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Radionuclide Releases to the Clinch River from White Oak Creek on the Oak Ridge Reservation– an Assessment of Historical Quantities Released, Off-Site Radiation Doses, and Health Risks

– APPENDICES –

Submitted to the Tennessee Department of Health by

ChemRisk
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OAK RIDGE HEALTH STUDIES
OAK RIDGE DOSE RECONSTRUCTION

– TASK 4 REPORT –

RADIONUCLIDES RELEASED TO THE CLINCH RIVER FROM WHITE OAK CREEK ON THE OAK RIDGE RESERVATION - AN ASSESSMENT OF HISTORICAL QUANTITIES RELEASED, OFF-SITE RADIATION DOSES, AND HEALTH RISKS

VOLUME 4A– APPENDICES

July 1999

Submitted to the Tennessee Department of Health by

This document was prepared as a team effort by the following individuals:

Project Manager

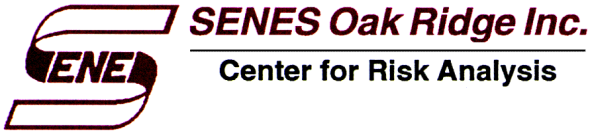
Thomas E. Widner[1]

Task 4 Manager

Jana S. Gouge[2]

Principal Authors:

A. Iulian Apostoaei[2]
B. Gordon Blaylock[2]
Brian Caldwell[3]
Susan Flack[4]
Jana S. Gouge
F. Owen Hoffman[2]
Cathy J. Lewis[2]
Shyam K. Nair[5]
E. Willow Reed[2]
Kathleen M. Thiessen[2]
Brian A. Thomas[2]
Thomas E. Widner



[1] ChemRisk®, A Service of McLaren/Hart Environmental Services, 1320 Harbor Bay Parkway, Suite 100, Alameda, California 94502. (510) 521-5200. E-mail for the project team can be sent to Tom_Widner@mclaren-hart.com.
[2] SENES Oak Ridge, Inc., 102 Donner Drive, Oak Ridge, Tennessee 37830.
[3] ChemRisk, A Service of McLaren/Hart, 5900 Landerbrook Drive, Cleveland, Ohio 44124.
[4] ChemRisk, A Service of McLaren/Hart Environmental Services, 1544 North Street, Boulder, Colorado 80304.
[5] SENES Oak Ridge, Inc., 102 Donner Drive, Oak Ridge, Tennessee 37830. Dr. Nair is currently with The Cadmus Group, Inc. in Oak Ridge, Tennessee.

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APPENDIX 3A

EQUATIONS USED IN THE SCREENING CALCULATIONS

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Appendix 3A: Equations Used in the Screening Calculations

The equations that were used for the screening level dose and risk estimates are provided in this Appendix. The exposure pathways represented by the equations were selected to represent the expected dominant routes of exposure for the Oak Ridge situation and to be adequate surrogates for pathways that are not explicitly included. For example, the equations for dose or risk from ingestion of contaminated beef are intended as a surrogate for all meat consumption, including game.

Water Ingestion:

$$SLRE_{water} = C_{water} \times U_{water} \times F_{cw} \times EF \times ED \times SF_{ing}$$

$SLRE_{water}$	=	Screening level risk estimate for water ingestion
C_{water}	=	Concentration of radionuclide in surface water (Bq L^{-1})
U_{water}	=	Average daily consumption of drinking water (L d^{-1})
F_{cw}	=	Fraction of water consumed that is contaminated (unitless)
EF	=	Exposure frequency (d y^{-1})
ED	=	Exposure duration (y)
SF_{ing}	=	Oral slope factor (Risk Bq^{-1})

Fish Ingestion:

$$SLRE_{fish} = (C_{water} \times BCF) \times U_{fish} \times F_{cf} \times EF \times ED \times SF_{ing}$$

$SLRE_{fish}$	=	Screening level risk estimate for fish ingestion
C_{water}	=	Concentration of radionuclide in surface water (Bq L^{-1})
BCF	=	Bioconcentration factor (L kg^{-1})
U_{fish}	=	Average daily consumption of fish (kg d^{-1})
F_{cf}	=	Fraction of fish consumed that is contaminated (unitless)
EF	=	Exposure frequency (d y^{-1})
ED	=	Exposure duration (y)
SF_{ing}	=	Oral slope factor (Risk Bq^{-1})

External Exposure from Soil (shoreline):

$$SLRE_{ext} = C_{sed} \cdot r \cdot t \cdot D_1 \cdot EF_{ext} \cdot \left(\frac{1 - e^{-l_R \cdot ED}}{l_R} \right) \cdot DCF_{ext} \cdot RCF$$

$$EF_{ext} = \left(S_f \cdot F_{t(up)} \right) + F_{t(down)}$$

$SLRE_{ext}$	=	Screening level risk estimate for external exposure to contaminated sediment
C_{sed}	=	Concentration of radionuclide in sediment (Bq g^{-1})
ρ	=	Soil density (g m^{-3})
t	=	Soil depth (m)
D_l	=	Dilution factor (unitless)
EF_{ext}	=	Exposure frequency (unitless)
S_f	=	Shielding factor (unitless)
$F_{t(up)}$	=	Fraction of time exposed when water is up (unitless)
$F_{t(down)}$	=	Fraction of time exposed when water is down (unitless)
λ_R	=	Radioactive decay constant (y^{-1})
ED	=	Exposure duration (y)
DCF_{ext}	=	External dose conversion factor (Sv y^{-1} per Bq m^{-2})
RCF	=	Risk conversion factor (Risk Sv^{-1})

Exposure to Contaminated Water while Swimming (immersion and ingestion):

$$SLRE_{swimming} = SLRE_{imm} + SLRE_{ing}$$

$SLRE_{swimming}$	=	Screening level risk estimate for external exposure while swimming
$SLRE_{imm}$	=	Screening level risk estimate for water immersion while swimming
$SLRE_{ing}$	=	Screening level risk estimate for inadvertent ingestion of water

$$SLRE_{imm} = C_{water} \cdot ET_s \cdot EF_s \cdot ED \cdot DCF_{imm} \cdot RCF \cdot CF$$

$SLRE_{imm}$	=	Screening level risk estimate for water immersion while swimming
C_{water}	=	Concentration of radionuclide in water (Bq L^{-1})
ET_s	=	Exposure time for swimming (h d^{-1})
EF_s	=	Exposure frequency for swimming (d hr^{-1})
ED	=	Exposure duration (y)
DCF_{imm}	=	Dose conversion factor for immersion (Sv y^{-1} per Bq L^{-1})
RCF	=	Risk conversion factor (Risk Sv^{-1})
CF	=	Units conversion factor (y hr^{-1})

$$SLRE_{ing} = C_{water} \times U_{water(r)} \times ET_s \times EF_s \times ED \times SF_{ing}$$

$SLRE_{ing}$	=	Screening level risk estimate for inadvertent ingestion of water
C_{water}	=	Concentration of radionuclide in water (Bq L^{-1})
U_{water}	=	Inadvertent consumption of water while swimming (L h^{-1})
F_{cw}	=	Fraction of water consumed that is contaminated (unitless)
ET_s	=	Exposure time (h d^{-1})
EF_s	=	Exposure frequency (d y^{-1})
ED	=	Exposure duration (y)
SF_{ing}	=	Oral slope factor (Risk Bq^{-1})

Dredging Scenario (External Exposure):

$$SLRE_{ext} = C_{sed} \times ET \times EF \times \left(\frac{1 - e^{-\lambda_R \cdot ED}}{\lambda_R} \right) \times DCF_{ext} \times RCF \times CF$$

$SLRE_{ext}$	=	Screening level risk estimate for external exposure to dredged sediment
C_{sed}	=	Concentration of radionuclide in sediment (Bq g^{-1})
ET	=	Exposure time (h d^{-1})
EF	=	Exposure frequency (d y^{-1})
λ_R	=	Radioactive decay (y^{-1})
ED	=	Exposure duration (y)
DCF_{ext}	=	External dose conversion factor for an infinite depth (Sv y^{-1} per Bq g^{-1})
RCF	=	Risk conversion factor (Risk Sv^{-1})
CF	=	Units conversion factor (y hr^{-1})

Ingestion of Beef:

$$C_{past} = C_{sed} \cdot B_{v,past}$$

C_{past}	=	Concentration of radionuclide in pasture (Bq kg^{-1} dry)
C_{sed}	=	Concentration of radionuclide in sediment (Bq kg^{-1} dry)
$B_{v,past}$	=	Transfer factor from dry soil to pasture (unitless)

$$C_{beef\,(sed)} = \left[\left(C_{past} \cdot Q_{fed,b} \cdot F_{pb}\right) + \left(C_{sed,b} \cdot Q_{sed,b} \cdot F_{csb}\right)\right] \cdot F_f$$

$C_{beef(sed)}$	=	Concentration of radionuclide in beef from dredged sediment (Bq kg^{-1})
C_{past}	=	Concentration of radionuclide in pasture (Bq kg^{-1})
$Q_{feed,b}$	=	Ingestion of pasture by beef cattle (kg d^{-1} dry)
F_{pb}	=	Fraction of contaminated pasture ingested by beef cattle (unitless)
C_{sed}	=	Concentration of radionuclide in sediment (Bq kg^{-1})
$Q_{sed,b}$	=	Ingestion of sediment by beef cattle (kg d^{-1})
F_{csb}	=	Fraction of contaminated sediment ingested by beef cattle (unitless)
F_f	=	Transfer coefficient to meat (d kg^{-1})

$$C_{beef\,(water)} = \left(C_{water} \cdot Q_{w,b} \cdot F_{cw}\right) \cdot F_f$$

$C_{beef(water)}$	=	Concentration of radionuclide in beef from river water (Bq kg^{-1})
C_{water}	=	Concentration of radionuclide in water (Bq L^{-1})
$Q_{w,b}$	=	Ingestion of water by beef cattle (L d^{-1})
F_{cw}	=	Fraction of contaminated water ingested by cattle (unitless)
F_f	=	Transfer coefficient to meat (d kg^{-1})

$$SLRE_{beef(sed)} = C_{beef(sed)} \times U_{beef} \times F_{cb} \times EF \times \left(\frac{1 - e^{-\lambda_R ED}}{\lambda_R} \right) \times SF_{ing}$$

$SLRE_{beef(sed)}$	=	Screening level risk estimate for ingestion of beef from cattle exposed to dredged sediment
C_{beef}	=	Concentration of radionuclide in beef (Bq kg^{-1})
U_{beef}	=	Beef ingestion rate by humans (kg d^{-1})
F_{cb}	=	Fraction of contaminated beef ingested by humans (unitless)
EF	=	Exposure frequency (d y^{-1})
λ_R	=	Radioactive decay (y^{-1})
ED	=	Exposure duration (y)
SF_{ing}	=	Oral slope factor (Risk Bq^{-1})

$$SLRE_{beef(water)} = C_{beef(water)} \times U_{beef} \times F_{cb} \times EF \times ED \times SF_{ing}$$

$SLRE_{beef(water)}$	=	Screening level risk estimate for ingestion of beef from cattle exposed to river water
$C_{beef(water)}$	=	Concentration of radionuclide in beef from river water (Bq kg^{-1})
U_{beef}	=	Beef ingestion rate by humans (kg d^{-1})
F_{cb}	=	Fraction of contaminated beef ingested by humans (unitless)
EF	=	Exposure frequency (unitless)
ED	=	Exposure duration (y)
SF_{ing}	=	Oral slope factor (Risk Bq^{-1})

$$SLRE_{beef} = SLRE_{beef(sed)} + SLRE_{beef(water)}$$

$SLRE_{beef}$ = Total screening level risk estimate for beef ingestion

Ingestion of Milk:

$$C_{past} = C_{sed} \cdot B_{v,past}$$

C_{past} = Concentration of radionuclide in pasture (Bq kg^{-1} dry)

C_{sed} = Concentration of radionuclide in sediment (Bq kg^{-1} dry)

$B_{v,past}$ = Transfer factor from dry soil to pasture

$$C_{milk(sed)} = \left[\left(C_{past} \cdot Q_{feed,d} \cdot F_{pd}\right) + \left(C_{sed} \cdot Q_{sed,d} \cdot F_{csd}\right)\right] \cdot F_m$$

$C_{milk(sed)}$ = Concentration of radionuclide in milk from dredged sediment (Bq L^{-1})

C_{past} = Concentration of radionuclide in pasture (Bq kg^{-1} dry)

$Q_{feed,d}$ = Ingestion of pasture by dairy cattle (kg d^{-1})

F_{pd} = Fraction of contaminated pasture ingested by dairy cattle (unitless)

C_{sed} = Concentration of radionuclide in sediment (Bq kg^{-1})

$Q_{sed,d}$ = Ingestion of sediment by dairy cattle (kg d^{-1})

F_{csd} = Fraction of sediment ingested by dairy cattle that is contaminated (unitless)

F_m = Transfer coefficient to milk (d L^{-1})

$$C_{milk(water)} = \left(C_{water} \cdot Q_{w,d} \cdot F_{cw}\right) \cdot F_m$$

$C_{milk(water)}$ = Concentration of radionuclide in milk (Bq L^{-1})

C_{water} = Concentration of radionuclide in water (Bq L^{-1})

$Q_{w,d}$ = Ingestion of water by dairy cattle (L d^{-1})

F_{cw} = Fraction of contaminated water ingested by cattle (unitless)

F_m = Transfer coefficient to milk (d L^{-1})

$$SLRE_{milk(sed)} = C_{milk(sed)} \cdot U_{milk} \cdot F_{cd} \cdot EF \cdot \left(\frac{1 - e^{-\lambda_R ED}}{\lambda_R}\right) \cdot SF_{ing}$$

$SLRE_{milk(sed)}$ = Screening level risk estimate for ingestion of milk from cows exposed to dredged sediment

$C_{milk(sed)}$ = Concentration of radionuclide in milk (Bq L^{-1})

U_{milk} = Milk ingestion rate by humans (L d^{-1})

F_{cd} = Fraction of contaminated milk ingested by humans (unitless)

EF = Exposure frequency (d y^{-1})

λ_R = Radioactive decay (y^{-1})

ED = Exposure duration (y)

SF_{ing} = Ingestion Slope Factor from 1995 HEAST (Risk Bq^{-1})

$$SLRE_{milk(water)} = C_{milk(water)} \cdot U_{milk} \cdot F_{cd} \cdot EF \cdot ED \cdot SF_{ing}$$

$SLRE_{milk(water)}$ = Screening level risk estimate for ingestion of milk from cows exposed to river water

$C_{milk(water)}$ = Concentration of radionuclide in milk (Bq L^{-1})

U_{milk} = Milk ingestion rate by humans (L d^{-1})

F_{cd} = Fraction of contaminated milk ingested by humans (unitless)

EF = Exposure frequency (d y^{-1})

ED = Exposure duration (y)

SF_{ing} = Oral slope factor (Risk Bq^{-1})

$$SLRE_{milk} = SLRE_{milk(sed)} + SLRE_{milk(water)}$$

$SLRE_{milk}$ = Total screening level risk estimate for milk ingestion

Ingestion of Vegetables:

$$C_{veg} = C_{sed} \cdot B_{v,veg}$$

C_{veg} = Concentration of radionuclide in vegetables (Bq kg^{-1} wet)

C_{sed} = Concentration of radionuclide in sediment (Bq kg^{-1} dry)

$B_{v,veg}$ = Transfer factor from dry soil to vegetables (unitless)

$$SLRE_{veg} = C_{veg} \cdot U_{veg} \cdot F_{cv} \cdot EF \cdot \left(\frac{1 - e^{-\lambda_R \cdot ED}}{\lambda_R} \right) \cdot SF_{ing}$$

$SLRE_{veg}$ = Screening level risk estimate for ingestion of vegetables grown on dredged soil

C_{veg} = Concentration of radionuclide in vegetables (Bq kg^{-1} wet)

U_{veg} = Vegetable ingestion rate by humans (kg d^{-1})

F_{cv} = Fraction of contaminated vegetables ingested by humans (unitless)

EF = Exposure frequency (d y^{-1})

λ_R = Radioactive decay (y^{-1})

ED = Exposure duration (y)

SF_{ing} = Oral slope factor (Risk Bq^{-1})

Ingestion of produce (irrigation):

$$SLRE_{prod} = C_{prod} \cdot U_{veg} \cdot F_{cp} \cdot EF \cdot ED \cdot SF_{ing}$$

$SLRE_{prod}$	=	Screening level risk estimate for ingestion of produce
C_{prod}	=	Concentration of radionuclide in produce (Bq kg^{-1})
U_{prod}	=	Average daily consumption of produce (kg d^{-1})
F_{cp}	=	Fraction of produce consumed that is contaminated (unitless)
EF	=	Exposure frequency (d y^{-1})
ED	=	Exposure duration (y)
SF_{ing}	=	Oral slope factor (Risk Bq^{-1})

$$C_{prod} = C_{veg(dd)} + C_{veg(uptake)}$$

$C_{veg(dd)}$	=	Concentration of radionuclide in produce from direct deposition (Bq kg^{-1})
$C_{veg(uptake)}$	=	Concentration of radionuclide in produce due to uptake from sediment (Bq kg^{-1})

$$C_{veg(dd)} = \frac{d \cdot \alpha \cdot \left(1 - e^{-(\lambda r + \lambda w)\, t_e}\right)}{\lambda_r}$$

d	=	Deposition rate (Bq L^{-1})
α	=	Mass interception fraction (m^2 kg)
λ_r	=	Radioactive decay (d^{-1})
λ_w	=	Removal rate of concentration on plant surfaces (d^{-1})
t_e	=	Time exposed during growing period (d)

$$C_{veg\ (uptake)} = F_v \cdot \frac{d \cdot (1 - e^{-(\lambda_R + \lambda_s)\, t_b})}{\rho \cdot \lambda_r}$$

F_v = Soil-to-vegetation transfer factor

d = Deposition rate (Bq L^{-1})

λ_r = Radioactive decay (d^{-1})

λ_s = Removal rate of concentration in root zone (d^{-1})

t_b = Duration of discharge of radioactive material (d)

ρ = Effective surface soil density (kg m^{-2})

$$d = C_{water} \cdot I_{water}$$

C_{water} = Concentration of radionuclide in water (bq L^{-1})

I_{water} = Irrigation rate (L m^{-2} d^{-1})

APPENDIX 3B

EXPOSURE PARAMETERS USED IN THE SCREENING CALCULATIONS

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Appendix 3B: Exposure Parameters Used in the Screening Calculations

Parameter values for this screening assessment were selected to estimate the screening-level risk (screening index) for a "most at-risk" reference individual. For example, for the screening of terrestrial food chain pathways, the target individual is assumed to derive most of his food (milk, meat, produce) from home-grown sources at the contaminated location. Similarly, for external exposure pathways, the target individual is assumed to spend a large fraction of time outdoors at the contaminated location.

The values that were assumed for contaminant-independent parameters are provided in Table 3B.1, together with the rationales for their selection. Parameters for which the values depend on the specific radionuclide are listed in Tables 3B.2 and 3B.3. These parameters include toxicity values, radionuclide decay constants, transfer factors, bioaccumulation factors, and distribution coefficients. Table 3B.4 contains upper-bound estimates of radionuclides released over White Oak Dam, based on information available at the beginning of 1996. Tables 3B.5 and 3B.6 contain conservative estimates of annual average radionuclide concentrations in water and sediment, respectively, based on the preliminary upper-bound release estimates shown in Table 3B.4.

Table 3B.1: Default Values for Contaminant-Independent Parameters

Parameter	Symbol	Value	Rationale
Exposure duration (yr)	ED	1	Because yearly concentration data were available, risks were calculated individually for each year from 1944 to 1991 and then summed. For this reason, an exposure duration of 1 year was used. The only exception was in the dredging scenario, where a 30-year total exposure duration was assumed.
Exposure frequency (d yr^{-1})	EF	365	The value is based on the assumption of no vacation (365 days).
Average daily consumption of meat by adults (kg d^{-1})	U_{meat}	0.3	The value (0.3) is based on the average total intake of meat (0.258 kg d^{-1}) for adults (Rupp, 1980). The number is representative of a person who raised most of his own meat.
Average daily consumption of meat by children (kg d^{-1})	U_{meat}	0.15	The value (0.15) is the average consumption of all meat, poultry, and fish for children aged 6-8 years old (ATSDR, 1992) and is the average intake of all meat for children aged 1-11 years old (Rupp, 1980).
Fraction of meat consumed that is contaminated (unitless)	F_{cb}	0.8	This value (0.8) is based on the assumption that part of the meat was obtained from non-contaminated sources.
Average daily consumption of milk by adults (L d^{-1})	U_{milk}	1.0	The value (1.0) is exceeded by fewer than 2.6% of adults aged 20-54 years old (Pao and Burk, 1975; cited in Rupp, 1980). Ninety percent or more are below 0.971 L d^{-1}.
Average daily consumption of milk by children (L d^{-1})	U_{milk}	1.0	The value (1.0) is consistent with the value reported in ICRP (1975). In Pao and Burk (1975; cited in Rupp, 1980), a range of 0.971 to 1.33 L d^{-1} is exceeded by fewer than 2.5% of children aged 3-11 years old. Ninety percent or more are below 0.971 L d^{-1}.

Table 3B.1 (Continued)

Parameter	Symbol	Value	Rationale
Fraction of milk consumed that is contaminated (unitless)	F_{cm}	1.0	The value (1.0) was based on the assumption that the maximally exposed individual obtained his milk from a backyard cow.
Average daily consumption of vegetables by adults, wet weight (kg d^{-1})	U_{veg}	0.5	The value (0.5) is based on average total intake of all fresh produce by adults (including leafy vegetables, deep yellow vegetables, legumes, tomatoes, potatoes, other vegetables, citrus, and other fruit) of approximately 0.48 kg d^{-1} in 1955 and 0.44 kg d^{-1} in 1965 (Rupp, 1980).
Average daily consumption of vegetables by children, wet weight (kg d^{-1})	U_{veg}	0.4	The value (0.4) is based on the average total intake of all fresh produce (including leafy vegetables, deep yellow vegetables, legumes, tomatoes, potatoes other vegetables, citrus, and other fruit) by children aged 1-11 years of approximately 0.37 kg d^{-1} in 1955 and 0.34 kg d^{-1} in 1965 (Rupp, 1980).
Fraction of vegetables consumed that is contaminated (unitless)	F_{cv}	0.6	The value (0.6) is based on the assumption that not all vegetables consumed are homegrown. For this analysis, 60% of the vegetables consumed were assumed to have been contaminated.
Average daily consumption of water by adults (L d^{-1})	U_{water}	2.2	The value (2.2) is the upper bound of total fluid intake excluding milk for adults (USEPA, 1989; ICRP, 1975).
Average daily consumption of water by children (L d^{-1})	U_{water}	1.3	The value (1.3) is the upper bound of total fluid intake excluding milk for children aged 12-17 (Cook et al., 1975; cited in Rupp, 1980).

Table 3B.1 (continued)

Parameter	Symbol	Value	Rationale
Incidental consumption of surface water during recreational activities (L h^{-1})	$U_{water(r)}$	0.05	The value (0.05) is the rate of incidental ingestion of surface water while swimming (USEPA, 1989).
Fraction of water consumed by humans that is contaminated (unitless)	F_{cw}	0.5	The value (0.5) is based on the assumption that tap water is not the only source of fluid intake.
Average daily consumption of fish by adults (kg d^{-1})	U_{fish}	0.03	The value (0.03) is the most frequently recorded consumption rate of freshwater fish in the Lake Michigan Survey (10 to 15 kg yr^{-1}) (Humphrey, 1978; cited in Rupp et al., 1980).
Average daily consumption of fish by children (kg d^{-1})	U_{fish}	0.007	The value (0.007) was slightly more conservative than the mean value (0.005) reported for the average daily consumption rate of fish for children ages 1 to 18 years who consume fish and live in the East South Central states (Rupp et al., 1980).
Fraction of fish consumed that is contaminated (unitless)	F_{cf}	0.8	The value (0.8) is based on the assumption that the maximally exposed individual is an avid fisherman and that the fisherman obtained the majority of his fish from a contaminated source.
Hold-up Time (d)	H_t	8	For short-lived radionuclides, a hold-up time was included to account for the fact that fishermen would most likely not eat the fish the day of the catch. Fish is often frozen until enough is obtained to make a meal. This could be as long as 30 days (1 month). To account for the times when fish would be cooked and eaten in a matter of a few days, an 8-day hold-up time was included.

Table 3B.1 (continued)

Parameter	Symbol	Value	Rationale
Daily ingestion of feed by beef cattle, dry weight (kg d^{-1})	$Q_{feed, b}$	10	The value (10) is the upper bound of the range reported by the IAEA (1994) for the dry matter intake of beef cattle.
Fraction of feed ingested by beef cattle that is from contaminated pasture (unitless)	F_{pb}	1	The value (1) is based on a worst-case scenario, where all of the cow's food was obtained from a contaminated pasture.
Daily ingestion of feed by dairy cattle, dry weight (kg d^{-1})	$Q_{feed, d}$	16	According to Husted-Anderson (1941), dairy cattle consumed 11-17.8 kg d^{-1} of dry matter in a closely managed feeding system. However, it is assumed that the milk was obtained from backyard cattle. "These animals typically forage on semi-wild vegetation and not much effort is made to improve the quality of pasture unless other grazing stock require it" (Koranda, 1965). Given the poorer economic conditions in the area during the 1940s to 1960s, improvements to the grazing pasture would have been unlikely. Therefore, the value (16) was chosen to be consistent with the upper bound estimate reported by Koranda (1965) for cattle raised in an unmanaged feeding regime.
Fraction of feed ingested by dairy cattle that is from contaminated pasture (unitless)	F_{pd}	0.75	The value (0.75) was assumed to be the worst-case scenario, where the cow obtains 75% of its food from contaminated pasture. Unlike beef cows, dairy cows are almost always provided with some supplemental feed.

Table 3B.1 (continued)

Parameter	Symbol	Value	Rationale
Daily ingestion rate of soil by beef and dairy cattle (kg d^{-1})	Q_{soil}	0.5	The value (0.5) is consistent with the central value reported by Darwin (1990; cited in Snyder et al., 1994). Zach and Mayoh (1984) and Whicker and Kirchner (1987) recommend the use of 0.5 kg d^{-1} in food-chain models.
Daily ingestion rate of water by beef cattle (L d^{-1})	$Q_{w,b}$	50	The value (50) is the upper bound of the range reported for beef cattle (range 38-50 L d^{-1}; McKone, 1988). [Note: Median of range is 45 L d^{-1}].
Daily ingestion rate of water by dairy cattle (L d^{-1})	$Q_{w,d}$	60	The value (60) is the upper bound of range reported for dairy cattle (range 38-60 L d^{-1}; McKone, 1988).
Fraction of water ingested by beef and dairy cattle that is from a contaminated source (unitless)	F_{cw}	1	For cows located on Jones Island, evidence suggests that all of the water ingested by the cows was from the Clinch River.
Fraction of sediment or soil ingested by beef cattle that was contaminated (unitless)	F_{csb}	1	For the cattle located on Jones Island, the assumption is that all of the soil ingested was contaminated.
Fraction of sediment or soil ingested by dairy cattle that was contaminated (unitless)	F_{csd}	1	For the cattle located on Jones Island, the assumption is that all of the soil ingested was contaminated.

Table 3B.1 (continued)

Parameter	Symbol	Value	Rationale
Dilution factor (unitless)	D_1	1	This value assumes no dilution.
Shielding factor from sediment under water (unitless)	S_f	0.6	The value (0.6) is calculated assuming a maximum energy of 3 MeV for gamma rays and a depth of approximately 13 cm.
Fraction of time exposed when water is up (unitless)	$F_{t(up)}$	0.2	The value (0.2) assumes a fisherman or camper is exposed every weekend (8 days per month) plus one day each week (4 days per month) during the summer and fall (time of year when water levels are high).
Fraction of time exposed when water is down (unitless)	$F_{t(down)}$	0.05	The value (0.05) assumes a fisherman is exposed 2 days per month during the winter months (3 months per year) for a total of 6 days per year. During the spring months (3 months per year), it was assumed that some recreational activity occurred every weekend (4 days per month) for a total of 12 days per year.
Exposure time for swimming (L d^{-1})	ET_s	4	The value (4) assumes that an individual will swim in the Clinch River 4 hours per day, based on the fact that the Clinch River is a relatively large body of water that may have been used frequently due to the lack of air conditioning during the 1940s and 1950s.
Exposure frequency for swimming (d L^{-1})	EF_s	120	The value (120) assumes that an individual will swim in the Clinch River 120 days per year (approx. 4 months of the year).
Fraction of contaminated produce ingested by humans (unitless)	F_{cp}	0.5	The value (0.5) for the fraction of contaminated produce assumes that 50% of an individual's vegetable/fruit intake will be made up of peaches irrigated with contaminated river water.

Table 3B.1 (continued)

Parameter	Symbol	Value	Rationale
Mass interception fraction (m^2 kg^{-1})	α	0.3	The value (0.3) is the fraction of deposited activity intercepted by the edible portion of vegetation per unit mass (IAEA, in preparation).
Removal rate of contamination on plant surfaces (d^{-1})	λ_w	0.05	The value (0.05) is the rate constant for reduction of the concentration of material deposited in the plant surfaces due to processes other than radioactive decay.
Removal rate of contamination in root zone (d^{-1})	λ_s	0.00014	The value (0.00014) is the rate constant for reduction of the concentration of material deposited in the root zone of soils due to processes other than radioactive decay.
Time exposed during growing period (d)	t_e	60	The assumption is that the crops (peaches) were exposed to contamination during the growth period (60 days).
Duration of discharge of radioactive materials (d)	t_b	365	The assumption is that the radioactive material is released for the entire year (365 d).
Effective surface soil density (kg m^{-2})	ρ	100	The value (100) is the standardized surface density for the effective root zone in soil (IAEA, in preparation).
Irrigation rate (L m^{-2} d^{-1})	I_w	0.438	The value represents an irrigation rate of 5 liters spread over 1 square meter per day for 32 days per year.
Risk Conversion Factor (Risk Sv^{-1})	RCF	0.073	This value represents total detriment for whole population (ICRP, 1990)

Table 3B.2: Summary of Radionuclide-Specific Parameters.

	Decay Constant	Slope Factors[2]	Dose Conversion Factors[3]		
		Ingestion	External (surface)	External (inf. depth)	Water Immersion
Radionuclide	**(y^{-1})**	**(Risk Bq^{-1})**	**(Sv y^{-1} per Bq m^{-2})**	**(Sv y^{-1} per Bq g^{-1})**	**(Sv y^{-1} per Bq L^{-1})**
Cs-137 [1]	2.3E-02	8.5 E-10	1.7 E-08	8.75E-04	1.9 E-06
Ru-106 [1]	6.9E-01	9.3 E-10	6.7 E-09	3.31E-04	7.1 E-07
Sr-90 [1]	2.4E-02	1.5 E-09	1.8 E-10	6.23E-06	1.2 E-08
Co-60	1.3E-01	5.1 E-10	7.4 E-08	4.16E-03	0.0 E+00
Ce-144 [1]	8.9E-01	8.0 E-10	1.8 E-09	8.20E-05	2.6 E-07
Zr-95 [1]	3.9E+00	1.1 E-10	4.6 E-08	2.36E-03	5.0 E-06
Nb-95	7.2E+00	6.1 E-11	2.4 E-08	1.20E-03	2.6 E-06
H-3[4]	5.6E-02	--	--	–	–
I-131 [1]	3.2E+01	1.3 E-08	1.2 E-08	5.56E-04	1.3 E-06
U-235 [1]	9.9E-10	1.3 E-09	5.3 E-09	1.94E-04	5.4 E-07
U-238 [1]	1.6E-10	1.2 E-09	8.8 E-10	3.51E-05	6.1 E-08
Pu-239/240[5]	1.1E-04	8.5 E-09	2.5 E-11	7.57E-08	3.5 E-10
Th-232 [1]	4.9E-11	8.9 E-10	1.7 E-11	1.34E-07	6.3 E-10
Am-241	1.6E-03	8.9 E-10	8.7 E-10	1.12E-05	5.9 E-08
Eu-154	7.9E-02	2.5 E-10	3.8 E-08	1.97E-03	4.2 E-06
La-140	1.5E+02	2.5 E-10	6.8 E-08	3.86E-03	8.0 E-06
Pm-147 [1]	2.7E-01	3.8 E-11	1.1 E-12	1.28E-08	4.4 E-11
Sm-151	7.7E-03	1.2 E-11	1.6 E-13	1.09E-10	2.7 E-12
Sr-89	5.0E+00	2.6E-10	7.2 E-11	2.3 E-06	4.7 E-09
Ba-140	2.0E+01	3.2E-10	7.4 E-08	4.1 E-03	8.6 E-06
P-32	1.8E+01	1.6E-10	9.2 E-11	3.0 E-06	6.0 E-09
Y-91	4.3E+00	3.6E-10	1.8 E-10	8.3 E-06	1.7 E-08
Pr-143	1.9E+01	1.8E-10	2.2 E-11	5.7 E-07	1.3 E-09
Nd-147	2.3E+01	1.6E-10	4.4 E-09	1.3 E-04	4.3 E-07

(1) Short-lived daughter products are included when considering slope factors and dose-conversion factors.
(2) All values from 1995 HEAST Tables (except I-131, which was calculated with age-specific data).
(3) All values from EPA Federal Guidance Report No. 12.
(4) See method for ^{3}H calculation in Section 3.1.5.
(5) Pu-240 isotope was assumed (most conservative assumption).

Table 3B.3 Summary of Radionuclide-Specific Parameters for Accumulation and Transfer.

Radionuclide	Screening Level Distribution Coefficients (Kd)[1] (L kg^{-1})	Screening Level Bioconcentration Factors[2] (BCF) (L kg^{-1})	Soil to Plant Uptake for Pasture Forage Bv, dry[3] (unitless)	Soil to Plant Uptake for Food Crops Bv, wet[3] (unitless)	Milk Transfer Coefficient Fm[3] (d kg^{-1})	Meat Transfer Coefficient Ff[3] (d L^{-1})
Cs-137	80000	2000	1	0.04	1.0 E-02	5.0 E-02
Ru-106	40000	10	0.2	0.05	3.0 E-05	5.0 E-02
Sr-90	4000	60	10	0.3	3.0 E-03	1.0 E-02
Co-60	71000	300	2	0.08	1.0 E-02	7.0 E-02
Ce-144	140000	30	0.1	0.05	3.0 E-04	2.0 E-04
Zr-95	10000	300	0.1	0.001	6.0 E-06	1.0 E-05
Nb-95	10000	300	0.2	0.01	4.0 E-06	3.0 E-06
H-3	1	1	---	---	---	---
I-131	75	40	0.1	0.02	1.0 E-02	5.0 E-02
U-235	1000	10	0.2	0.01	6.0 E-04	3.0 E-03
U-238	1000	10	0.2	0.01	6.0 E-04	3.0 E-03
Pu-239/240[4]	10000000	30	0.1	0.002	3.0 E-06	2.0 E-04
Th-232	1000000	100	0.1	0.001	5.0 E-06	1.0 E-04
Am-241	40000	30	0.1	0.002	2.0 E-05	1.0 E-04
Eu-154	800	50	0.1	0.002	6.0 E-05	2.0 E-03
La-140	10000	25	0.1	0.002	6.0 E-05	2.0 E-03
Pm-147	10000	30	0.1	0.002	6.0 E-05	2.0 E-03
Sm-151	10000	300	0.1	0.002	6.0 E-05	2.0 E-03
Sr-89	100	60	10	0.3	2.8 E-03	8.0 E-03
Ba-140	1000	5	0.1	0.05	4.8 E-04	2.0 E-04
P-32	30	10,000	10	1	1.6 E-02	5.0 E-02
Y-91	1000	30	0.1	0.005	6.0 E-05	1.0 E-03
Pr-143	1000	30	0.1	0.002	6.0 E-05	2.0 E-03
Nd-47	1000	30	0.1	0.002	6.0 E-05	2.0 E-03

(1) All values are maximum observed K_d values from IAEA (1994).
(2) All values from IAEA (1994) except La-140 and Sm-151, which come from Baker and Soldat (1992).
(3) All values from IAEA (1994).
(4) Pu-240 isotope was assumed (most conservative assumption).

Table 3B.4: Upper bound release estimates (Bq y^{-1}).

	Cs-137	Ru-106	Sr-90	Co-60	TRE	Ce-144	Zr-95	Nb-95	I-131	H-3	TRU
1944	2.2 E+11	5.9 E+12	2.2 E+11	7.8 E+11	4.1 E+12	1.0 E+12	2.5 E+13	2.5 E+13	4.1 E+12	1.7 E+14	1.1 E+11
1945	4.8 E+12	8.3 E+12	4.8 E+12	1.0 E+12	5.9 E+12	1.4 E+12	1.2 E+13	1.2 E+13	5.8 E+12	1.7 E+14	1.1 E+11
1946	1.7 E+13	2.3 E+13	1.7 E+13	2.8 E+12	1.6 E+13	4.0 E+12	2.0 E+12	2.0 E+12	1.6 E+13	1.7 E+14	1.1 E+11
1947	3.7 E+12	5.1 E+12	3.7 E+12	5.6 E+11	3.6 E+12	8.9 E+11	4.4 E+11	4.4 E+11	3.6 E+12	1.7 E+14	1.1 E+11
1948	9.1 E+12	1.3 E+13	9.1 E+12	1.6 E+12	8.7 E+12	2.2 E+12	1.1 E+12	1.1 E+12	8.9 E+12	1.7 E+14	1.1 E+11
1949	8.5 E+12	1.2 E+13	1.7 E+13	1.7 E+12	8.5 E+12	2.0 E+12	2.0 E+13	2.4 E+12	8.5 E+12	1.7 E+14	4.4 E+09
1950	2.1 E+12	2.6 E+12	4.2 E+12	1.7 E+12	3.3 E+12	2.1 E+12	1.7 E+12	4.7 E+12	2.1 E+12	1.7 E+14	4.4 E+09
1951	2.2 E+12	2.0 E+12	3.2 E+12	1.7 E+12	1.2 E+12	2.2 E+12	5.6 E+11	2.2 E+11	2.0 E+12	1.7 E+14	8.9 E+09
1952	1.1 E+12	1.7 E+12	8.0 E+12	1.7 E+12	2.9 E+12	2.6 E+12	2.1 E+12	2.0 E+12	2.2 E+12	1.7 E+14	3.3 E+09
1953	6.7 E+11	2.9 E+12	1.4 E+13	1.7 E+12	1.2 E+13	7.8 E+11	8.9 E+11	4.4 E+11	2.2 E+11	1.7 E+14	8.9 E+09
1954	2.4 E+12	1.2 E+12	1.6 E+13	1.7 E+12	1.8 E+13	2.7 E+12	1.6 E+12	1.0 E+12	4.4 E+11	1.7 E+14	7.8 E+09
1955	7.0 E+12	3.4 E+12	1.0 E+13	7.8 E+11	1.7 E+13	9.4 E+12	5.6 E+11	6.7 E+11	7.8 E+11	1.7 E+14	2.8 E+10
1956	1.9 E+13	3.2 E+12	1.1 E+13	5.1 E+12	1.6 E+13	6.5 E+12	1.3 E+12	1.7 E+12	4.4 E+11	1.7 E+14	3.1 E+10
1957	9.9 E+12	6.7 E+12	9.2 E+12	5.6 E+11	1.2 E+13	1.4 E+12	2.6 E+12	7.8 E+11	1.1 E+11	1.7 E+14	1.7 E+10
1958	6.1 E+12	4.7 E+12	1.7 E+13	1.0 E+12	2.7 E+13	3.3 E+12	6.7 E+11	6.7 E+11	8.9 E+11	1.7 E+14	8.9 E+09
1959	8.4 E+12	5.8 E+13	6.7 E+12	8.5 E+12	1.0 E+13	5.3 E+12	3.0 E+12	3.3 E+12	1.1 E+11	1.7 E+14	7.5 E+10
1960	3.4 E+12	2.1 E+14	3.1 E+12	8.0 E+12	5.3 E+12	3.0 E+12	4.2 E+12	5.0 E+12	5.6 E+11	1.7 E+14	2.1 E+10
1961	1.7 E+12	2.2 E+14	2.4 E+12	3.4 E+12	2.7 E+12	4.4 E+11	2.2 E+12	7.8 E+12	4.4 E+11	1.7 E+14	7.8 E+09
1962	6.7 E+11	1.6 E+14	1.0 E+12	1.6 E+12	1.2 E+12	1.1 E+11	2.2 E+11	8.9 E+11	4.4 E+10	1.7 E+14	6.7 E+09
1963	4.4 E+11	4.8 E+13	8.9 E+11	1.6 E+12	1.0 E+12	2.2 E+11	3.3 E+10	7.8 E+10	4.4 E+10	1.7 E+14	1.9 E+10
1964	6.7 E+11	2.1 E+13	7.8 E+11	1.7 E+12	1.4 E+12	3.3 E+10	2.2 E+10	1.1 E+10	3.3 E+10	2.1 E+14	8.9 E+09
1965	2.2 E+11	7.7 E+12	3.3 E+11	1.3 E+12	6.7 E+11	1.1 E+10	3.3 E+10	3.3 E+10	2.2 E+10	1.3 E+14	5.6 E+10
1966	2.2 E+11	3.2 E+12	3.3 E+11	7.8 E+11	5.6 E+11	1.1 E+10	7.8 E+10	7.8 E+10	2.2 E+10	3.4 E+14	1.8 E+10
1967	3.3 E+11	1.9 E+12	5.6 E+11	3.3 E+11	1.0 E+12	2.2 E+10	5.6 E+10	5.6 E+10	1.0 E+11	1.5 E+15	1.1 E+11
1968	1.1 E+11	5.6 E+11	3.3 E+11	1.1 E+11	4.4 E+11	3.3 E+09	3.3 E+10	3.3 E+10	3.3 E+10	1.1 E+15	4.4 E+09
1969	1.1 E+11	2.2 E+11	3.3 E+11	1.1 E+11	5.6 E+11	2.2 E+09	2.2 E+10	2.2 E+10	5.6 E+10	1.4 E+15	2.2 E+10
1970	2.2 E+11	1.1 E+11	4.4 E+11	1.1 E+11	5.6 E+11	6.7 E+09	2.2 E+09	2.2 E+09	3.3 E+10	1.1 E+15	4.4 E+10
1971	1.1 E+11	5.6 E+10	3.3 E+11	1.1 E+11	3.3 E+11	5.6 E+09	1.1 E+09	1.1 E+09	2.2 E+10	9.9 E+14	5.6 E+09
1972	2.2 E+11	5.6 E+10	6.7 E+11	1.1 E+11	5.6 E+11	3.3 E+09	1.1 E+09	1.1 E+09	3.3 E+10	1.2 E+15	7.8 E+09
1973	2.2 E+11	7.8 E+10	7.8 E+11	1.1 E+11	5.6 E+11	2.2 E+09	5.6 E+09	5.6 E+09	5.6 E+10	1.7 E+15	8.9 E+09
1974	1.1 E+11	2.2 E+10	6.7 E+11	6.7 E+10	5.6 E+11	2.2 E+09	2.2 E+09	2.2 E+09	2.2 E+10	9.5 E+14	2.2 E+09
1975	6.7 E+10	3.3 E+10	7.8 E+11	5.6 E+10	5.6 E+11	2.2 E+09	2.2 E+09	2.2 E+09	3.3 E+10	1.2 E+15	2.2 E+09

Table 3B.4 Continued.

	Cs-137	Ru-106	Sr-90	Co-60	TRE	Ce-144	Zr-95	Nb-95	I-131	H-3	TRU
1976	2.2 E+10	2.2 E+10	5.6 E+11	1.0 E+11	5.6 E+11	2.2 E+09	2.2 E+09	2.2 E+09	3.3 E+09	8.2 E+14	1.1 E+09
1977	2.2 E+10	2.2 E+10	3.3 E+11	4.4 E+10	5.6 E+11	2.2 E+09	2.2 E+09	2.2 E+09	3.3 E+09	6.9 E+14	3.3 E+09
1978	3.3 E+09	2.2 E+10	2.2 E+11	4.4 E+10	5.6 E+11	2.2 E+09	2.2 E+09	2.2 E+09	4.4 E+09	7.0 E+14	3.3 E+09
1979	2.2 E+09	1.1 E+10	2.7 E+11	4.4 E+10	5.6 E+11	2.2 E+09	2.2 E+09	2.2 E+09	4.4 E+09	8.5 E+14	3.3 E+09
1980	6.7 E+10	1.1 E+10	1.7 E+11	4.4 E+10	5.6 E+11	2.2 E+09	2.2 E+09	2.2 E+09	4.4 E+09	5.1 E+14	4.4 E+09
1981	2.2 E+10	1.1 E+10	1.7 E+11	7.8 E+10	5.6 E+11	2.2 E+09	2.2 E+09	2.2 E+09	4.4 E+09	3.2 E+14	4.4 E+09
1982	1.7 E+11	2.2 E+10	3.0 E+11	1.1 E+11	5.6 E+11	2.2 E+09	2.2 E+09	2.2 E+09	6.7 E+09	6.0 E+14	3.3 E+09
1983	1.3 E+11	2.2 E+10	2.3 E+11	3.3 E+10	5.6 E+11	2.2 E+09	2.2 E+09	2.2 E+09	4.4 E+08	6.2 E+14	5.6 E+09
1984	6.7 E+10	2.2 E+10	2.9 E+11	2.2 E+10	5.6 E+11	2.2 E+09	2.2 E+09	2.2 E+09	5.6 E+09	7.1 E+14	3.3 E+09
1985	6.7 E+10	2.2 E+10	2.9 E+11	2.2 E+10	5.6 E+11	2.2 E+09	2.2 E+09	2.2 E+09	5.6 E+09	7.1 E+14	3.3 E+09
1986	6.7 E+10	2.2 E+10	2.9 E+11	2.2 E+10	5.6 E+11	2.2 E+09	2.2 E+09	2.2 E+09	5.6 E+09	7.1 E+14	3.3 E+09
1987	6.7 E+10	2.2 E+10	2.9 E+11	2.2 E+10	5.6 E+11	2.2 E+09	2.2 E+09	2.2 E+09	5.6 E+09	7.1 E+14	3.3 E+09
1988	6.7 E+10	2.2 E+10	2.9 E+11	2.2 E+10	5.6 E+11	2.2 E+09	2.2 E+09	2.2 E+09	5.6 E+09	7.1 E+14	3.3 E+09
1989	6.7 E+10	2.2 E+10	2.9 E+11	2.2 E+10	5.6 E+11	2.2 E+09	2.2 E+09	2.2 E+09	5.6 E+09	7.1 E+14	3.3 E+09
1990	6.7 E+10	2.2 E+10	2.9 E+11	2.2 E+10	5.6 E+11	2.2 E+09	2.2 E+09	2.2 E+09	5.6 E+09	7.1 E+14	3.3 E+09
1991	6.7 E+10	2.2 E+10	2.9 E+11	2.2 E+10	5.6 E+11	2.2 E+09	2.2 E+09	2.2 E+09	5.6 E+09	7.1 E+14	3.3 E+09

Table 3B.5: Estimated radionuclide concentrations in water (Bq L^{-1}).

	Cs-137	Ru-106	Sr-90	Co-60	Ce-144	Zr-95	Nb-95	H-3	I-131
1944	4.9 E-02	1.3 E+00	4.9 E-02	1.7 E-01	2.2 E-01	5.5 E+00	5.5 E+00	3.7 E+01	9.1 E-01
1945	1.1 E+00	2.0 E+00	1.1 E+00	2.4 E-01	3.4 E-01	2.7 E+00	2.7 E+00	3.9 E+01	1.4 E+00
1946	3.8 E+00	5.2 E+00	3.8 E+00	6.3 E-01	9.0 E-01	4.5 E-01	4.5 E-01	3.8 E+01	3.6 E+00
1947	9.6 E-01	1.3 E+00	9.6 E-01	1.5 E-01	2.3 E-01	1.2 E-01	1.2 E-01	4.4 E+01	9.3 E-01
1948	2.5 E+00	3.5 E+00	2.5 E+00	4.2 E-01	6.1 E-01	3.0 E-01	3.0 E-01	4.5 E+01	2.4 E+00
1949	1.8 E+00	2.6 E+00	3.6 E+00	3.6 E-01	4.3 E-01	4.3 E+00	5.2 E-01	3.6 E+01	1.8 E+00
1950	3.7 E-01	4.5 E-01	7.4 E-01	2.9 E-01	3.7 E-01	2.9 E-01	8.2 E-01	2.9 E+01	3.7 E-01
1951	4.1 E-01	3.7 E-01	5.9 E-01	3.1 E-01	4.1 E-01	1.0 E-01	4.1 E-02	3.1 E+01	3.7 E-01
1952	2.7 E-01	4.0 E-01	1.9 E+00	4.0 E-01	6.2 E-01	5.1 E-01	4.9 E-01	4.0 E+01	5.4 E-01
1953	1.7 E-01	7.4 E-01	3.7 E+00	4.2 E-01	2.0 E-01	2.3 E-01	1.1 E-01	4.2 E+01	5.7 E-02
1954	9.2 E-01	4.6 E-01	5.8 E+00	6.3 E-01	1.0 E+00	5.8 E-01	3.8 E-01	6.3 E+01	1.7 E-01
1955	1.6 E+00	7.9 E-01	2.4 E+00	1.8 E-01	2.2 E+00	1.3 E-01	1.5 E-01	3.8 E+01	1.8 E-01
1956	4.4 E+00	7.5 E-01	2.6 E+00	1.2 E+00	1.5 E+00	3.1 E-01	3.9 E-01	3.9 E+01	1.0 E-01
1957	1.9 E+00	1.3 E+00	1.8 E+00	1.1 E-01	2.8 E-01	4.9 E-01	1.5 E-01	3.2 E+01	2.1 E-02
1958	1.3 E+00	1.0 E+00	3.6 E+00	2.2 E-01	7.2 E-01	1.4 E-01	1.4 E-01	3.6 E+01	1.9 E-01
1959	2.9 E+00	2.0 E+01	2.3 E+00	3.0 E+00	1.9 E+00	1.0 E+00	1.2 E+00	5.8 E+01	3.9 E-02
1960	9.3 E-01	5.7 E+01	8.4 E-01	2.2 E+00	8.1 E-01	1.1 E+00	1.4 E+00	4.5 E+01	1.5 E-01
1961	4.1 E-01	5.5 E+01	6.1 E-01	8.5 E-01	1.1 E-01	5.5 E-01	1.9 E+00	4.1 E+01	1.1 E-01
1962	1.3 E-01	3.0 E+01	1.9 E-01	3.0 E-01	2.1 E-02	4.3 E-02	1.7 E-01	3.2 E+01	8.6 E-03
1963	1.0 E-01	1.1 E+01	2.1 E-01	3.6 E-01	5.2 E-02	7.7 E-03	1.8 E-02	3.9 E+01	1.0 E-02
1964	2.1 E-01	6.6 E+00	2.4 E-01	5.2 E-01	1.0 E-02	6.9 E-03	3.5 E-03	6.6 E+01	1.0 E-02
1965	5.4 E-02	1.9 E+00	8.1 E-02	3.2 E-01	2.7 E-03	8.1 E-03	8.1 E-03	3.2 E+01	5.4 E-03
1966	8.2 E-02	1.2 E+00	1.2 E-01	2.9 E-01	4.1 E-03	2.9 E-02	2.9 E-02	1.3 E+02	8.2 E-03
1967	6.3 E-02	3.5 E-01	1.0 E-01	6.3 E-02	4.2 E-03	1.0 E-02	1.0 E-02	2.8 E+02	1.9 E-02
1968	3.1 E-02	1.5 E-01	9.3 E-02	3.1 E-02	9.3 E-04	9.3 E-03	9.3 E-03	3.0 E+02	9.3 E-03
1969	4.2 E-02	8.3 E-02	1.2 E-01	4.2 E-02	8.3 E-04	8.3 E-03	8.3 E-03	5.1 E+02	2.1 E-02
1970	5.4 E-02	2.7 E-02	1.1 E-01	2.7 E-02	1.6 E-03	5.4 E-04	5.4 E-04	2.6 E+02	8.1 E-03
1971	2.4 E-02	1.2 E-02	7.3 E-02	2.4 E-02	1.2 E-03	2.4 E-04	2.4 E-04	2.2 E+02	4.8 E-03
1972	3.4 E-02	8.5 E-03	1.0 E-01	1.7 E-02	5.1 E-04	1.7 E-04	1.7 E-04	1.8 E+02	5.1 E-03
1973	3.6 E-02	1.3 E-02	1.3 E-01	1.8 E-02	3.6 E-04	9.0 E-04	9.0 E-04	2.7 E+02	9.0 E-03
1974	1.5 E-02	3.1 E-03	9.2 E-02	9.2 E-03	3.1 E-04	3.1 E-04	3.1 E-04	1.3 E+02	3.1 E-03
1975	1.0 E-02	5.2 E-03	1.2 E-01	8.7 E-03	3.5 E-04	3.5 E-04	3.5 E-04	1.9 E+02	5.2 E-03
1976	6.1 E-03	6.1 E-03	1.5 E-01	2.7 E-02	6.1 E-04	6.1 E-04	6.1 E-04	2.2 E+02	9.1 E-04
1977	4.2 E-03	4.2 E-03	6.3 E-02	8.4 E-03	4.2 E-04	4.2 E-04	4.2 E-04	1.3 E+02	6.3 E-04
1978	7.0 E-04	4.7 E-03	4.7 E-02	9.4 E-03	4.7 E-04	4.7 E-04	4.7 E-04	1.5 E+02	9.4 E-04
1979	3.2 E-04	1.6 E-03	3.9 E-02	6.5 E-03	3.2 E-04	3.2 E-04	3.2 E-04	1.2 E+02	6.5 E-04
1980	1.5 E-02	2.6 E-03	3.9 E-02	1.0 E-02	5.2 E-04	5.2 E-04	5.2 E-04	1.2 E+02	1.0 E-03
1981	8.8 E-03	4.4 E-03	6.6 E-02	3.1 E-02	8.8 E-04	8.8 E-04	8.8 E-04	1.3 E+02	1.8 E-03
1982	2.9 E-02	3.9 E-03	5.3 E-02	1.6 E-02	3.9 E-04	3.9 E-04	3.9 E-04	1.1 E+02	1.2 E-03
1983	3.2 E-02	5.4 E-03	5.6 E-02	6.5 E-03	5.4 E-04	5.4 E-04	5.4 E-04	1.5 E+02	1.1 E-04
1984	1.5 E-02	4.9 E-03	6.3 E-02	3.9 E-03	4.9 E-04	4.9 E-04	4.9 E-04	1.6 E+02	1.2 E-03
1985	2.4 E-02	8.1 E-03	1.1 E-01	6.6 E-03	8.1 E-04	8.1 E-04	8.1 E-04	2.6 E+02	2.0 E-03
1986	2.5 E-02	8.5 E-03	1.1 E-01	6.9 E-03	8.5 E-04	8.5 E-04	8.5 E-04	2.7 E+02	2.1 E-03
1987	1.7 E-02	5.6 E-03	7.3 E-02	4.5 E-03	5.6 E-04	5.6 E-04	5.6 E-04	1.8 E+02	1.4 E-03
1988	3.7 E-02	1.2 E-02	1.6 E-01	1.0 E-02	1.2 E-03	1.2 E-03	1.2 E-03	3.9 E+02	3.1 E-03
1989	1.2 E-02	3.9 E-03	5.0 E-02	3.1 E-03	3.9 E-04	3.9 E-04	3.9 E-04	1.2 E+02	9.7 E-04
1990	1.5 E-02	4.9 E-03	6.3 E-02	3.9 E-03	4.9 E-04	4.9 E-04	4.9 E-04	1.6 E+02	1.2 E-03
1991	8.1 E-03	2.7 E-03	3.5 E-02	2.2 E-03	2.7 E-04	2.7 E-04	2.7 E-04	8.6 E+01	6.8 E-04

Table 3B.5 Continued.

	U-235	U-238	Pu-239/240	Th-232	Am-241	Eu-154	La-140	Pm-147	Sm-151
1944	2.5 E-02	2.5 E-02	2.5 E-02	2.5 E-02	2.5 E-02	9.1 E-01	9.1 E-01	9.1 E-01	9.1 E-01
1945	2.6 E-02	2.6 E-02	2.6 E-02	2.6 E-02	2.6 E-02	1.4 E+00	1.4 E+00	1.4 E+00	1.4 E+00
1946	2.5 E-02	2.5 E-02	2.5 E-02	2.5 E-02	2.5 E-02	3.6 E+00	3.6 E+00	3.6 E+00	3.6 E+00
1947	2.9 E-02	2.9 E-02	2.9 E-02	2.9 E-02	2.9 E-02	9.3 E-01	9.3 E-01	9.3 E-01	9.3 E-01
1948	3.0 E-02	3.0 E-02	3.0 E-02	3.0 E-02	3.0 E-02	2.4 E+00	2.4 E+00	2.4 E+00	2.4 E+00
1949	9.5 E-04	9.5 E-04	9.5 E-04	9.5 E-04	9.5 E-04	1.8 E+00	1.8 E+00	1.8 E+00	1.8 E+00
1950	7.8 E-04	7.8 E-04	7.8 E-04	7.8 E-04	7.8 E-04	5.8 E-01	5.8 E-01	5.8 E-01	5.8 E-01
1951	1.6 E-03	1.6 E-03	1.6 E-03	1.6 E-03	1.6 E-03	2.2 E-01	2.2 E-01	2.2 E-01	2.2 E-01
1952	8.1 E-04	8.1 E-04	8.1 E-04	8.1 E-04	8.1 E-04	7.0 E-01	7.0 E-01	7.0 E-01	7.0 E-01
1953	2.3 E-03	2.3 E-03	2.3 E-03	2.3 E-03	2.3 E-03	3.1 E+00	3.1 E+00	3.1 E+00	3.1 E+00
1954	2.9 E-03	2.9 E-03	2.9 E-03	2.9 E-03	2.9 E-03	6.7 E+00	6.7 E+00	6.7 E+00	6.7 E+00
1955	6.4 E-03	6.4 E-03	6.4 E-03	6.4 E-03	6.4 E-03	3.8 E+00	3.8 E+00	3.8 E+00	3.8 E+00
1956	7.3 E-03	7.3 E-03	7.3 E-03	7.3 E-03	7.3 E-03	3.6 E+00	3.6 E+00	3.6 E+00	3.6 E+00
1957	3.2 E-03	3.2 E-03	3.2 E-03	3.2 E-03	3.2 E-03	2.3 E+00	2.3 E+00	2.3 E+00	2.3 E+00
1958	1.9 E-03	1.9 E-03	1.9 E-03	1.9 E-03	1.9 E-03	5.7 E+00	5.7 E+00	5.7 E+00	5.7 E+00
1959	2.6 E-02	2.6 E-02	2.6 E-02	2.6 E-02	2.6 E-02	3.6 E+00	3.6 E+00	3.6 E+00	3.6 E+00
1960	5.7 E-03	5.7 E-03	5.7 E-03	5.7 E-03	5.7 E-03	1.4 E+00	1.4 E+00	1.4 E+00	1.4 E+00
1961	1.9 E-03	1.9 E-03	1.9 E-03	1.9 E-03	1.9 E-03	6.6 E-01	6.6 E-01	6.6 E-01	6.6 E-01
1962	1.3 E-03	1.3 E-03	1.3 E-03	1.3 E-03	1.3 E-03	2.4 E-01	2.4 E-01	2.4 E-01	2.4 E-01
1963	4.4 E-03	4.4 E-03	4.4 E-03	4.4 E-03	4.4 E-03	2.3 E-01	2.3 E-01	2.3 E-01	2.3 E-01
1964	2.8 E-03	2.8 E-03	2.8 E-03	2.8 E-03	2.8 E-03	4.5 E-01	4.5 E-01	4.5 E-01	4.5 E-01
1965	1.3 E-02	1.3 E-02	1.3 E-02	1.3 E-02	1.3 E-02	1.6 E-01	1.6 E-01	1.6 E-01	1.6 E-01
1966	6.6 E-03	6.6 E-03	6.6 E-03	6.6 E-03	6.6 E-03	2.1 E-01	2.1 E-01	2.1 E-01	2.1 E-01
1967	2.1 E-02	2.1 E-02	2.1 E-02	2.1 E-02	2.1 E-02	1.9 E-01	1.9 E-01	1.9 E-01	1.9 E-01
1968	1.2 E-03	1.2 E-03	1.2 E-03	1.2 E-03	1.2 E-03	1.2 E-01	1.2 E-01	1.2 E-01	1.2 E-01
1969	8.3 E-03	8.3 E-03	8.3 E-03	8.3 E-03	8.3 E-03	2.1 E-01	2.1 E-01	2.1 E-01	2.1 E-01
1970	1.1 E-02	1.1 E-02	1.1 E-02	1.1 E-02	1.1 E-02	1.3 E-01	1.3 E-01	1.3 E-01	1.3 E-01
1971	1.2 E-03	1.2 E-03	1.2 E-03	1.2 E-03	1.2 E-03	7.3 E-02	7.3 E-02	7.3 E-02	7.3 E-02
1972	1.2 E-03	1.2 E-03	1.2 E-03	1.2 E-03	1.2 E-03	8.5 E-02	8.5 E-02	8.5 E-02	8.5 E-02
1973	1.4 E-03	1.4 E-03	1.4 E-03	1.4 E-03	1.4 E-03	9.0 E-02	9.0 E-02	9.0 E-02	9.0 E-02
1974	3.1 E-04	3.1 E-04	3.1 E-04	3.1 E-04	3.1 E-04	7.7 E-02	7.7 E-02	7.7 E-02	7.7 E-02
1975	3.5 E-04	3.5 E-04	3.5 E-04	3.5 E-04	3.5 E-04	8.7 E-02	8.7 E-02	8.7 E-02	8.7 E-02
1976	3.0 E-04	3.0 E-04	3.0 E-04	3.0 E-04	3.0 E-04	1.5 E-01	1.5 E-01	1.5 E-01	1.5 E-01
1977	6.3 E-04	6.3 E-04	6.3 E-04	6.3 E-04	6.3 E-04	1.0 E-01	1.0 E-01	1.0 E-01	1.0 E-01
1978	7.0 E-04	7.0 E-04	7.0 E-04	7.0 E-04	7.0 E-04	1.2 E-01	1.2 E-01	1.2 E-01	1.2 E-01
1979	4.9 E-04	4.9 E-04	4.9 E-04	4.9 E-04	4.9 E-04	8.1 E-02	8.1 E-02	8.1 E-02	8.1 E-02
1980	1.0 E-03	1.0 E-03	1.0 E-03	1.0 E-03	1.0 E-03	1.3 E-01	1.3 E-01	1.3 E-01	1.3 E-01
1981	1.8 E-03	1.8 E-03	1.8 E-03	1.8 E-03	1.8 E-03	2.2 E-01	2.2 E-01	2.2 E-01	2.2 E-01
1982	5.9 E-04	5.9 E-04	5.9 E-04	5.9 E-04	5.9 E-04	9.8 E-02	9.8 E-02	9.8 E-02	9.8 E-02
1983	1.3 E-03	1.3 E-03	1.3 E-03	1.3 E-03	1.3 E-03	1.3 E-01	1.3 E-01	1.3 E-01	1.3 E-01
1984	7.3 E-04	7.3 E-04	7.3 E-04	7.3 E-04	7.3 E-04	1.2 E-01	1.2 E-01	1.2 E-01	1.2 E-01
1985	1.2 E-03	1.2 E-03	1.2 E-03	1.2 E-03	1.2 E-03	2.0 E-01	2.0 E-01	2.0 E-01	2.0 E-01
1986	1.3 E-03	1.3 E-03	1.3 E-03	1.3 E-03	1.3 E-03	2.1 E-01	2.1 E-01	2.1 E-01	2.1 E-01
1987	8.4 E-04	8.4 E-04	8.4 E-04	8.4 E-04	8.4 E-04	1.4 E-01	1.4 E-01	1.4 E-01	1.4 E-01
1988	1.9 E-03	1.9 E-03	1.9 E-03	1.9 E-03	1.9 E-03	3.1 E-01	3.1 E-01	3.1 E-01	3.1 E-01
1989	5.8 E-04	5.8 E-04	5.8 E-04	5.8 E-04	5.8 E-04	9.7 E-02	9.7 E-02	9.7 E-02	9.7 E-02
1990	7.3 E-04	7.3 E-04	7.3 E-04	7.3 E-04	7.3 E-04	1.2 E-01	1.2 E-01	1.2 E-01	1.2 E-01
1991	4.1 E-04	4.1 E-04	4.1 E-04	4.1 E-04	4.1 E-04	6.8 E-02	6.8 E-02	6.8 E-02	6.8 E-02

Table 3B.5 Continued.

	Sr-89	Ba-140	P-32	Y-91	Pr-143	Nd-147
1944	0.0 E+00	9.9 E-01	0.0 E+00	9.1 E-01	9.1 E-01	9.1 E-01
1945	0.0 E+00	8.8 E-01	0.0 E+00	1.4 E+00	1.4 E+00	1.4 E+00
1946	0.0 E+00	1.7 E+00	0.0 E+00	3.6 E+00	3.6 E+00	3.6 E+00
1947	0.0 E+00	3.7 E-01	0.0 E+00	9.3 E-01	9.3 E-01	9.3 E-01
1948	0.0 E+00	6.2 E-01	0.0 E+00	2.4 E+00	2.4 E+00	2.4 E+00
1949	0.0 E+00	1.1 E+00	0.0 E+00	1.8 E+00	1.8 E+00	1.8 E+00
1950	0.0 E+00	2.5 E-01	1.9 E-02	5.8 E-01	5.8 E-01	5.8 E-01
1951	0.0 E+00	1.4 E-01	9.8 E-04	2.2 E-01	2.2 E-01	2.2 E-01
1952	0.0 E+00	3.7 E-01	0.0 E+00	7.0 E-01	7.0 E-01	7.0 E-01
1953	0.0 E+00	8.5 E-02	2.1 E-01	3.1 E+00	3.1 E+00	3.1 E+00
1954	0.0 E+00	9.7 E-02	2.8 E-01	6.7 E+00	6.7 E+00	6.7 E+00
1955	0.0 E+00	4.6 E-02	0.0 E+00	3.8 E+00	3.8 E+00	3.8 E+00
1956	0.0 E+00	9.7 E-02	9.7 E-02	3.6 E+00	3.6 E+00	3.6 E+00
1957	0.0 E+00	0.0 E+00	6.2 E-02	2.3 E+00	2.3 E+00	2.3 E+00
1958	0.0 E+00	0.0 E+00	0.0 E+00	5.7 E+00	5.7 E+00	5.7 E+00
1959	5.2 E-03	0.0 E+00	9.0 E-02	3.6 E+00	3.6 E+00	3.6 E+00
1960	2.8 E-02	0.0 E+00	0.0 E+00	1.4 E+00	1.4 E+00	1.4 E+00
1961	2.1 E-02	0.0 E+00	4.0 E-01	6.6 E-01	6.6 E-01	6.6 E-01
1962	1.3 E-02	0.0 E+00	0.0 E+00	2.4 E-01	2.4 E-01	2.4 E-01
1963	9.8 E-03	0.0 E+00	1.4 E-02	2.3 E-01	2.3 E-01	2.3 E-01
1964	1.1 E-02	0.0 E+00	1.3 E-02	4.5 E-01	4.5 E-01	4.5 E-01
1965	6.2 E-03	0.0 E+00	1.1 E-02	1.6 E-01	1.6 E-01	1.6 E-01
1966	1.4 E-02	0.0 E+00	0.0 E+00	2.1 E-01	2.1 E-01	2.1 E-01
1967	5.5 E-03	0.0 E+00	7.4 E-03	1.9 E-01	1.9 E-01	1.9 E-01
1968	6.5 E-03	0.0 E+00	3.1 E-03	1.2 E-01	1.2 E-01	1.2 E-01
1969	4.8 E-03	0.0 E+00	0.0 E+00	2.1 E-01	2.1 E-01	2.1 E-01
1970	3.2 E-03	0.0 E+00	0.0 E+00	1.3 E-01	1.3 E-01	1.3 E-01
1971	1.8 E-03	0.0 E+00	2.4 E-03	7.3 E-02	7.3 E-02	7.3 E-02
1972	0.0 E+00	0.0 E+00	0.0 E+00	8.5 E-02	8.5 E-02	8.5 E-02
1973	0.0 E+00	0.0 E+00	3.1 E-05	9.0 E-02	9.0 E-02	9.0 E-02
1974	0.0 E+00	0.0 E+00	2.4 E-05	7.7 E-02	7.7 E-02	7.7 E-02
1975	0.0 E+00	0.0 E+00	0.0 E+00	8.7 E-02	8.7 E-02	8.7 E-02
1976	0.0 E+00	0.0 E+00	0.0 E+00	1.5 E-01	1.5 E-01	1.5 E-01
1977	0.0 E+00	0.0 E+00	3.7 E-05	1.0 E-01	1.0 E-01	1.0 E-01
1978	0.0 E+00	0.0 E+00	0.0 E+00	1.2 E-01	1.2 E-01	1.2 E-01
1979	0.0 E+00	0.0 E+00	0.0 E+00	8.1 E-02	8.1 E-02	8.1 E-02
1980	0.0 E+00	0.0 E+00	0.0 E+00	1.3 E-01	1.3 E-01	1.3 E-01
1981	0.0 E+00	0.0 E+00	0.0 E+00	2.2 E-01	2.2 E-01	2.2 E-01
1982	0.0 E+00	0.0 E+00	0.0 E+00	9.8 E-02	9.8 E-02	9.8 E-02
1983	0.0 E+00	0.0 E+00	0.0 E+00	1.3 E-01	1.3 E-01	1.3 E-01
1984	0.0 E+00	0.0 E+00	0.0 E+00	1.2 E-01	1.2 E-01	1.2 E-01
1985	0.0 E+00	0.0 E+00	0.0 E+00	2.0 E-01	2.0 E-01	2.0 E-01
1986	0.0 E+00	0.0 E+00	0.0 E+00	2.1 E-01	2.1 E-01	2.1 E-01
1987	0.0 E+00	0.0 E+00	4.3 E-05	1.4 E-01	1.4 E-01	1.4 E-01
1988	0.0 E+00	0.0 E+00	1.9 E-04	3.1 E-01	3.1 E-01	3.1 E-01
1989	0.0 E+00	0.0 E+00	3.1 E-04	9.7 E-02	9.7 E-02	9.7 E-02
1990	0.0 E+00	0.0 E+00	2.4 E-04	1.2 E-01	1.2 E-01	1.2 E-01
1991	0.0 E+00	0.0 E+00	0.0 E+00	6.8 E-02	6.8 E-02	6.8 E-02

Table 3B.6 Estimated radionuclide concentrations in bottom sediment (Bq g^{-1}).

	Cs-137	Ru-106	Sr-90	Co-60	Ce-144	Zr-95	Nb-95	H-3
1944	1.6 E-01	4.1 E+00	9.0 E-02	5.5 E-01	7.2 E-01	1.4 E+01	1.4 E+01	7.9 E-02
1945	8.6 E-01	1.5 E+00	4.5 E-01	1.8 E-01	2.6 E-01	1.5 E+00	1.5 E+00	1.6 E-02
1946	1.8 E+00	2.1 E+00	1.0 E+00	3.1 E-01	3.5 E-01	1.3 E-01	1.0 E-01	2.2 E-02
1947	1.8 E+00	1.3 E+00	1.0 E+00	2.9 E-01	1.8 E-01	2.1 E-02	1.9 E-02	2.5 E-02
1948	3.4 E+00	3.1 E+00	1.8 E+00	5.3 E-01	5.3 E-01	1.6 E-01	1.6 E-01	3.6 E-02
1949	3.5 E+00	2.2 E+00	2.2 E+00	5.2 E-01	3.2 E-01	9.9 E-01	1.2 E-01	3.8 E-02
1950	4.3 E+00	1.4 E+00	2.6 E+00	5.8 E-01	1.7 E-01	2.4 E-02	1.2 E-01	4.5 E-02
1951	3.6 E+00	6.8 E-01	2.3 E+00	5.1 E-01	1.8 E-01	2.6 E-02	1.0 E-02	4.7 E-02
1952	2.8 E+00	4.2 E-01	2.2 E+00	5.0 E-01	3.0 E-01	1.7 E-01	1.6 E-01	5.4 E-02
1953	2.3 E+00	5.0 E-01	2.8 E+00	5.4 E-01	1.9 E-01	8.9 E-02	4.3 E-02	5.9 E-02
1954	2.3 E+00	4.7 E-01	4.3 E+00	7.5 E-01	6.8 E-01	2.8 E-01	1.8 E-01	7.2 E-02
1955	2.3 E+00	3.8 E-01	4.0 E+00	6.2 E-01	7.1 E-01	2.8 E-02	2.8 E-02	6.9 E-02
1956	3.8 E+00	4.7 E-01	4.0 E+00	9.6 E-01	9.0 E-01	1.1 E-01	1.4 E-01	6.9 E-02
1957	3.9 E+00	2.5 E-01	4.1 E+00	8.9 E-01	3.9 E-01	2.2 E-03	1.4 E-01	6.8 E-02
1958	3.9 E+00	1.3 E-01	4.1 E+00	8.0 E-01	1.7 E-01	2.2 E-03	2.9 E-01	6.7 E-02
1959	4.6 E+00	7.3 E+00	4.1 E+00	1.7 E+00	7.6 E-01	2.6 E-01	2.9 E-01	6.7 E-02
1960	4.5 E+00	1.5 E+01	3.9 E+00	1.9 E+00	4.7 E-01	1.7 E-01	1.9 E-01	6.5 E-02
1961	4.4 E+00	1.5 E+01	3.8 E+00	1.7 E+00	2.0 E-01	5.5 E-02	1.8 E-01	6.2 E-02
1962	7.2 E+00	1.3 E+01	6.2 E+00	2.6 E+00	1.4 E-01	1.8 E-03	2.3 E-04	9.9 E-02
1963	6.9 E+00	7.7 E+00	6.0 E+00	2.3 E+00	6.4 E-02	6.8 E-04	1.5 E-03	9.3 E-02
1964	6.8 E+00	7.3 E+00	5.7 E+00	2.2 E+00	3.3 E-02	1.1 E-03	5.5 E-04	8.9 E-02
1965	6.6 E+00	3.7 E+00	5.6 E+00	2.0 E+00	1.4 E-02	2.1 E-05	5.5 E-04	8.5 E-02
1966	6.5 E+00	2.1 E+00	5.5 E+00	1.8 E+00	6.9 E-03	1.5 E-03	1.5 E-03	8.1 E-02
1967	6.4 E+00	1.1 E+00	5.4 E+00	1.6 E+00	2.8 E-03	2.8 E-05	7.7 E-04	7.7 E-02
1968	6.1 E+00	5.6 E-01	5.2 E+00	1.4 E+00	1.4 E-03	7.7 E-04	7.7 E-04	8.0 E-02
1969	6.0 E+00	2.9 E-01	5.0 E+00	1.2 E+00	7.0 E-04	2.8 E-04	2.7 E-04	7.9 E-02
1970	5.8 E+00	1.5 E-01	4.9 E+00	1.1 E+00	4.1 E-04	1.4 E-05	8.7 E-06	7.6 E-02
1971	5.7 E+00	7.4 E-02	4.8 E+00	9.2 E-01	3.4 E-04	7.3 E-06	7.1 E-06	7.3 E-02
1972	5.6 E+00	3.8 E-02	4.7 E+00	8.1 E-01	1.5 E-04	1.7 E-06	1.5 E-06	6.9 E-02
1973	5.4 E+00	1.9 E-02	4.5 E+00	7.1 E-01	7.6 E-05	1.1 E-05	1.1 E-05	6.6 E-02
1974	5.3 E+00	9.8 E-03	4.5 E+00	6.2 E-01	3.1 E-05	2.1 E-07	1.1 E-05	6.3 E-02
1975	5.2 E+00	5.1 E-03	4.4 E+00	5.5 E-01	3.1 E-05	5.1 E-06	5.1 E-06	6.0 E-02
1976	5.1 E+00	3.4 E-03	4.2 E+00	4.8 E-01	1.4 E-04	2.3 E-05	2.3 E-05	5.9 E-02
1977	4.9 E+00	2.1 E-03	4.1 E+00	4.2 E-01	1.1 E-04	1.2 E-05	1.1 E-05	5.6 E-02
1978	4.8 E+00	1.1 E-03	4.0 E+00	3.7 E-01	4.5 E-05	2.3 E-07	1.1 E-05	5.3 E-02
1979	4.7 E+00	5.8 E-04	3.9 E+00	3.3 E-01	3.2 E-05	3.3 E-06	3.3 E-06	5.1 E-02
1980	4.6 E+00	4.3 E-04	3.8 E+00	2.9 E-01	1.3 E-04	2.2 E-05	2.2 E-05	4.9 E-02
1981	4.5 E+00	6.9 E-04	3.7 E+00	2.5 E-01	1.7 E-04	4.0 E-05	3.9 E-05	4.8 E-02
1982	4.5 E+00	3.6 E-04	3.8 E+00	2.3 E-01	7.2 E-05	7.9 E-07	2.0 E-05	4.7 E-02
1983	4.4 E+00	9.3 E-04	3.7 E+00	2.0 E-01	1.4 E-04	2.0 E-05	2.0 E-05	4.6 E-02
1984	4.3 E+00	1.1 E-03	3.6 E+00	1.8 E-01	1.4 E-04	2.0 E-05	1.9 E-05	4.5 E-02
1985	4.2 E+00	5.5 E-04	3.5 E+00	1.6 E-01	5.8 E-05	3.8 E-07	1.9 E-05	4.2 E-02
1986	4.1 E+00	2.0 E-03	3.4 E+00	1.4 E-01	3.0 E-04	4.2 E-05	4.2 E-05	4.3 E-02
1987	4.0 E+00	1.3 E-03	3.3 E+00	1.2 E-01	1.7 E-04	9.4 E-06	8.6 E-06	4.1 E-02
1988	3.9 E+00	3.4 E-03	3.2 E+00	1.1 E-01	5.1 E-04	6.3 E-05	6.3 E-05	4.3 E-02
1989	3.8 E+00	1.8 E-03	3.1 E+00	9.5 E-02	2.2 E-04	4.1 E-06	3.0 E-06	4.1 E-02
1990	3.7 E+00	9.2 E-04	3.1 E+00	8.4 E-02	9.3 E-05	4.1 E-06	3.0 E-06	3.9 E-02
1991	3.7 E+00	4.9 E-04	3.0 E+00	7.4 E-02	4.2 E-05	9.9 E-07	9.9 E-07	3.7 E-02

Table 3B.6 Continued.

	I-131	U-235	U-238	Pu-239/240	Th-232	Am-241	Eu-154	La-140
1944	6.8 E-02	1.9 E-02	1.9 E-02	8.2 E-02	8.2 E-02	7.6 E-02	1.9 E-05	4.4 E-02
1945	2.0 E-02	4.1 E-03	4.1 E-03	2.1 E-02	2.1 E-02	1.9 E-02	3.6 E-06	4.7 E-02
1946	2.7 E-02	5.6 E-03	5.6 E-03	2.6 E-02	2.6 E-02	2.4 E-02	5.9 E-06	6.0 E-02
1947	4.2 E-03	6.6 E-03	6.6 E-03	3.1 E-02	3.1 E-02	2.8 E-02	5.6 E-06	1.8 E-02
1948	3.0 E-02	9.7 E-03	9.7 E-03	5.0 E-02	5.0 E-02	4.5 E-02	6.5 E-06	3.7 E-02
1949	1.3 E-02	8.8 E-03	8.8 E-03	4.5 E-02	4.5 E-02	4.1 E-02	5.5 E-06	3.2 E-02
1950	9.0 E-03	1.1 E-02	1.1 E-02	5.7 E-02	5.7 E-02	5.1 E-02	6.5 E-06	8.4 E-03
1951	4.5 E-03	9.4 E-03	9.4 E-03	4.8 E-02	4.8 E-02	4.3 E-02	5.2 E-06	2.5 E-03
1952	9.1 E-03	7.3 E-03	7.3 E-03	3.7 E-02	3.7 E-02	3.3 E-02	4.8 E-06	7.7 E-03
1953	8.6 E-04	6.1 E-03	6.1 E-03	3.1 E-02	3.0 E-02	2.7 E-02	8.2 E-06	4.1 E-02
1954	2.5 E-03	5.3 E-03	5.3 E-03	2.6 E-02	2.6 E-02	2.4 E-02	1.7 E-05	1.1 E-01
1955	1.5 E-03	5.2 E-03	5.2 E-03	2.5 E-02	2.4 E-02	2.2 E-02	1.7 E-05	5.0 E-02
1956	1.3 E-03	5.2 E-03	5.2 E-03	2.4 E-02	2.3 E-02	2.1 E-02	1.8 E-05	6.3 E-02
1957	1.3 E-03	5.5 E-03	5.5 E-03	2.5 E-02	2.5 E-02	2.2 E-02	1.8 E-05	3.9 E-02
1958	2.0 E-04	5.7 E-03	5.7 E-03	2.6 E-02	2.6 E-02	2.3 E-02	1.7 E-05	1.3 E-01
1959	2.0 E-04	6.8 E-03	6.8 E-03	3.4 E-02	3.4 E-02	3.1 E-02	1.6 E-05	1.0 E-01
1960	4.8 E-04	6.8 E-03	6.8 E-03	3.4 E-02	3.4 E-02	3.0 E-02	1.4 E-05	3.9 E-02
1961	2.0 E-04	6.6 E-03	6.6 E-03	3.3 E-02	3.3 E-02	3.0 E-02	1.3 E-05	1.6 E-02
1962	1.1 E-04	1.1 E-02	1.1 E-02	5.6 E-02	5.6 E-02	5.0 E-02	2.0 E-05	6.6 E-03
1963	1.5 E-05	1.1 E-02	1.1 E-02	5.6 E-02	5.6 E-02	5.0 E-02	1.8 E-05	6.4 E-03
1964	1.5 E-05	1.1 E-02	1.1 E-02	5.8 E-02	5.7 E-02	5.0 E-02	1.7 E-05	2.3 E-02
1965	9.2 E-06	1.1 E-02	1.1 E-02	5.8 E-02	5.8 E-02	5.0 E-02	1.6 E-05	8.6 E-03
1966	3.6 E-06	1.1 E-02	1.1 E-02	6.1 E-02	6.0 E-02	5.1 E-02	1.4 E-05	1.1 E-02
1967	5.9 E-06	1.1 E-02	1.1 E-02	6.1 E-02	6.0 E-02	5.1 E-02	1.3 E-05	7.3 E-03
1968	8.2 E-06	1.1 E-02	1.1 E-02	6.0 E-02	6.0 E-02	5.0 E-02	1.2 E-05	5.8 E-03
1969	5.9 E-06	1.1 E-02	1.1 E-02	6.2 E-02	6.2 E-02	5.1 E-02	1.1 E-05	1.1 E-02
1970	1.1 E-06	1.1 E-02	1.1 E-02	6.3 E-02	6.3 E-02	5.1 E-02	1.0 E-05	7.2 E-03
1971	1.2 E-06	1.1 E-02	1.1 E-02	6.3 E-02	6.3 E-02	5.1 E-02	9.5 E-06	3.8 E-03
1972	5.7 E-07	1.1 E-02	1.1 E-02	6.3 E-02	6.2 E-02	5.1 E-02	8.8 E-06	3.2 E-03
1973	1.1 E-06	1.1 E-02	1.1 E-02	6.3 E-02	6.2 E-02	5.1 E-02	8.1 E-06	0.0 E+00
1974	9.2 E-07	1.1 E-02	1.1 E-02	6.3 E-02	6.3 E-02	5.1 E-02	7.5 E-06	0.0 E+00
1975	7.5 E-07	1.1 E-02	1.1 E-02	6.3 E-02	6.3 E-02	5.1 E-02	6.9 E-06	0.0 E+00
1976	2.9 E-07	1.1 E-02	1.1 E-02	6.3 E-02	6.3 E-02	5.0 E-02	6.4 E-06	0.0 E+00
1977	1.6 E-07	1.1 E-02	1.1 E-02	6.3 E-02	6.2 E-02	5.0 E-02	5.9 E-06	0.0 E+00
1978	1.1 E-07	1.1 E-02	1.1 E-02	6.3 E-02	6.3 E-02	5.0 E-02	5.5 E-06	0.0 E+00
1979	6.1 E-08	1.1 E-02	1.1 E-02	6.3 E-02	6.3 E-02	5.0 E-02	5.0 E-06	0.0 E+00
1980	3.8 E-07	1.1 E-02	1.1 E-02	6.3 E-02	6.3 E-02	5.0 E-02	4.6 E-06	0.0 E+00
1981	8.4 E-07	1.1 E-02	1.1 E-02	6.3 E-02	6.3 E-02	5.0 E-02	4.3 E-06	0.0 E+00
1982	4.4 E-07	1.1 E-02	1.1 E-02	6.6 E-02	6.5 E-02	5.2 E-02	4.1 E-06	0.0 E+00
1983	3.4 E-08	1.1 E-02	1.1 E-02	6.6 E-02	6.5 E-02	5.2 E-02	3.8 E-06	0.0 E+00
1984	4.5 E-07	1.1 E-02	1.1 E-02	6.6 E-02	6.5 E-02	5.1 E-02	3.5 E-06	0.0 E+00
1985	6.6 E-07	1.1 E-02	1.1 E-02	6.6 E-02	6.5 E-02	5.1 E-02	3.2 E-06	0.0 E+00
1986	8.7 E-07	1.1 E-02	1.1 E-02	6.6 E-02	6.5 E-02	5.1 E-02	2.9 E-06	0.0 E+00
1987	1.9 E-07	1.1 E-02	1.1 E-02	6.6 E-02	6.5 E-02	5.1 E-02	2.7 E-06	0.0 E+00
1988	1.3 E-06	1.1 E-02	1.1 E-02	6.7 E-02	6.6 E-02	5.1 E-02	2.5 E-06	0.0 E+00
1989	6.5 E-08	1.1 E-02	1.1 E-02	6.7 E-02	6.6 E-02	5.1 E-02	2.3 E-06	0.0 E+00
1990	4.4 E-08	1.1 E-02	1.1 E-02	6.7 E-02	6.7 E-02	5.1 E-02	2.1 E-06	0.0 E+00
1991	2.3 E-08	1.1 E-02	1.1 E-02	6.7 E-02	6.7 E-02	5.1 E-02	2.0 E-06	0.0 E+00

Table 3B.6 Continued.

	Pm-147	Sm-151	Sr-89	Ba-140	P-32	Y-91	Pr-143	Nd-147
1944	2.3 E+00	2.3 E+00	0.0 E+00	7.7 E-01	0.0 E+00	7.0 E-01	7.0 E-01	7.0 E-01
1945	7.9 E-01	7.9 E-01	0.0 E+00	1.4 E-01	0.0 E+00	2.2 E-01	2.2 E-01	2.2 E-01
1946	8.3 E-01	1.5 E+00	0.0 E+00	1.2 E-01	0.0 E+00	2.8 E-01	2.7 E-01	2.7 E-01
1947	1.8 E-01	1.6 E+00	0.0 E+00	1.8 E-02	0.0 E+00	4.7 E-02	4.4 E-02	4.4 E-02
1948	1.3 E+00	2.6 E+00	0.0 E+00	8.5 E-02	0.0 E+00	3.2 E-01	3.2 E-01	3.2 E-01
1949	4.7 E-01	2.7 E+00	0.0 E+00	8.2 E-02	0.0 E+00	1.4 E-01	1.4 E-01	1.4 E-01
1950	2.2 E-02	3.4 E+00	0.0 E+00	3.5 E-67	0.0 E+00	2.4 E-03	1.4 E-09	1.7 E-11
1951	5.7 E-02	2.9 E+00	0.0 E+00	1.5 E-02	5.0 E-06	2.4 E-02	2.4 E-02	2.4 E-02
1952	2.4 E-01	2.4 E+00	0.0 E+00	5.5 E-02	1.2 E-190	1.0 E-01	1.0 E-01	1.0 E-01
1953	1.2 E+00	3.1 E+00	0.0 E+00	1.2 E-02	1.3 E-03	4.5 E-01	4.5 E-01	4.5 E-01
1954	3.2 E+00	5.6 E+00	0.0 E+00	1.5 E-02	1.8 E-03	1.0 E+00	1.0 E+00	1.0 E+00
1955	8.0 E-01	5.6 E+00	0.0 E+00	3.4 E-03	5.0 E-188	3.0 E-01	2.9 E-01	2.9 E-01
1956	1.3 E+00	5.9 E+00	0.0 E+00	1.2 E-02	5.1 E-04	4.5 E-01	4.5 E-01	4.5 E-01
1957	5.2 E-02	6.2 E+00	0.0 E+00	4.3 E-68	1.7 E-188	6.3 E-03	3.7 E-09	4.6 E-11
1958	2.1 E-03	6.3 E+00	0.0 E+00	1.5 E-133	0.0 E+00	8.7 E-05	3.1 E-17	4.7 E-21
1959	9.1 E-01	6.8 E+00	3.6 E-05	4.8 E-199	1.9 E-04	2.2 E-01	2.2 E-01	2.2 E-01
1960	2.4 E-01	6.6 E+00	1.2 E-04	1.6 E-264	5.9 E-189	5.4 E-02	5.1 E-02	5.1 E-02
1961	7.2 E-02	6.5 E+00	5.3 E-05	0.0 E+00	3.0 E-04	1.5 E-02	1.4 E-02	1.4 E-02
1962	4.6 E-03	1.1 E+01	6.0 E-07	0.0 E+00	1.6 E-188	3.3 E-04	1.9 E-10	2.3 E-12
1963	2.0 E-02	1.1 E+01	1.9 E-05	0.0 E+00	8.0 E-06	3.9 E-03	3.9 E-03	3.9 E-03
1964	7.2 E-02	1.0 E+01	2.0 E-05	0.0 E+00	7.4 E-06	8.3 E-03	8.3 E-03	8.3 E-03
1965	2.8 E-03	1.0 E+01	1.4 E-07	0.0 E+00	2.4 E-190	1.1 E-04	6.6 E-11	8.2 E-13
1966	1.1 E-02	1.0 E+01	8.4 E-06	0.0 E+00	0.0 E+00	1.2 E-03	1.2 E-03	1.2 E-03
1967	4.1 E-04	1.0 E+01	5.7 E-08	0.0 E+00	0.0 E+00	1.6 E-05	9.3 E-12	1.2 E-13
1968	1.0 E-02	1.0 E+01	7.6 E-06	0.0 E+00	1.1 E-06	1.4 E-03	1.4 E-03	1.4 E-03
1969	7.1 E-03	9.9 E+00	1.9 E-06	0.0 E+00	3.5 E-191	7.8 E-04	7.6 E-04	7.6 E-04
1970	2.4 E-03	9.8 E+00	6.1 E-07	0.0 E+00	0.0 E+00	2.6 E-04	2.5 E-04	2.5 E-04
1971	2.2 E-03	9.7 E+00	6.4 E-07	0.0 E+00	2.5 E-07	2.5 E-04	2.4 E-04	2.4 E-04
1972	8.4 E-04	9.6 E+00	4.3 E-09	0.0 E+00	8.1 E-192	1.2 E-04	1.2 E-04	1.2 E-04
1973	1.1 E-03	9.5 E+00	2.9 E-11	0.0 E+00	1.5 E-09	1.4 E-04	1.4 E-04	1.4 E-04
1974	4.2 E-05	9.5 E+00	1.9 E-13	0.0 E+00	4.9 E-194	1.9 E-06	1.1 E-12	1.4 E-14
1975	1.3 E-03	9.4 E+00	1.3 E-15	0.0 E+00	0.0 E+00	1.6 E-04	1.6 E-04	1.6 E-04
1976	5.8 E-03	9.3 E+00	8.8 E-18	0.0 E+00	0.0 E+00	6.4 E-04	6.3 E-04	6.3 E-04
1977	3.1 E-03	9.2 E+00	5.9 E-20	0.0 E+00	3.7 E-09	3.4 E-04	3.4 E-04	3.4 E-04
1978	1.2 E-04	9.2 E+00	4.0 E-22	0.0 E+00	1.2 E-193	4.6 E-06	2.7 E-12	3.3 E-14
1979	8.2 E-04	9.1 E+00	2.7 E-24	0.0 E+00	0.0 E+00	9.8 E-05	9.8 E-05	9.8 E-05
1980	5.6 E-03	9.0 E+00	1.8 E-26	0.0 E+00	0.0 E+00	6.2 E-04	6.2 E-04	6.2 E-04
1981	1.0 E-02	8.9 E+00	1.2 E-28	0.0 E+00	0.0 E+00	1.3 E-03	1.3 E-03	1.3 E-03
1982	4.0 E-04	9.2 E+00	8.5 E-31	0.0 E+00	0.0 E+00	1.9 E-05	1.1 E-11	1.4 E-13
1983	5.0 E-03	9.1 E+00	5.7 E-33	0.0 E+00	0.0 E+00	5.6 E-04	5.6 E-04	5.6 E-04
1984	5.0 E-03	8.9 E+00	3.8 E-35	0.0 E+00	0.0 E+00	5.8 E-04	5.7 E-04	5.7 E-04
1985	1.9 E-04	8.9 E+00	2.6 E-37	0.0 E+00	0.0 E+00	7.7 E-06	4.6 E-12	5.7 E-14
1986	1.0 E-02	8.8 E+00	1.7 E-39	0.0 E+00	0.0 E+00	1.1 E-03	1.1 E-03	1.1 E-03
1987	2.5 E-03	8.7 E+00	1.2 E-41	0.0 E+00	2.3 E-09	2.6 E-04	2.4 E-04	2.4 E-04
1988	1.6 E-02	8.6 E+00	7.8 E-44	0.0 E+00	3.2 E-08	1.7 E-03	1.7 E-03	1.7 E-03
1989	1.3 E-03	8.5 E+00	5.2 E-46	0.0 E+00	8.6 E-09	1.1 E-04	8.4 E-05	8.4 E-05
1990	5.1 E-05	8.5 E+00	3.5 E-48	0.0 E+00	2.7 E-193	1.4 E-06	6.7 E-13	8.3 E-15
1991	2.5 E-04	8.5 E+00	2.4 E-50	0.0 E+00	0.0 E+00	3.0 E-05	3.0 E-05	3.0 E-05

APPENDIX 4A

GENERIC EXPOSURE EQUATIONS

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Appendix 4A: Generic Exposure Equations

The Task 4 report describes an analysis of exposures to radionuclides released from X-10 facility through ingestion of fish, ingestion of water, ingestion of milk, ingestion of meat, and external exposure to shoreline sediments. The generic equations used to estimate the intake or exposure for each of these pathways are listed below.

Ingestion of Fish:

$$Intake = \left(C_{water} \cdot BCF\right) \cdot N_{fish} \cdot P_{fish} \cdot F_{cf} \cdot EF \cdot ED \cdot F_{R,fish} \qquad (4A.1)$$

where

$Intake$	=	Amount of radioactivity ingested (Bq)
C_{water}	=	Concentration in surface water (Bq L^{-1})
BCF	=	Bioconcentration factor (L kg^{-1})
N_{fish}	=	Number of meals (fish meals d^{-1})
P_{fish}	=	Size of portions (kg fish $meal^{-1}$)
F_{cf}	=	Fraction of fish consumed that is contaminated (unitless)
EF	=	Exposure frequency (d y^{-1})
ED	=	Exposure duration (y)
$F_{R,fish}$	=	Fraction of radionuclide remaining in fish after processing (unitless).

Ingestion of Water (Drinking Water Pathway):

$$Intake = C_{water} \cdot U_{water} \cdot F_{cw} \cdot F_{filt} \cdot EF \cdot ED \cdot B_{RK} \qquad (4A.2)$$

where:

$Intake$	=	Amount of radioactivity ingested (Bq)
C_{water}	=	Concentration of radionuclide in surface water (Bq L^{-1})
U_{water}	=	Average daily consumption of drinking water (L d^{-1})
F_{cw}	=	Fraction of water consumed that is contaminated (unitless)
F_{filt}	=	Fraction of radioactivity in water remaining after filtering (unitless)
EF	=	Exposure frequency (d y^{-1})

ED = Exposure duration (y)

B_{RK} = Fraction of Clinch River water backflowing up the Tennessee River (unitless) [used only for CRM 0 at Kingston].

Ingestion of Milk:

$$Intake = C_{milk} \cdot U_{milk} \cdot F_{cm} \cdot EF \cdot ED \cdot e^{-(\lambda_R \cdot t_{delay})} \quad (4A.3)$$

where

$Intake$ = Amount of radioactivity ingested (Bq)

C_{milk} = Concentration in milk at the time of milking (Bq L^{-1})

U_{milk} = Milk ingestion rate by humans (L d^{-1})

F_{cm} = Fraction of contaminated milk ingested by humans (unitless)

EF = Exposure frequency (d y^{-1})

ED = Exposure duration (y)

λ_R = Radioactive decay (d^{-1})

t_{delay} = time between milking and consumption (d)

and

$$C_{milk} = C_{water} \cdot WM \quad (4A.4)$$

where

C_{milk} = Concentration in milk (Bq L^{-1})

C_{water} = Concentration of contaminant in water (Bq L^{-1})

WM = Water to milk transfer factor (unitless)

and

$$WM = F_m \cdot Q_m \cdot P_m \quad (4A.5)$$

where

F_m = Transfer coefficient to milk (d L^{-1})

Q_m = Amount of water consumed by a dairy cow (L d^{-1})

P_m = Fraction of water consumed by a dairy cow that is contaminated (unitless)

Ingestion of Meat:

$$Intake = C_{meat} \cdot U_{meat} \cdot F_{cb} \cdot EF \cdot ED \cdot F_{r,meat} \quad (4A.6)$$

where

$Intake$	=	Amount of radioactivity ingested (Bq)
C_{meat}	=	Concentration of contaminant in meat at time of slaughter (Bq kg^{-1})
U_{meat}	=	Ingestion of meat by humans (kg d^{-1})
F_{cb}	=	Fraction of contaminated meat ingested by humans (unitless)
EF	=	Exposure frequency (d y^{-1})
ED	=	Exposure duration (y)
$F_{r,meat}$	=	Fraction of radionuclide remaining in meat after food preparation (unitless)

and

$$C_{meat} = C_{water} \cdot WF \quad (4A.7)$$

where

C_{meat}	=	Concentration in meat (Bq kg^{-1})
C_{water}	=	Concentration of contaminant in water (Bq L^{-1})
WF	=	Water to meat transfer factor (L kg^{-1})

and

$$WF = F_f \cdot Q_f \cdot P_f \quad (4A.8)$$

where

Q_f	=	Ingestion of water by beef cattle (L d^{-1})
F_f	=	Transfer coefficient to meat (d kg^{-1})
P_f	=	Fraction of water consumed by beef cattle that is contaminated (unitless)

External Exposure to Shoreline Sediments:

$$Exposure = C_{sed} \cdot EF_{ext} \cdot ED \quad (4A.9)$$

where

Exposure = Radiation absorbed from external exposure (Bq kg^{-1} y)

C_{sed} = Concentration of contaminant in sediment (Bq kg^{-1})

EF_{ext} = Exposure frequency (unitless)

ED = Exposure duration (y)

and

$$EF_{(ext)} = \left(ET_{ss} \cdot F_{t(up)}\right) + \left(ET_{fw} \cdot F_{t(down)}\right) \quad (4A.10)$$

where

$F_{t(up)}$ = Fraction of time (days per every 365 days) using the shoreline when the water level is up (unitless)

ET_{ss} = Fraction of time (hours per every 24 hours) in a single trip for the summer and spring months (unitless)

$F_{t(down)}$ = Fraction of time (days per every 365 days) using the shoreline when the water level is down (unitless)

ET_{fw} = Fraction of time (hours per every 24 hours) in a single trip for the fall and winter months (unitless)

After the intake or exposure is obtained for a given pathway, the dose is determined by the following equation:

$$D = Intake\ or\ \ Exposure \cdot DF \quad (4A.11)$$

where

D = Dose delivered to an organ from an exposure (Sv)

Intake = Amount of radioactivity ingested (Bq)

or *Exposure* = Radiation absorbed from external exposure (Bq m^{-2})

DF = Organ-specific dose factor per unit intake (energy deposited divided by organ mass) (Sv Bq^{-1} for internal exposure or for external, a dose rate factor with units of Sv y^{-1} Bq^{-1} kg).

APPENDIX 5A

SUMMARY OF HISTORICAL RECORDS RELATED TO MEASUREMENTS OF RELEASES OF RADIONUCLIDES FROM WHITE OAK CREEK

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Appendix 5A: Summary of Monitoring Data for Releases of Radionuclides from White Oak Creek

This document summarizes historical monitoring data for releases of radionuclides from White Oak Creek. The monitoring data were identified in reports stored at the X- 10 Laboratory Records Center in Building 4500 at ORNIL. Section 1.0 of this document presents the following information for each type of monitoring report located by the project team, where available:

- Title of the report series,
- Time period during which specific reports in the series were issued,
- Frequency of monitoring activity and sample location,
- Types of analyses conducted (e.g., gross beta, gross gamma, or specific radionuclides),
- Collection and analytical methods, and
- Data reporting format.

Section 2 of this document describes several reports located by the project team that do not include monitoring data, but contain other information relevant to the evaluation of discharges of radionuclides from White Oak Creek, such as calculation procedures. These special reports include investigations of flood events, analyses of plant wastes for specific radionuclides, and descriptions of methods used to calculate the curies discharged per day from beta activity measurements and to measure water flow over White Oak Dam.

Specific reports within a given report series that have been identified to date are listed in Table 5A. 1. The table includes report number, first author, title, and the ChemRisk Repository number of the document if a copy was obtained and entered into the InMagic database.

1.0 Measurement of Radioactivity in Discharges from White Oak Creek

The following sections describe reports containing historical radioactivity monitoring data for discharges from White Oak Creek. Routine water monitoring activities were reportedly conducted by the Area Monitoring group, but the data were analyzed by the Health Physics group.

1.1 Early Water Surveys

The earliest identified water monitoring data for radioactivity in discharges from White Oak Creek were collected on July 26, 1944. These data are presented in "Activity of Mud and Water from White Oak Dam" (CF 44-08-376; ChemRisk Repository No. 1397). This one page report tabulates results from single samples collected at White Oak Dam and at seven locations along White Oak Creek. Radioactivity data for both water (in c/mL/min) and mud (in :Ci/gm) are presented. The sampling locations are shown on an attached sketch. Collection or analysis methods are not discussed.

Three subsequent reports entitled "Water Survey White Oak Dam" (CF 44 09-377, CF 44-10-063, CF 44-10-064; ChemRisk Repository No. 1846 and 2376) present radioactivity monitoring results for water samples collected at White Oak Dam during the three week period between September 11, 1944 and October 1, 1944. These data were collected using the "small container/ large container" immersion sampling method (described in Section 5), and reported as gamma dose rate (mr/hr).

1.2 Settling Pond and White Oak Dam Water Surveys

This series of reports, located for the period October 1944 through March 1948, presents radioactivity monitoring results for water samples collected at the inlet and outlet to the settling pond and at White Oak Dam. In general samples were collected approximately daily at the inlet and outlet to the settling pond and once per week at White Oak Dam. Individual reports were issued weekly from October 1944 through early 1946 and less frequently (e.g., biweekly or monthly) from early 1946 through March 1948. Reports in this series identified at the X- 10 Laboratory Records Center are listed in Table 5A.1.

Samples were collected and measured for gamma dose rate using the small/large container immersion method.

1.3 Health Physics Division Monthly/Quarterly/Semi-Annual/Annual Progress Reports

This series of reports summarizes the research activities of the ORNL Health Physics Division. The earliest identified report of this type was issued in 1946 as a monthly report (MonH215; ChemRisk Repository No. 574), then quarterly, semi-annual, and annual from 1959 to 1977 (ChemRisk Repository No. 1963). The types of research included in Health Physics Division progress reports are radiation physics, waste disposal research, and internal dosimetry, as well as publications and papers given during the previous year. Occasionally included within the discussion of waste disposal research are descriptions of studies in the White Oak Creek basin. These descriptions are generally very brief and are described in greater detail elsewhere. The reports in this series that have been identified by the project team are listed in Table 5A.1.

1.4 706-D Area Reports

This series of weekly reports, identified for the period from September 27, 1947 (CF 47-10-29; (ChemRisk Repository No. 1318, 1282, 1875) tabulates data on the daily activity of water discharged from the Settling Basin. Data presented include average beta activity of discharge (in c/min/mL), flow from the Settling Basin (in thousands of gallons/day), and approximate curies discharged from the Settling Basin. The reports in this series that have been identified are listed in Table 5A.1.

1.5 Waste Monitoring / Area Monitoring Weekly / Monthly Reports

Beginning in July 1947 (CF 47-7-36; ChemRisk Repository No. 1624), routine water monitoring results from the Settling Basin and White Oak Dam are presented in this series of reports. The

reports were issued from 1947 to 1949 (ChemRisk Repository No. 1624, 1578, 1317, 2377) and for six months in 1953 (ChemRisk Repository No. 2688), and are titled "Waste Monitoring Weekly (or Group) Reports" and "Area Monitoring Weekly Reports". In addition to other types of monitoring data (e.g., air, clothing, waste), these reports present beta and gamma radiation values for water collected at the Settling Basin and at White Oak Dam. The reports in this series that have been identified by the project team are listed in Table 5A.1.

Samples for beta activity are collected four times daily at each location, and weekly averages at each location in mr/hr are tabulated. In addition, the total curies discharged from each location are presented. Gamma activity is measured according to the methods set forth in CH-2566, "Operating Equations and Procedures Involved in Water Counting at Site X," by K.Z. Morgan (ChemRisk Repository No. 2565). Results are tabulated as the daily average of measurements from small and large containers collected at each location.

A summary of the data presented in these reports for the period from September 18, 1949 to March 5, 1950 is provided in Appendix 1 to the report "Fission Products Dispersal- Estimated Hydrological Hazards" (CF 50-3-101; ChemRisk Repository No. 1842). Data are tabulated as curies discharged per week from the Settling Basin into White Oak Creek and Lake, and from White Oak Lake into the Clinch River. The difference between the amount of activity discharged from the lake and that discharged into it per week is calculated, and the cumulative total excess discharge is presented.

1.6 Applied Health Physics Monthly / Quarterly / Semi-Annual / Annual Reports

This series of reports presents a summary of data collected during routine radioactivity monitoring programs conducted by the Applied Health Physics Division. The reports were published routinely from 1953 until 1984. Applied Health Physics reports were issued quarterly in 1953 and 1954, semi-annually in 1955 and 1956, and annually from 1957-84. A monthly report titled "Radioactivity in Clinch River Water" was located for the period January through April 1962. Reports for 1959-62 include curies of radioactivity discharged quarterly to the Clinch River from White Oak Creek. Curies discharged are reported by month in the 1962-64 quarterly reports.

The types of data that are summarized include area monitoring (e.g., air, clothing measurements), personnel monitoring, meteorological data (e.g., inches of rainfall), and instrument assays. In addition, data collected as part of the liquid waste disposal system monitoring program are summarized. Data of this type that are presented include average weekly beta activity and plutonium discharges from the Settling Basin and White Oak Lake and the probable average concentration of radioactivity in the Clinch River below White Oak Creek. Individual measurements are not presented, and the frequency of sample collection or measurement methods used are not discussed. The reports in this series that have been identified by the project team are listed in Table 5A.1.

1.7 Laboratory Facilities - Waste Disposal/ Radioactive Waste Disposal Operations Reports

This series of reports presents data obtained from sampling stations established to monitor ORNL waste effluents. The titles of these reports have changed slightly over time from "Laboratory Facilities -Waste Disposal Reports" for December 1961 through 1964, and "Radioactive (Liquid and Gaseous) Waste Disposal Operations (and Effluent Monitoring) Reports" for 1965-85.

Types of data summarized in these reports include activity as total Sr, Ru-106, Cs-137, and Co-60 in wastes discharged to White Oak Creek from the burial grounds, waste pits, trenches, and in discharges from White Oak Creek to the Clinch River. A figure showing the locations of the sampling stations is provided. Gross beta activity in process waste discharge from a number of buildings and processing areas at ORNL is also summarized. Sampling and analytical methods are not discussed in these reports.

1.8 Waste Treatment and Disposal Progress Reports

This series of reports, issued from 1961 through 1965, reviews the progress of the ORNL development program. This program's objective was to develop and demonstrate, on a pilot plant scale, processes for treatment and disposal of radioactive wastes produced in the nuclear power industry. Environmental research on the Clinch River is included to provide characterization of the distribution, transport, and accumulation of fission products in the environment. To this end, these reports include a brief summary of the White Oak Basin studies, including a summary of activity measurements for specific radionuclides in process wastes and at White Oak Creek Mile 2.6. These data are described in greater detail in the Clinch River Studies reports (ChemRisk Repository No. 165, 196, 206, 151, 205, 202, 311, 1810, 149, 2110, 1434, 3118, 3119, 1820, 3180). Specific reports in this series that have been identified are listed in Table 5A.1.

1.9 Summary of the Availability of Historical Water Monitoring Data

In summary, reports describing water monitoring for radioactivity at White Oak Dam have been identified beginning in July 1944. In general, weekly or monthly summaries of water monitoring results are available from this date forward. For the earlier years (i.e., 1940s and 1950s), only gamma and beta activity measurements are presented. Reports describing routine monitoring of White Oak Dam releases for specific radionuclides have not been identified until December 1961 (i.e., in Laboratory Facilities - Waste Disposal and Radioactive Waste Disposal Operations Reports).

2.0 Special Reports

Special studies in which water discharged from White Oak Creek to the Clinch River was monitored for radioactivity are summarized in this section, including studies of the effectiveness of White Oak Creek as a settling basin, the effects of flood conditions on release measurements, and specific radionuclide analyses.

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2.1 Investigation of the Efficiency of White Oak Creek

A study was conducted in 1947 to evaluate the relative effectiveness of different sections of the White Oak Creek drainage area in removing radioactive fission products from the effluent. The results of this study are reported in "Preliminary Report - Efficiency of White Oak Creek" (CF 47-11-554; ChemRisk Repository No. 1844). Estimated volume of creek flow is presented for a number of locations in the drainage area, since it was recognized that a significant factor in the efficiency of removal would be the natural volume of flow of different parts of White Oak Creek as it varied with the contributions of tributary streamlets. Observed beta activity and theoretical dilution factors for each location are presented.

2.2 Studies of the Effects of Floods on the Discharge of Radioactivity from White Oak Creek

Three reports describing the effects of floods on the discharge of radioactivity over White Oak Dam were identified for the period between 1948 and 1950. The first, "Preliminary Report on Discharges of Radioactivity into White Oak Creek and the Clinch River" (CF 48-12-293; ChemRisk Repository No. 1395), presents data collected during the floods of February 12-15, July 14, and November 19 and 28, 1948. The second, "Studies on Overflow at White Oak Dam" (CF 49-07-222; ChemRisk Repository No. 2138), presents data collected during the flood of late March 1949. The third report, "Monitoring of White Oak Discharge Water During Flood of January 30-31, 1950" (CF 50-3-44; ChemRisk Repository No. 1401), presents data collected between January 29, 1950 and February 2, 1950. Each of these reports is described below.

2.2.1 Preliminary Report on Discharges of Radioactivity into White Oak Creek and the Clinch River

This report summarizes measurements of radioactivity in White Oak Dam discharges made during 1948. Maximum, minimum, and average daily discharges of radioactivity into White Oak Creek and the Clinch River, in curies (beta and gamma) per day, are presented for each month. Cumulative discharges for the year are also tabulated. In addition, data collected during the floods of February 12-15, July 14, and November 19 and 28 are presented. Data from these periods includes flow rates, activity discharge measurements, and estimates of the probable activity in the Clinch River. The effect of floods on purging White Oak Lake is also discussed.

2.2.2 Studies on Overflow at White Oak Dam

This report presents data collected during the flood of late March 1949. Water samples were collected several times per day between March 25 and March 31 to measure radioactivity; these data were reported as gross beta in c/m/mL. The analysis method is described as follows. In the laboratory, a 50 mL portion of each sample was centrifuged and the supernatant decanted into a separate beaker and reduced to near dryness. Samples were then transferred into an aluminum dish and brought to dryness under a heat lamp. Sediment from each sample was micro-washed into a separate aluminum dish and brought to dryness under a heat lamp. After cooling to room temperature, the samples were counted in a beta chamber at approximately 10% geometry.

Average curies per day discharged over White Oak Dam and the probable average concentration in the Clinch River are presented for the periods previous to, during, and following the flood, and deviations from the probable average concentration in the Clinch River are calculated. The report indicates that the probable average concentration in the Clinch River was calculated using as a dilution factor the ratio of White Oak Darn discharge to the flow of the Clinch River. Average discharge volumes from White Oak Dam are provided for each day of sampling; however, the flow of the Clinch River for corresponding periods is not provided.

2.2.3 Monitoring of White Oak Discharge Water During Flood of January 30-31, 1950

This report presents data collected between January 29, 1950 and February 2, 1950, when 5.65 inches of rainfall were recorded at ORNL. During this period, data were collected on an "around the clock schedule" to monitor radioactivity in discharge water from White Oak Dam. Both beta and gamma activity were measured. While the water was pouring over the dam at a high level on January 30 and 31, 1000-mL water samples for beta activity were collected at approximately one- hour intervals. When the water receded to a level near the top of the coffer piling, samples were collected less frequently. In the laboratory, two 10-mL portions of each sample were brought to dryness in aluminum dishes under a heat lamp. After cooling to room temperature, the samples were counted in a beta chamber at approximately 10% geometry.

Gamma radioactivity was measured from approximately eight gallon samples collected over a 28 hour period. The samples were emptied into a previously decontaminated 14" inch diameter by 14" inch height stainless steel container. Monitoring equipment consisted of a scaler, scale of 64, G.M. tube enclosed in a brass cylinder, and a Wizard Recorder. Samples were counted for five minutes. Gamma radiation was calculated in terms of mr/hr using the conversion factor of 4.1×10^{-4} times the net counts per minute.

Water level in inches above or below the top of the coffer piling is provided for each interval during which samples were collected. Total curies discharged per day over White Oak Dam (as beta activity) and the probable concentration in the Clinch River, calculated based on the dilution afforded by the Clinch River, are presented for each day that samples were collected. However, the methodology or assumptions used to calculate the probable concentration in the Clinch River are not discussed. In addition to beta activity, curies discharged per day as gamma activity are also presented.

Radiochemical analyses data for Ru, Zr, Cb, TRE, Cs, Sr, and Pu are tabulated as the percent of total activity. The methodology used to determine these values is not provided, nor is the specific period to which these data correspond.

2.3 Analyses for Specific Radionuclides

Radiochemical analyses data relevant to discharges over White Oak Dam were identified in several reports. Distribution of activity for specific elements in W-6 Storage Tank waste solutions measured during 1944 is tabulated in "Disposal of Active Waste Solutions" (CE-1852; ChemRisk Repository No. 1400). The percent of total beta and gamma activity as Cb, Ce, Cs, Ru, Sr, Te, Zr, Y, La and Ba measured in solution, precipitate, and supernate from samples collected on May 15 is presented.

The total activity as Sr, Y, Zr, and Ru measured in the W-10, W-7, and W-9 Storage Tanks on September 1, 1944 is tabulated in "Distribution of Fission Activity in Metal Waste Solutions" (CN-2047; ChemRisk Repository No. 1436). In addition, the activity of each element for subsequent years (1945 through 1949) is predicted based on the half-lives of the elements.

In addition to the above two reports, radiochemical analyses data for Ru, Zr, Cb, TRE, Cs, Sr, and Pu were collected at White Oak Dam during the flood of January 1950 (CF 50-3-44; ChemRisk Repository No. 1401), as discussed above.

Table 5A.1 Reports containing Data Relevant to Measurement of Radioactivity in Water Discharged over White Oak Dam.

Early Water Surveys (1944)

CF 44-08-376	D.J. Rendell	Activity of Mud and Water from White Oak Dam *(ChemRisk Repository No. 1397)*
CF 44-09-377	D.J. Rendell	Water Survey White Oak Dam; 9/11-9/17/44 *(ChemRisk Repository No. 1846)*
CF 44-10-063	D.J. Rendell	Water Activity Report for Week; 9/17-9/23/44 *(ChemRisk Repository No. 2376)*
CF 44-10-064	D.J. Rendell	Water Survey White Oak Dam; 9/29-10/1/44 *(ChemRisk Repository No. 2376)*

Settling Pond and White Oak Dam Water Surveys (1944-48)

CF 044-10-149	D.J. Rendell	Settling Pond and White Oak Dam Water Survey; 10/2-10/8/44
CF 44-10-222	D.J. Rendell	Settling Pond and White Oak Dam Water Survey; 10/9-10/15/44 *(ChemRisk Repository No. 2376)*
CF 44-10-300	D.J. Rendell	Settling Pond and White Oak Dam Water Survey; 10/16-10/22/44 *(ChemRisk Repository No. 2376)*
CF 44-11-047	D.J. Rendell	Settling Pond and White Oak Dam Water Survey; 10/23-10/29/44 *(ChemRisk Repository No. 2376)*
CF 44-11-103	D.J. Rendell	Settling Pond and White Oak Dam Water Survey; 10/30-11/5/44 *(ChemRisk Repository No. 2376)*
CF 44-11-183	D.J. Rendell	Settling Pond and White Oak Dam Water Survey; 11/6-11/12/44
CF 44-11-306	D.J. Rendell	Settling Pond and White Oak Dam Water Survey; 11/13-11/19/44 *(ChemRisk Repository No. 2376)*
CF 44-11-389	D.J. Rendell	Settling Pond and White Oak Dam Gamma Water Survey; 11/20-11/26/44 *(ChemRisk Repository No. 2376)*
CF 44-12-097	D.J. Rendell	Settling Pond and White Oak Creek Gamma Water Survey; 11/27-12/3/44 *(ChemRisk Repository No. 2376)*
CF 44-12-174	D.J. Rendell	Settling Pond and White Oak Dam Gamma Water Survey; 12/4-12/10/44 *(ChemRisk Repository No. 2376)*
CF 44-12-245	D.J. Rendell	Settling Pond and White Oak Dam Water Survey; 12/11-12/16/44 *(ChemRisk Repository No. 2376)*

CF 45-01-045	J.S. Cheka	Settling Pond and White Oak Dam Water Survey; 12/19-12/29/44 *(ChemRisk Repository No. 2376)*
CF 45-01-125	J.S. Cheka	Settling Pond and White Oak Dam Water Survey; 1/1-1/6/45 *(ChemRisk Repository No. 2376)*
CF 45-01-214	J.S. Cheka	Settling Pond and White Oak Dam Water Survey; 1/8-1/13/45 *(ChemRisk Repository No. 1273)*
CF 45-01-307	J.S. Cheka	Settling Pond and White Oak Dam Water Survey; 1/15-1/20/45 *(ChemRisk Repository No. 2376)*
CF 45-01-391	J.S. Cheka	Settling Pond and White Oak Dam Water Survey; 1/22-1/27/45 *(ChemRisk Repository No. 2376)*
CF 45-02-087	J.S. Cheka	Settling Pond and White Oak Dam Water Survey; 1/29-2/3/45 *(ChemRisk Repository No. 2376)*
CF 45-02-268	J.S. Cheka	Settling Pond and White Oak Dam Water Survey; 2/5-2/11/45 and 2/13-2/17/45 *(ChemRisk Repository No. 2376)*
CF 45-02-314	J.S. Cheka	Settling Pond and White Oak Dam Water Survey; 2/19-2/24/45 *(ChemRisk Repository No. 2376)*
CF 45-03-078	J.S. Cheka	Settling Pond and White Oak Dam Water Survey; 2/26-3/3/45 *(ChemRisk Repository No. 2376)*
CF 045-03-233	J.S. Cheka	White Oak Dam and Settling Pond Survey; 3/5-3/10/45 *(ChemRisk Repository No. 2376)*
CF 45-03-322	J.S. Cheka	White Oak Dam and Settling Pond Survey; 3/12-3/17 and 3/19-3/24/45 *(ChemRisk Repository No. 2376)*
CF 45-04-011	J.S. Cheka	White Oak Dam and Settling Pond Survey; 3/26-3/31/45 *(ChemRisk Repository No. 2376)*
CF 45-04-106	J.S. Cheka	White Oak Dam and Settling Pond Survey; 4/3-4/7/45 *(ChemRisk Repository No. 2376)*
CF 45-04-183	J.S. Cheka	White Oak Dam and Settling Pond Survey; 4/7-4/14/45 *(ChemRisk Repository No. 2376)*
CF 45-04-235	J.S. Cheka	White Oak Dam and Settling Basin Survey; 4/16-4/21/45 *(ChemRisk Repository No. 2376)*
CF 45-05-011	J.S. Cheka	White Oak Dam and Settling Basin Survey; 4/23-4/28/45 *(ChemRisk Repository No. 2376)*
CF 45-05-078	Greenwood	White Oak Dam and Settling Basin Survey; 4/30-5/5/45 *(ChemRisk Repository No. 2376)*
CF 45-05-195	Greenwood	White Oak Dam and Settling Basin Survey; 5/7-5/12/45 *(ChemRisk Repository No. 2376)*

CF 45-05-293	Greenwood	White Oak Dam and Settling Basin Survey; 5/14-5/19/45 *(ChemRisk Repository No. 2376)*
CF 45-05-322	Greenwood	White Oak Dam and Settling Basin Survey; 5/21-5/26/45 *(ChemRisk Repository No. 2376)*
CF 45-06-077	Greenwood	White Oak Dam and Settling Basin Survey; 5/28-6/2/45 *(ChemRisk Repository No. 2376)*
CF 45-06-131	Greenwood	White Oak Dam and Settling Basin Survey; 6/4-6/9/45 *(ChemRisk Repository No. 2376)*
CF 45-06-264	Greenwood	White Oak Dam and Settling Basin Survey; 6/11-6/16/45 *(ChemRisk Repository No. 2376)*
CF 45-06-299	J.S. Cheka	White Oak Dam and Settling Basin Survey; 6/17-6/23/45 *(ChemRisk Repository No. 2376)*
CF 45-07-031	Greenwood	White Oak Dam and Settling Basin Survey; 6/25-6/30/45 *(ChemRisk Repository No. 2376)*
CF 45-07-100	Greenwood	White Oak Dam and Settling Basin Survey; 7/2-7/7/45 *(ChemRisk Repository No. 2376)*
CF 45-07-211	Greenwood	White Oak Dam and Settling Basin Survey; 7/9-7/14/45 *(ChemRisk Repository No. 2376)*
CF 45-07-247	Greenwood	White Oak Dam and Settling Basin Survey; 7/16-7/21/45 *(ChemRisk Repository No. 2376)*
CF 45-07-297	Greenwood	White Oak Dam and Settling Basin Survey; 7/23-7/28/45 *(ChemRisk Repository No. 2376)*
CF 45-08-082	Greenwood	White Oak Dam and Settling Basin Survey; 7/30-8/4/45 *(ChemRisk Repository No. 2376)*
CF 45-08-169	H.R. Craft	White Oak Dam and Settling Basin Survey; 8/6-8/11/45 *(ChemRisk Repository No. 2376)*
CF 45-08-223	H.R. Craft	White Oak Dam and Settling Basin Survey; 8/13-8/18/45 *(ChemRisk Repository No. 2376)*
CF 45-09-012	H.R. Craft	White Oak Dam and Settling Basin Survey; 8/20-8/25/45 *(ChemRisk Repository No. 2376)*
CF 45-09-070	H.R. Craft	White Oak Dam and Settling Basin Survey; 8/27-9/1/45
CF 45-09-122	H.R. Craft	White Oak Dam and Settling Basin Survey; 9/3-9/8/45
CF 45-09-222	H.R. Craft	White Oak Dam and Settling Basin Survey; 9/11-9/15/45 *(ChemRisk Repository No. 2376)*

CF 45-09-270	H.R. Craft	White Oak Dam and Settling Basin Survey; 9/17-9/21/45 *(ChemRisk Repository No. 2376)*
CF 45-10-071	H.R. Craft	White Oak Dam and Settling Basin Survey; 9/24-9/29/45 *(ChemRisk Repository No. 2376)*
CF 45-10-112	H.R. Craft	White Oak Dam and Settling Basin Survey; 10/1-10/6/45
CF 45-10-194	H.R. Craft	White Oak Dam and Settling Basin Survey; 10/8-10/15/45 *(ChemRisk Repository No. 2376)*
CF 45-10-225	H.R. Craft	White Oak Dam and Settling Basin Survey; 10/16-10/22/45 *(ChemRisk Repository No. 2376)*
CF 45-11-054	H.R. Craft	White Oak Dam and Settling Basin Survey; 10/16-10/22/45 *(ChemRisk Repository No. 2376)*
CF 45-11-079	H.R. Craft	White Oak Dam and Settling Basin Survey; 11/2-11/9/45 *(ChemRisk Repository No. 2376)*
CF 45-11-171	H.R. Craft	White Oak Dam and Settling Basin Survey; 11/12-11/16/45 *(ChemRisk Repository No. 2376)*
CF 45-12-020	H.R. Craft	White Oak Dam and Settling Basin Survey; 11/19-11/23/45 *(ChemRisk Repository No. 2376)*
CF 45-12-068	H.R. Craft	White Oak Dam and Settling Basin Survey; 11/26-11/30/45 *(ChemRisk Repository No. 2376)*
CF 45-12-090	H.R. Craft	White Oak Dam and Settling Basin Survey; 12/3-12/7/45 *(ChemRisk Repository No. 2376)*
CF 45-12-158	H.R. Craft	White Oak Dam and Settling Basin Survey; 12/10-12/15/45 *(ChemRisk Repository No. 2376)*
CF 46-01-025	H.R. Craft	White Oak Dam and Settling Basin Survey; 12/17-12/29/45 *(ChemRisk Repository No. 2376)*
CF 46-01-183	H.R. Craft	White Oak Dam and Settling Basin Survey; ½-1/5/46
CF 46-01-205	H.R. Craft	White Oak Dam and Settling Basin Survey; 1/7-1/11/46 *(ChemRisk Repository No. 2376)*
CF 46-01-246	Greenwood	Correction to Report Dated 1/16/46 Entitled: Extent of Activity in Mud Washed through White Oak Dam on January 6, 1946 *(ChemRisk Repository No. 1393)*
CF 46-01-406	H.R. Craft	White Oak Dam and Settling Basin Survey; 1/14-1/25/46 *(Copy requested-not received)*
CF 46-02-238	H.R. Craft	White Oak Dam and Settling Basin Survey; 1/26-2/14/46 *(ChemRisk Repository No. 2376)*

CF 46-02-295	H.R. Craft	White Oak Dam and Settling Basin Survey; 2/15-2/20/46 *(ChemRisk Repository No. 2376)*
CF 46-03-071	H.R. Craft	White Oak Dam and Settling Basin Survey; 2/21-2/28/46 *(ChemRisk Repository No. 2376)*
CF 46-03-177	H.R. Craft	White Oak Dam and Settling Basin Survey; 3/1-3/8/46 *(ChemRisk Repository No. 2376)*
CF 46-03-299	H.R. Craft	White Oak Dam and Settling Basin Survey; 3/11-3/18/46 *(ChemRisk Repository No. 2376)*
CF 46-03-394	H.R. Craft	White Oak Dam and Settling Basin Survey; 3/19-3/22/46 *(ChemRisk Repository No. 2376)*
CF 46-04-050	H.R. Craft	White Oak Dam and Settling Basin Survey; 3/25-3/29/46 *(ChemRisk Repository No. 2376)*
CF 46-04-183	H.R. Craft	White Oak Dam and Settling Basin Survey; 4/1-4/5/46 *(ChemRisk Repository No. 2376)*
CF 46-04-280	H.R. Craft	White Oak Dam and Settling Basin Survey; 4/8-4/12/46 *(ChemRisk Repository No. 2376)*
CF 46-04-440	H.R. Craft	White Oak Dam and Settling Basin Survey; 4/15-4/19/46 *(ChemRisk Repository No. 2376)*
CF 46-04-574	H.R. Craft	White Oak Dam and Settling Basin Survey; 4/22-4/26/46 *(ChemRisk Repository No. 2376)*
CF 46-05-155	H.R. Craft	White Oak Dam and Settling Basin Survey; 4/29-5/6/46 *(ChemRisk Repository No. 2376)*
CF 46-05-254	H.R. Craft	White Oak Dam and Settling Basin Survey; 5/6-5/10/46 *(ChemRisk Repository No. 2376)*
CF 46-05-392	H.R. Craft	White Oak Dam and Settling Basin Survey; 5/13-5/17/46 *(ChemRisk Repository No. 2376)*
CF 46-05-481	H.R. Craft	White Oak Dam and Settling Basin Survey; 5/20-5/24/46 *(ChemRisk Repository No. 2376)*
CF 46-07-114	H.R. Craft	White Oak Dam and Settling Basin Survey; 5/27-5/31/46 *(ChemRisk Repository No. 2376)*
CF 46-06-209	H.R. Craft	White Oak Dam and Settling Basin Survey; 6/3-6/7/46 *(ChemRisk Repository No. 2376)*
CF 46-06-256	H.R. Craft	White Oak Dam and Settling Basin Survey; 6/10-6/14/46 *(ChemRisk Repository No. 2376)*
CF 46-06-299	H.R. Craft	White Oak Dam and Settling Basin Survey; 6/17-6/21/46 *(ChemRisk Repository No. 2376)*

CF 46-07-113	H.R. Craft	White Oak Dam and Settling Basin Survey; 6/24-6/28/46 *(ChemRisk Repository No. 2376)*
CF 46-07-153	H.R. Craft	White Oak Dam and Settling Basin Survey; 7/1-7/5/46 *(ChemRisk Repository No. 2376)*
CF 46-07-243	H.R. Craft	White Oak Dam and Settling Basin Survey; 7/15-7/19/46 *(ChemRisk Repository No. 2376)*
CF 46-08-042	H.R. Craft	White Oak Dam and Settling Basin Survey; 7/22-7/26/46 *(ChemRisk Repository No. 2376)*
CF 46-08-068	H.R. Craft	White Oak Dam and Settling Basin Survey; 7/29-8/2/46 *(ChemRisk Repository No. 2376)*
CF 46-08-191	H.R. Craft	White Oak Dam and Settling Basin Survey; 8/5-8/9/46 *(ChemRisk Repository No. 2376)*
CF 46-08-190	H.R. Craft	White Oak Dam and Settling Basin Survey; 8/12-8/16/46 *(ChemRisk Repository No. 2376)*
CF 46-08-279	H.R. Craft	White Oak Dam and Settling Basin Survey; 8/19-8/23/46 *(ChemRisk Repository No. 2376)*
CF 46-09-091	H.R. Craft	White Oak Dam and Settling Basin Survey; 8/26-8/30/46 *(ChemRisk Repository No. 2376)*
CF 46-09-192	H.R. Craft	White Oak Dam and Settling Basin Survey; 9/2-9/13/46 *(ChemRisk Repository No. 2376)*
CF 46-09-277	H.R. Craft	White Oak Dam and Settling Basin Survey; 9/16-9/20/46 *(ChemRisk Repository No. 2376)*
CF 46-10-051	H.R. Craft	White Oak Dam and Settling Basin Survey; 9/23-9/28/46 *(ChemRisk Repository No. 2376)*
CF 47-05-018	M.A. Buford	White Oak Dam and Settling Basin Survey; 4/21-5/16/47 *(ChemRisk Repository No. 2376)*
CF 47-07-007	T.H.J. Burnett	White Oak Dam and Settling Basin Survey; 6/23-7/3/47 *(ChemRisk Repository No. 2376)*
CF 47-08-447	T.H.J. Burnett	White Oak Dam and Settling Basin Survey; 7/3-7/29/47 *(ChemRisk Repository No. 2376)*
CF 47-08-294	T.H.J. Burnett	White Oak Dam and Settling Basin Survey; 7/30-8/14/47 *(ChemRisk Repository No. 2376)*
CF 47-09-167	T.H.J. Burnett	White Oak Dam and Settling Basin Survey; 8/14-9/3/47 *(ChemRisk Repository No. 2376)*
CF 47-10-104	T.H.J. Burnett	White Oak Dam and Settling Basin Survey; 9/14-9/30/47

CF 47-11-244	T.H.J. Burnett	White Oak Dam and Settling Basin Survey; 10/47 *(ChemRisk Repository No. 2376)*
CF 47-12-089	T.H.J. Burnett	White Oak Dam and Settling Basin Survey; 11/47 *(ChemRisk Repository No. 2376)*
CF 48-01-088	T.H.J. Burnett	White Oak Dam and Settling Basin Survey; 12/47 *(ChemRisk Repository No. 2376)*
CF 48-02-029	T.H.J. Burnett	White Oak Dam and Settling Basin Survey; 1/48
CF 48-03-152	T.H.J. Burnett	White Oak Dam and Settling Basin Survey; 2/48 *(ChemRisk Repository No. 2376)*
CF 48-04-237	T.H.J. Burnett	White Oak Dam and Settling Basin Survey; 3/48 *(ChemRisk Repository No. 2376)*

Health Physics Division Reports (1946-77)

ORNL-2384	K.Z. Morgan	Health Physics Division Annual Progress Report for Period Ending July 31, 1957 *(ChemRisk Repository No. 576)*

1946-1956 *(ChemRisk Repository No. 2871, 2601, 309, 574)*

1958, 1959, 1960, 1961, 1962, 1963, 1964, 1965, 1966 *(ChemRisk Repository No. 57, 182, 577, 578, 579, 56, 580, 727, 65)*

1968, 1969, 1970, 1971, 1972, 1975, 1977 *(ChemRisk Repository No. 1963, 581, 1811)*

706-D Area Reports (1947-48)

CF 47-10-039	E. Witkowski	706-D Area Report, Week Ending September 27, 1947 *(ChemRisk Repository No. 1318)*
CF 47-10-274	E. Witkowski	706-D Area Report, Week Ending October 11, 1947 *(ChemRisk Repository No. 1318)*
CF 48-01-150	E. Witkowski	706-D Area Report, Week Ending January 10, 1948 *(ChemRisk Repository No. 1318)*

Waste Monitoring Reports (1947-53)

CF 47-4-3	T.H.J. Burnett	Liquid Waste Monitoring Monthly Report; 3/47 *(ChemRisk Repository No. 1587)*
CF 47-6-17	T.H.J. Burnett	Liquid Waste Monitoring Monthly Report; 5/47 *(ChemRisk Repository No. 1587)*

CF 47-8-441	T.H.J. Burnett	Liquid Waste Monitoring Monthly Report; 7/47 *(ChemRisk Repository No. 1587)*
CF 47-9-168	T.H. J. Burnett	Liquid Waste Monitoring Monthly Report; 8/47 *(ChemRisk Repository No. 1587)*
CF 47-10-99	T.H. J. Burnett	Liquid Waste Monitoring Monthly Report; 9/47 *(ChemRisk Repository No. 1587)*
CF 47-11-339	T.H.J. Burnett	Liquid Waste Monitoring Monthly Report; 10/47 *(ChemRisk Repository No. 1587)*
CF 47-12-397	T.H.J. Burnett	Liquid Waste Monitoring Monthly Report; 11/47 *(ChemRisk Repository No. 1587)*
CF 48-1-87	T.H. J. Burnett	Liquid Waste Monitoring Monthly Report; 12/47 *(ChemRisk Repository No. 1587)*
CF 48-2-123	T.H.J. Burnett	Liquid Waste Monitoring Monthly Report; 1/48 *(ChemRisk Repository No. 1587)*
CF 48-03-153	T.H.J. Burnett	Liquid Waste Monitoring; 2/48 *(ChemRisk Repository No. 1587)*
CF 48-04-174	T.H.J. Burnett	Liquid Waste Monitoring; 3/48 *(ChemRisk Repository No. 1587)*
CF 47-7-36	T.H.J. Burnett	Waste Monitoring Group Report; 7/47 *(ChemRisk Repository No. 1624)*
CF 47-9-166	T.H.J. Burnett	Waste Monitoring Group Report; 8/47 *(ChemRisk Repository No. 1624)*
CF 47-10-95	T.H.J. Burnett	Waste Monitoring Group Report; 9/47 *(ChemRisk Repository No. 1624)*
CF 47-11-340	T.H.J. Burnett	Waste Monitoring Group Report; 10/47 *(ChemRisk Repository No. 1624)*
CF 47-12-393	T.H.J. Burnett	Waste Monitoring Group Report; 11/47 *(ChemRisk Repository No. 1624)*
CF 48-2-189	T.H.J. Burnett	Waste Monitoring Group Report; 2/48 *(ChemRisk Repository No. 1624)*
CF 48-3-210	W.D. Cottrell	Waste Monitoring Weekly Report; *(ChemRisk Repository No. 1578)*
CF 48-04-365	W.D. Cottrell	Waste Monitoring Weekly Report; 3/48 *(ChemRisk Repository No. 1578)*
CF 48-05-208	W.D. Cottrell	Waste Monitoring Weekly Report; 4/48 *(ChemRisk Repository No. 1578)*

CF 48-05-290	W.D. Cottrell	Waste Monitoring Weekly Report for Week Ending May 8, 1948 *(ChemRisk Repository No. 1578)*
CF 48-06-045	W.D. Cottrell	Waste Monitoring Weekly Report for Week Ending May 15, 1948 *(ChemRisk Repository No. 1578)*
CF 48-06-044	W.D. Cottrell	Waste Monitoring Weekly Report for Week Ending May 22, 1948 *(ChemRisk Repository No. 1578)*
CF 48-06-154	W.D. Cottrell	Waste Monitoring Weekly Report for Week Ending May 29, 1948 *(ChemRisk Repository No. 1578)*
CF 48-06-189	W.D. Cottrell	Waste Monitoring Weekly Report for the Week Ending June 5, 1948 *(ChemRisk Repository No. 1317)*
CF 48-06-332	W.D. Cottrell	Waste Monitoring Weekly Report for Week Ending June 12, 1948 *(ChemRisk Repository No. 1578)*
CF 48-07-015	W.D. Cottrell	Waste Monitoring Weekly Report for Week Ending June 19, 1948 *(ChemRisk Repository No. 1578)*
CF 48-07-066	W.D. Cottrell	Waste Monitoring Weekly Report for the Week Ending June 26, 1948 *(ChemRisk Repository No. 1578)*
CF 48-07-168	W.D. Cottrell	Waste Monitoring Weekly Report for Week Ending July 3, 1948 *(ChemRisk Repository No. 1578)*
CF 48-07-205	W.D. Cottrell	Waste Monitoring Weekly Report for the Week Ending July 10, 1948 *(ChemRisk Repository No. 1317)*
CF 48-07-319	W.D. Cottrell	Waste Monitoring Weekly Report for the Week Ending July 17, 1948 *(ChemRisk Repository No. 1578)*
CF 48-08-046	W.D. Cottrell	Waste Monitoring Weekly Report for Week Ending July 24, 1948 *(ChemRisk Repository No. 1317)*
CF 48-08-297	C.N. Rucker	Liquid Waste Disposal System at ORNL *(ChemRisk Repository No. 1391)*
CF 48-09-037	W.D. Cottrell	Waste Monitoring Weekly Report for Week Ending August 28, 1948 *(ChemRisk Repository No. 1578)*
CF 48-09-080	W.D. Cottrell	Waste Monitoring Weekly Report for Week Ending September 4, 1948 *(ChemRisk Repository No. 1317)*
CF 48-09-147	W.D. Cottrell	Waste Monitoring Weekly Report for Week Ending September 11, 1948 *(ChemRisk Repository No. 1317)*
CF 48-09-274	W.D. Cottrell	Waste Monitoring Weekly Report for Week Ending September 19, 1948 *(ChemRisk Repository No. 1578)*
CF 48-10-090	W.D. Cottrell	Waste Monitoring Weekly Report for Week Ending September 25, 1948 *(ChemRisk Repository No. 1578)*

CF 48-10-130	W.D. Cottrell	Waste Monitoring Weekly Report for Week Ending October 10, 1948 *(ChemRisk Repository No. 1780)*
CF 48-10-199	W.D. Cottrell	Area Monitoring Weekly Report for Week Ending October 10, 1948 *(ChemRisk Repository No. 2377)*
CF 48-10-326	W.D. Cottrell	Area Monitoring Weekly Report for Week Ending October 17, 1948 *(ChemRisk Repository No. 2377)*
CF 48-11-052	W.D. Cottrell	Area Monitoring Weekly Report for Week Ending October 24, 1948 *(ChemRisk Repository No. 1317)*
CF 48-11-137	W.D. Cottrell	Area Monitoring Report for Week Ending October 31, 1948 *(ChemRisk Repository No. 1317)*
CF 48-11-223	W.D. Cottrell	Area Monitoring Report for Week Ending November 7, 1948 *(ChemRisk Repository No. 1317)*
CF 48-11-276	W.D. Cottrell	Area Monitoring Report for Week Ending November 14, 1948 *(ChemRisk Repository No. 2377)*
CF 48-12-006	W.D. Cottrell	Area Monitoring Report for Week Ending November 21, 1948 *(ChemRisk Repository No. 2377)*
CF 48-12-081	W.D. Cottrell	Area Monitoring Report for Week Ending November 28, 1948 *(ChemRisk Repository No. 2377)*
CF 48-12-130	W.D. Cottrell	Area Monitoring Report for Week Ending December 5, 1948 *(ChemRisk Repository No. 1317)*
CF 48-12-161	W.D. Cottrell	Area Monitoring Report for Week Ending December 12, 1948 *(ChemRisk Repository No. 2377)*
CF 48-12-223	W.D. Cottrell	Area Monitoring Report for Week Ending December 19, 1948 *(ChemRisk Repository No. 2377)*
CF 48-12-299	W.D. Cottrell	Area Monitoring Report for Week Ending December 26, 1948 *(ChemRisk Repository No. 2377)*
CF 49-01-090	W.D. Cottrell	Area Monitoring Report for Week Ending January 2, 1949 *(ChemRisk Repository No. 2377)*
CF 49-01-145	W.D. Cottrell	Area Monitoring Report for Week Ending January 9, 1949 *(ChemRisk Repository No. 2377)*
CF 49-01-199	W.D. Cottrell	Area Monitoring Report for Week Ending January 16, 1949 *(ChemRisk Repository No. 2377)*
CF 49-01-264	W.D. Cottrell	Area Monitoring Report for Week Ending January 23, 1949 *(ChemRisk Repository No. 2377)*
CF 49-02-070	W.D. Cottrell	Area Monitoring Report for Week Ending January 30, 1949 *(ChemRisk Repository No. 2377)*

CF 49-02-127	W.D. Cottrell	Area Monitoring Report for Week Ending February 6, 1949 *(ChemRisk Repository No. 2377)*
CF 49-02-183	W.D. Cottrell	Area Monitoring Report for Week Ending February 13, 1949 *(ChemRisk Repository No. 2377)*
CF 49-02-238	W.D. Cottrell	Area Monitoring Report for Week Ending February 20, 1949 *(ChemRisk Repository No. 2377)*
CF 49-03-072	W.D. Cottrell	Area Monitoring Report for Week Ending February 27, 1949 *(ChemRisk Repository No. 2377)*
CF 49-03-142	W.D. Cottrell	Area Monitoring Report for Week Ending March 6, 1949 *(ChemRisk Repository No. 2377)*
CF 49-03-209	W.D. Cottrell	Area Monitoring Report for Week Ending March 13, 1949 *(ChemRisk Repository No. 2377)*
CF 49-03-252	W.D. Cottrell	Area Monitoring Report for Week Ending March 20, 1949 *(ChemRisk Repository No. 2377)*
CF 49-04-006	W.D. Cottrell	Area Monitoring Report for Week Ending March 27, 1949 *(ChemRisk Repository No. 2377)*

Applied Health Physics Reports (1953-84)

CF 54-2-186	H.P. Division	Applied Health Physics Quarterly Report for Period September 28, 1953–January 3, 1954 *(ChemRisk Repository No. 1432)*
CF 54-4-164	H.P. Division	Applied Health Physics Quarterly Report for Period January 4, 1954 – April 4, 1954 *(ChemRisk Repository No. 1432)*
CF 54-07-103	H.P. Division	Applied Health Physics Quarterly Report for Period April 5, 1954 – July 4, 1954 *(ChemRisk Repository No. 1432)*
CF 55-1-203	H.P. Division	Applied Health Physics Quarterly Report for Period 4th Quarter 1954 *(ChemRisk Repository No. 1432)*
CF 56-1-94	H.P. Division	Applied Health Physics Semi-Annual Report, July 1955-January 1956 *(ChemRisk Repository No. 1911)*
CF 57-01-173	H.P. Division	Applied Health Physics Semi-Annual Report, July 1956-December 1956 *(ChemRisk Repository No. 1432)*
CF 61-5-100	J.C. Hart	Applied Health Physics Quarterly Report – January through March, 1961 *(ChemRisk Repository No. 1432)*
CF 61-7-71	J.C. Hart	Applied Health Physics Quarterly Report – April through June, 1961 *(ChemRisk Repository No. 1423)*

CF 61-11-03	J.C. Hart	Applied Health Physics Quarterly Report – July through September, 1961 *(ChemRisk Repository No. 1432)*
CF 62-02-274	J.C. Hart	Applied Health Physics Quarterly Report – October through December, 1961 *(ChemRisk Repository No. 1432)*
CF 62-05-065	J.C. Hart	Applied Health Physics Quarterly Report – January, February, and March of 1962 *(ChemRisk Repository No. 1432)*
CF 62-08-084	J.C. Hart	Applied Health Physics Quarterly Report - April, May and June of 1962 *(ChemRisk Repository No. 1432)*
CF 62-11-74	J.C. Hart	Applied Health Physics Quarterly Report – July, August, and September of 1962 *(ChemRisk Repository No. 1437)*
CF 63-3-51	J.C. Hart	Applied Health Physics Quarterly Report – October, November, and December of 1962 *(ChemRisk Repository No. 1436)*
CF 63-9-8	J.C. Hart	Applied Health Physics Quarterly Report – January, February, and March of 1963 *(ChemRisk Repository No. 1433)*
CF 63-10-14	J.C. Hart	Applied Health Physics Quarterly Report – April, May and June of 1963 *(ChemRisk Repository No. 1432)*
CF 63-12-39	J.C. Hart	Applied Health Physics Quarterly Report – July, August, and September of 1963 *(ChemRisk Repository No. 1432)*
CF 64-3-3	J.C. Hart	Applied Health Physics Quarterly Report – October, November, and December 1963 *(ChemRisk Repository No. 1432)*
CF 64-6-49	J.C. Hart	Applied Health Physics Quarterly Report – January, February, and March of 1964 *(ChemRisk Repository No. 1432)*
CF 64-8-84	J.C. Hart	Applied Health Physics Quarterly Report – April, May, and June of 1962 *(ChemRisk Repository No. 1432)*
CF 57-12-146	K.Z. Morgan	Applied Health Physics Annual Report for 1957 *(ChemRisk Repository No. 1988)*
ORNL-2777	K.Z. Morgan	Applied Health Physics Annual Report for 1958 *(ChemRisk Repository No. 1804)*
ORNL-3073	K.Z. Morgan	Applied Health Physics Annual Report for 1959 *(ChemRisk Repository No. 691)*
ORNL-3159	K.Z. Morgan	Applied Health Physics Annual Report for 1960 *(ChemRisk Repository No. 542)*
ORNL-3284	K.Z. Morgan	Applied Health Physics Annual Report for 1961 *(ChemRisk Repository No. 543)*

ORNL-3490	K.Z. Morgan	Applied Health Physics Annual Report for 1962 *(ChemRisk Repository No. 544)*
ORNL-3665	K.Z. Morgan	Applied Health Physics Annual Report for 1963 *(ChemRisk Repository No. 545)*
ORNL-3820	K.Z. Morgan	Applied Health Physics Annual Report for 1964 *(ChemRisk Repository No. 546)*
ORNL-3969	K.Z. Morgan	Applied Health Physics Annual Report for 1965 *(ChemRisk Repository No. 547)*
ORNL-4146	K.Z. Morgan	Applied Health Physics Annual Report for 1966 *(ChemRisk Repository No. 548)*
ORNL-4286	K.Z. Morgan	Applied Health Physics Annual Report for 1967 *(ChemRisk Repository No. 549)*
ORNL-4423	K.Z. Morgan	Applied health Physics and Safety Annual Report for 1968 *(ChemRisk Repository No. 550)*
ORNL-4563	K.Z. Morgan	Applied Health Physics and Safety Annual Report for 1969 *(ChemRisk Repository No. 551)*
ORNL-4690	K.Z. Morgan	Applied Health Physics and Safety Annual Report for 1970 *(ChemRisk Repository No. 552)*
ORNL-4795	K.Z. Morgan	Applied Health Physics and Safety Annual Report for 1971 *(ChemRisk Repository No. 553)*
ORNL-4894	J.A. Auxier	Applied Health Physics and Safety Annual Report for 1972 *(ChemRisk Repository No. 554)*
ORNL-4974	J.A. Auxier	Applied Health Physics and Safety Annual Report for 1973 *(ChemRisk Repository No. 555)*
ORNL-5055	J.A. Auxier	Applied Health Physics and Safety Annual Report for 1974 *(ChemRisk Repository No. 556)*
ORNL-5169	J.A. Auxier	Applied Health Physics and Safety Annual Report for 1975 *(ChemRisk Repository No. 557)*
ORNL-5310	J.A. Auxier	Applied Health Physics and Safety Annual Report for 1976 *(ChemRisk Repository No. 558)*
ORNL-5420	J.A. Auxier	Industrial Safety and Applied Health Physics Annual Report for 1977 *(ChemRisk Repository No. 559)*
ORNL-5543	J.A. Auxier	Industrial Safety and Applied Health Physics Annual Report for 1978 *(ChemRisk Repository No. 560)*
ORNL-5663	J.A. Auxier	Industrial Safety and Applied Health Physics Annual Report for 1979 *(ChemRisk Repository No. 561)*

ORNL-5821	J.A. Auxier	Industrial Safety and Applied Health Physics Annual Report for 1980 *(ChemRisk Repository No. 562)*
ORNL-5859	J.A. Auxier	Industrial Safety and Applied Health Physics Annual Report for 1981 *(ChemRisk Repository No. 358)*
ORNL-5962	J.A. Auxier	Industrial Safety and Applied Health Physics Annual Report for 1982 *(ChemRisk Repository No. 563)*

Waste Disposal Operations Reports (1961-85)

CF 62-02-055	J.F. Manneschmidt	Laboratory Facilities – Waste Disposal Report for December 1961 *(ChemRisk Repository No. 1828)*
CF 63-05-014	L.C. Lasher	Laboratory Facilities – Waste Disposal Report for March 1963 *(ChemRisk Repository No. 1828)*
CF 01-028	L.C. Lasher	Laboratory Facilities – Waste Disposal Report for November 1963 *(ChemRisk Repository No. 1828)*
CF 65-01-057	L.C. Lasher	Radioactive Waste Disposal Operations Report for December 1964 *(ChemRisk Repository No. 2056)*
CF 65-08-011	L.C. Lasher	Radioactive Waste Disposal Operations Report for the Month of June 1965 *(ChemRisk Repository No. 2056)*
CF 67-01-019	L.C. Lasher	Radioactive Waste Disposal Operations Report for the Month of November 1966 *(ChemRisk Repository No. 2056)*
CF 68-01-030	L.C. Lasher	Radioactive Waste Disposal Operations Report for the Month of November 1967 *(ChemRisk Repository No. 2018)*
CF 69-01-018	L.C. Lasher	Radioactive Waste Disposal Operations Report for the Month of October 1968 *(ChemRisk Repository No. 2056)*
CF 70-02-008	L.C. Lasher	Radioactive Waste Disposal Operations Report for the Month of November 1969 *(ChemRisk Repository No. 2056)*
CF 71-01-035	L.C. Lasher	Radioactive Waste Disposal Operations Report for the Month of October 1979 *(ChemRisk Repository No. 2524)*
CF 72-01-051	G.J. Dixon	Radioactive Waste Disposal Operations Report for the Month of November 1971 *(ChemRisk Repository No. 2056)*
CF 73-01-025	G.J. Dixon L.C. Lasher	Radioactive Waste Disposal Operations Report for the Month of November 1972 *(ChemRisk Repository No. 2056)*
CF 74-01-009	G.J. Dixon L.C. Lasher	Radioactive Waste Disposal Operations and Effluent Monitoring Report for the Month of October 1973 *(ChemRisk Repository No. 2195)*

CF 75-01-028	G.J. Dixon L.C. Lasher	Radioactive Waste Disposal Operations and Effluent Monitoring Report for the Month of November 1974 *(ChemRisk Repository No. 2511)*
CF 76/295	E. Beauchamp L.C. Lasher	Radioactive Waste Disposal Operations and Effluent Monitoring Report for the Month of June 1976 *(ChemRisk Repository No. 2511)*
CF 76/338	E. Beauchamp L.C. Lasher	Radioactive Waste Disposal Operations and Effluent Monitoring Report for the Month of July 1976 *(ChemRisk Repository No. 2511)*
CF 76/363	E. Beauchamp L.C. Lasher	Radioactive Waste Disposal Operations and Effluent Monitoring Report for the Month of August 1976 *(ChemRisk Repository No. 2511)*
CF 76/419	E. Beauchamp L.C. Lasher	Radioactive Waste Disposal Operations and Effluent Monitoring Report for the Month of September 1976 *(ChemRisk Repository No. 2511)*
CF 77/65	E. Beauchamp L.C. Lasher	Radioactive Waste Disposal Operations and Effluent Monitoring Report for the Month of December 1976 *(ChemRisk Repository No. 2511)*
CF 85/85	L.C. Lasher	Radioactive Liquid and Gaseous Waste Disposal Operations and Effluent Monitoring Report for the Month of November 1984 *(ChemRisk Repository No. 2511)*
CF 85/86	L.C. Lasher	Radioactive Liquid and Gaseous Waste Disposal Operations and Effluent Monitoring Report for the Month of December 1984 *(ChemRisk Repository No. 2511)*
CF 85/328	L.C. Lasher	Radioactive Liquid and Gaseous Waste Disposal Operations and Effluent Monitoring Report for the Month of January 1985 *(ChemRisk Repository No. 2511)*
CF 85/433	C.B. Scott	Radioactive Liquid and Gaseous Waste Disposal Operations and Effluent Monitoring Report for the Month of May 1985 *(ChemRisk Repository No. 2511)*
CF 85/434	C.B. Scott	Radioactive Liquid and Gaseous Waste Disposal Operations and Effluent Monitoring Report for the Month of June 1985 *(ChemRisk Repository No. 2511)*

Waste Treatment Progress Reports (1961-65)

CF 61-7-3	Blanco Struxness	Waste Treatment and Disposal Report for April and May 1961 *(ChemRisk Repository No. 1987)*
ORNL-TM-0015	Blanco Struxness	Waste Treatment and Disposal Progress Report for June and July 1961 *(ChemRisk Repository No. 359)*
ORNL-TM-0049	Blanco Struxness	Waste Treatment and Disposal Progress Report for August and September 1961 *(ChemRisk Repository No. 2005)*

ORNL-TM-169	Blanco Struxness	Waste Treatment and Disposal Progress Report for August and September 1961 *(ChemRisk Repository No. 2005)*
ORNL-TM-0252	Blanco Struxness	Waste Treatment and Disposal Progress Report for February and March 1962 *(Have copy)*
ORNL-TM-376	Blanco Struxness	Waste Treatment and Disposal Progress Report for April and May 1962 *(ChemRisk Repository No. 2005)*
ORNL-TM-396	Blanco Struxness	Waste Treatment and Disposal Progress Report for June and July 1962 *(ChemRisk Repository No. 1815)*
ORNL-TM-482	Blanco Struxness	Waste Treatment and Disposal Progress Report for August – October 1962 *(ChemRisk Repository No. 3002)*
ORNL-TM-516	Blanco Struxness	Waste Treatment and Disposal Progress Report for November and December 1962, and January 1963 *(ChemRisk Repository No. 1816)*
ORNL-TM-603	Blanco Struxness	Waste Treatment and Disposal Progress Report for February – April 1963 *(ChemRisk Repository No. 1817)*
ORNL-TM-757	Blanco Struxness	Waste Treatment and Disposal Progress Report for May – October 1963 *(ChemRisk Repository No. 1817)*
ORNL-TM-830	Blanco Struxness	Waste Treatment and Disposal Progress Report for November – January 1964 *(ChemRisk Repository No. 2005)*
ORNL-TM-1081	Blanco Struxness	Waste Treatment and Disposal Progress Report for July – December 1964 *(ChemRisk Repository No. 2005)*
ORNL-TM-1465	Blanco Parker	Waste Treatment and Disposal Semiannual Progress Report July -December 1965 *(ChemRisk Repository No. 2691)*
ORNL-TM-1887	Blanco Struxness	Waste Treatment and Disposal Progress Report for July – December 1966 *(ChemRisk Repository No. 1956)*

Special Studies

CF 47-11-554	T.H.J. Burnett	Preliminary Report – Efficiency of white Oak Creek *(ChemRisk Repository No. 1844)*
FF-47-12-116	T.H.J. Burnett	Measurement Methods for White Oak Dam Discharge (calibration and interpretation) *(ChemRisk Repository No. 1280)*
CF 48-01-175	T.H.J. Burnett	Water Activity Computations (calculations and variables) *(ChemRisk Repository No. 1283)*
CF 48-02-356	W.D. Cottrell	Beta Activity and Settling Basin Effluent and White Oak Dam Discharge for Period October 1947 – December 1947 *(ChemRisk Repository No. 1399)*

CF 48-12-293	L.R. Setter	Preliminary Report on Discharges of Radioactivity into White Oak Creek and the Clinch River – 1/1 to 11/27/48 *(ChemRisk Repository No. 1395)*
CF 49-07-222	R.G. Lawler	Studies on Overflow at White Oak Dam *(ChemRisk Repository No. 1392)*
CF 50-03-044	W.D. Cottrell	Monitoring of White Oak Discharge Water during Flood of January 30-31, 1950 *(ChemRisk Repository No. 1401)*
CF 50-03-101	T.H.J. Burnett	Fission Products Dispersal – Estimated Hydrological Hazards *(ChemRisk Repository No. 1842)*
CF 1889	H.M. Parker	Review of Water Monitoring Procedures at Clinton Laboratories, July 1944 *(ChemRisk Repository No. 335)*
CN-2047	J.T. Weills J.A. Lane	Distribution of Fission Activity in Metal Waste Solutions *(ChemRisk Repository No. 1396)*

APPENDIX 5B

DETAILS OF THE METHODS AND RESULTS OF THE INDEPENDENT RECONSTRUCTION OF WHITE OAK CREEK RELEASES FOR 1954

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Appendix 5B: Details of the Methods and Results of the Independent Reconstruction of White Oak Creek Releases for 1954

This appendix describes the process that was used to independently calculate the quantity of gross beta radioactivity released from White Oak Creek during 1954 using gross beta concentration measurements and USGS measurements of flow rates at White Oak Dam. Weekly reports that documented average gross beta measurements in terms of mrep per hour were available from 1953 - 1956. The weekly averages of mrep per hour measurements were converted to average concentrations with units of µCi per liter (µCi L^{-1}) using a conversion algorithm presented in K. Z. Morgan's 1945 document detailing radioactive waste management. Calculated concentrations were then multiplied times the average United States Geological Survey (USGS) flow rate calculated for White Oak Dam to estimate a weekly release rate (Ci wk^{-1}). These independently calculated releases were then compared to the weekly curie release rates reported by X-10 for the same period.

Table 5B.1 presents the weekly release rates calculated for 1954; this year was selected for the independent reconstruction and comparison as the gross beta measurements and the White Oak Creek flow rates were determined to the most complete. The concentration and flow rate data sets for 1954 are unique in that they cover the entire calendar year, enabling the project team to conduct the independent calculations.

The results of the comparison between the independently calculated weekly releases versus the reported releases for 1954 exhibit some variability, which may be attributable in part to the specific definition of when weeks ended. However, the independently calculated total is in good agreement with that reported by X-10, in fact the independently calculated gross beta total for 1954 is within 1.4 Ci of the reported total for that year (Table 5B.1). Unfortunately, incomplete data were available for 1953, 1955, and 1956. The process described in this appendix for 1954 was also applied to portions of these years, but comparison to reported annual release totals were not as meaningful.

Table 5B.1: Independent Calculations using USGS Flow Rates and Gross Beta Measurements - Comparison with Reported Values for 1954

			Release Rate Calculated from Gross Beta Measurements and WOC Flow Rates						Reported Releases*	Comparison of Methods	
1954	week	date	Average mrep/h	Average µCi/L	Average L/wk	Average µCi/d	Average Ci/d	Ci/wk	(Ci/wk)	Reported-Calculated Release Rates (Ci/week)	Ratio of Release Rates Reported/Calculated
January	1	1/2/54	0.019	2.46E-02	1.00E+07	2.47E+05	0.25	1.73	4.82	3.09	2.79
	2	1/9/54	0.011	1.42E-02	8.81E+06	1.25E+05	0.13	0.88	4.67	3.79	5.32
	3	1/16/54	0.02	2.59E-02	1.57E+08	4.06E+06	4.06	28.40	27.53	-0.87	0.97
	4	1/23/54	0.01	1.29E-02	2.36E+08	3.06E+06	3.06	21.40	18.65	-2.75	0.87
	5	1/30/54	0.011	1.42E-02	5.38E+07	7.66E+05	0.77	5.36	7.9	2.54	1.47
February	6	2/6/54	0.016	2.07E-02	1.74E+07	3.59E+05	0.36	2.52	6.05	3.53	2.40
	7	2/13/54	0.013	1.68E-02	1.05E+07	1.77E+05	0.18	1.24	9.75	8.51	7.87
	8	2/20/54	0.02	2.59E-02	1.98E+07	5.13E+05	0.51	3.59	3.49	-0.10	0.97
	9	2/27/54	0.026	3.36E-02	1.74E+07	5.84E+05	0.58	4.09	7.32	3.23	1.79
March	10	3/6/54	0.02	2.59E-02	8.49E+07	2.20E+06	2.22	15.37	4.99	-10.38	0.32
	11	3/13/54	0.021	2.72E-02	2.37E+07	6.45E+05	0.64	4.51	11.57	7.06	2.56
	12	3/20/54	0.013	1.68E-02	1.93E+07	3.25E+05	0.33	2.28	2.24	-0.04	0.98
	13	3/27/54	0.045	5.82E-02	7.46E+07	4.34E+06	4.34	30.40	31.01	0.61	1.02
April	14	4/3/54	0.09	1.16E-01	5.99E+07	6.98E+06	6.98	48.85	21.49	-27.36	0.44
	15	4/10/54	0.075	9.70E-02	2.81E+07	2.73E+06	2.73	19.11	9.34	-9.77	0.49
	16	4/17/54	0.017	2.20E-02	1.81E+07	3.98E+05	0.40	2.79	2.92	0.13	1.05
	17	4/24/54	0.017	2.20E-02	1.66E+07	3.66E+05	0.37	2.56	2.63	0.07	1.03
	18	5/1/54	0.038	4.91E-02	1.44E+07	7.10E+05	0.71	4.97	3.81	-1.16	0.77
May	19	5/8/54	0.07	9.05E-02	2.94E+07	2.66E+06	2.66	18.61	7.85	-10.76	0.42
	20	5/15/54	NA								
	21	5/22/54	0.076	9.83E-02	1.35E+07	1.32E+06	1.32	9.26	14.18	4.92	1.53
	22	5/29/54	0.07	9.05E-02	1.05E+07	9.53E+05	0.95	6.67	11.51	4.84	1.73
June	23	6/5/54	0.049	6.34E-02	1.71E+07	1.09E+06	1.09	7.60	7.9	0.30	1.04
	24	6/12/54	0.043	5.56E-02	9.05E+06	5.03E+05	0.50	3.52	4.25	0.73	1.21
	25	6/19/54	0.033	4.27E-02	8.81E+06	3.76E+05	0.38	2.63	3.18	0.55	1.21
	26	6/26/54	0.043	5.56E-02	7.83E+06	4.35E+05	0.44	3.05	3.45	0.40	1.13
July	27	7/3/54	NA								
	28	7/10/54	0.063	8.15E-02	9.05E+06	7.38E+05	0.74	5.16	5.84	0.68	1.13
	29	7/17/54	0.055	7.11E-02	9.54E+06	6.79E+05	0.68	4.75	5.97	1.22	1.26
	30	7/24/54	0.057	7.37E-02	1.25E+07	9.20E+05	0.92	6.44	7.86	1.42	1.22
	31	7/31/54	0.046	5.95E-02	8.81E+06	5.24E+05	0.52	3.67	4.87	1.20	1.33
August	32	8/7/54	0.043	5.56E-02	8.81E+06	4.90E+05	0.49	3.43	4.35	0.92	1.27
	33	8/14/54	0.037	4.79E-02	1.20E+07	5.74E+05	0.57	4.02	5.02	1.00	1.25
	34	8/21/54	0.038	4.91E-02	1.03E+07	5.05E+05	0.51	3.54	4.25	0.71	1.20
	35	8/28/54	0.028	3.62E-02	1.22E+07	4.43E+05	0.44	3.10	4.08	0.98	1.32
September[1]	36	9/4/54	0.028	3.62E-02	1.05E+07	3.81E+05	0.38	2.67	3.42	0.75	1.28
	37	9/11/54	0.029	3.75E-02	1.20E+07	4.50E+05	0.45	3.15	3.83	0.68	1.22
	38	9/18/54	0.029	3.75E-02	1.08E+07	4.04E+05	0.40	2.83	4.25	1.42	1.50
	39	9/25/54	0.028	3.62E-02	9.54E+06	3.46E+05	0.35	2.42	3.11	0.69	1.29
October	40	10/2/54	0.03	3.88E-02	1.42E+07	5.51E+05	0.55	3.85	4.33	0.48	1.12
	41	10/9/54	0.024	3.10E-02	1.00E+07	3.11E+05	0.31	2.18	2.79	0.61	1.28
	42	10/16/54	0.023	2.97E-02	9.54E+06	2.84E+05	0.28	1.99	2.47	0.48	1.24
	43	10/23/54	0.021	2.72E-02	8.56E+06	2.33E+05	0.23	1.63	1.79	0.16	1.10
	44	11/1/54	0.024	3.10E-02	8.81E+06	2.73E+05	0.27	1.91	2.35	0.44	1.23
November	45	11/6/54	0.024	3.10E-02	9.30E+06	2.89E+05	0.29	2.02	2.47	0.45	1.22
	46	11/13/54	0.023	2.97E-02	8.56E+06	2.55E+05	0.25	1.78	2.38	0.60	1.33
	47	11/20/54	0.025	3.23E-01	8.56E+06	2.77E+05	0.28	1.94	2.51	0.57	1.29
	48	11/27/54	0.026	3.36E-02	7.10E+06	2.39E+05	0.24	1.67	2.49	0.82	1.49
December	49	12/4/54	0.027	3.49E-02	1.15E+07	4.02E+05	0.40	2.81	3.02	0.21	1.07
	50	12/11/54	0.051	6.60E-02	2.99E+07	1.97E+06	1.97	13.78	14.73	0.95	1.07
	51	12/18/54	0.121	1.56E-01	2.57E+07	4.02E+06	4.02	28.14	29.29	1.15	1.04
	52	12/25/54	0.06	7.76E-02	2.18E+07	1.69E+06	1.69	11.83	13.45	1.62	1.14

	Calculated using Gross Beta and USGS Flow Rates	Reported Release Rates	Difference Reported-Calculated
TOTAL CURIES RELEASED	372	373.42	1.32
AVERAGE CURIES RELEASED PER WEEK	7.4	7.47	0.03

* Information compiled from 1955 Area Monitoring Reports.

[1] USGS flow rates not avail.for this period. Scaled flow rates from East Fork Poplar Creek were used.

NA = Not Available

APPENDIX 5C

MEASURED GAMMA DOSE RATES FROM WHITE OAK CREEK SAMPLES FROM 1945

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Appendix 5C: Measured Gamma Dose Rates from White Oak Creek Samples from 1945

As described in Section 5.3.1, gross beta analyses were available for few periods during the 1944 to 1948 time period. In a 1962 effort to retrospectively estimate annual gross beta releases for 1944 through 1948, X-10 personnel compensated for the lack of gross beta analyses by making use of the relationship between gamma radiation and gross beta radioactivity from available measurements. The 1962 document by Frank Parker describes that relationship and the data that were used to estimate annual gross beta releases for each year from 1944 through 1948.

In order to verify the method and calculations used in Parker's 1962 document, gamma radiation measurements were collected from various X-10 reports. A complete set of measurements was available for 1945. These data are presented in this appendix, and were used by the project team to verify the annual average gamma radiation value used by X-10 personnel for 1945. Gamma dose rate measurements were also located for about half of the year for 1944, 1946, and 1947.

Table 5C.1 presents the biweekly gamma radiation measurements taken by X-10 personnel in 1945. As described in Section 5.3.1, early gamma radiation measurements were taken in two separate, water filled containers ("small" and "large"). The biweekly gamma radiation measurements were averaged on a weekly basis, and then averaged again for the year. The annual average gamma radiation calculated for 1945 by the Task 4 project team exactly matched the value used in Parker's analysis (Table 5.1).

Table 5C.1: Gamma Dose Rates Measured from White Oak Creek Samples in 1945, with Checks of X-10 Averaging

Date	Small Container mr/hr	Large Container mr/hr	Avg. mr/hr
1/3/45	0.160	0.035	
1/5/45	0.035	0.008	
Averages	0.098	0.022	**0.060**
1/8/45	0.079	0.093	
1/9/45	0.117	0.163	
	0.098	0.128	**0.113**
1/15/45	0.023	0.032	
1/17/45	0.031	0.039	
1/19/45	0.025	0.014	
Averages	0.026	0.028	**0.027**
1/22/45	0.023	0.020	
1/24/45	0.062	0.023	
1/26/45	0.027	0.041	
Averages	0.037	0.028	**0.033**
1/29/45	0.056	0.023	**0.040**
2/13/45	0.001	0.018	
2/15/45	0.000	0.048	
2/17/45	0.074	0.000	
Averages	0.025	0.022	**0.024**
2/20/45	0.012	0.038	
2/22/45	0.000	0.000	
2/23/45	0.036	0.023	
Averages	0.016	0.020	**0.018**
2/27/45	0.000	0.000	
3/1/45	0.001	0.000	
3/3/45	**0.000**	0.038	
Averages	0.000	0.013	**0.007**
3/6/45	0.000	0.003	
3/8/45	0.000	0.013	
3/10/45	0.000	0.000	
Averages	0.000	0.005	**0.003**
3/13/45	0.026	0.000	
3/15/45	0.000	0.002	
3/17/45	0.000	0.000	
Averages	0.009	0.001	**0.005**
3/20/45	0.087	0.014	
3/22/45	0.004	0.000	
3/24/45	0.000	0.000	
Averages	0.030	0.005	**0.018**

Date	Small Container mr/hr	Large Container mr/hr	Avg. mr/hr
3/27/45	0.000	0.000	
3/29/45	0.010	0.000	
3/31/45	0.000	0.000	
Averages	0.003	0.000	**0.002**
4/3/45	0.003	0.002	
4/5/45	0.007	0.056	
4/7/45	0.005	0.011	
Averages	0.005	0.023	**0.014**
4/10/45	0.008	0.003	
4/12/45	0.005	0.000	
4/14/45	0.016	0.012	
Averages	0.010	0.005	**0.007**
4/16/45	0.016	0.012	
4/17/45	0.009	0.002	
4/19/45	0.004	0.001	
4/21/45	0.005	0.009	
Averages	0.009	0.006	**0.007**
4/24/45	0.019	0.017	
4/26/45	0.039	0.022	
4/28/45	0.024	0.020	
Averages	0.027	0.020	**0.024**
5/1/45	0.021	0.000	
5/3/45	0.019	0.000	
5/5/45	0.020	0.024	
Averages	0.020	0.008	**0.014**
5/8/45	0.005	0.006	
5/10/45	0.011	0.005	
5/12/45	0.000	0.000	
Averages	0.005	0.003	**0.004**
5/15/45	0.002	0.003	
5/17/45	0.000	0.000	
Averages	0.001	0.002	**0.001**
5/25/45	0.080	0.007	
5/26/45	0.000	0.002	
Averages	0.040	0.004	**0.022**
5/29/45	0.000	0.000	
5/31/45	0.006	0.006	
6/2/45	0.054	**0.017**	
Averages	0.020	0.008	**0.014**

Table 5C.1: Gamma Dose Rates Measured from White Oak Creek Samples in 1945, with Checks of X-10 Averaging

Date	mr/hr	mr/hr	Avg. Mr/hr	Date	mr/hr	mr/hr	Avg. Mr/hr
6/5/45	0.051	0.049		8/14/45	0.033	0.048	
6/7/45	0.035	0.033		8/16/45	**0.058**	0.059	
6/9/45	0.066	0.087		8/18/45	0.028	0.043	
Averages	0.051	0.056	**0.054**	Averages	0.040	0.050	**0.045**
6/12/45	0.019	0.027		8/21/45	0.027	0.032	
6/14/45	0.024	0.030		8/23/45	0.017	0.016	
6/16/45	0.038	0.045		8/25/45	0.000	0.011	
Averages	0.027	0.034	**0.031**	Averages	0.015	0.020	**0.017**
6/20/45	0.002	0.025		8/28/45	0.023	0.017	
6/21/45	0.035	0.031		8/30/45	0.057	0.061	
6/23/45	0.055	0.071		9/1/45	0.000	0.007	
Averages	0.031	0.042	**0.037**	Averages	0.027	0.028	**0.028**
6/26/45	0.035	0.058		9/5/45	0.042	0.057	
6/28/45	0.040	0.052		9/7/45	0.042	0.060	
6/30/45	0.039	0.049		Averages	0.042	0.059	**0.050**
Averages	0.038	0.053	**0.046**				
				9/10/45	0.044	0.053	
7/3/45	0.038	0.038		9/12/45	0.041	0.045	
7/5/45	0.036	0.040		9/14/45	0.052	0.053	
7/7/45	0.026	0.030		Averages	0.046	0.050	**0.048**
Averages	0.033	0.036	**0.035**				
				9/17/45	0.028	0.033	
7/10/45	0.023	0.025		9/19/45	0.023	0.000	
7/12/45	0.026	0.024		9/22/45	0.044	0.056	
7/14/45	0.017	0.015		Averages	0.032	0.030	**0.031**
Averages	0.022	0.021	**0.022**				
				9/25/45	0.096	0.154	
7/17/45	0.007	0.007		9/27/45	0.055	0.093	
7/19/45	0.005	0.006		9/29/45	0.056	0.069	
7/21/45	0.015	0.014		Averages	0.069	0.105	**0.087**
Averages	0.009	0.009	**0.009**				
				10/2/45	0.051	0.095	
7/24/45	0.005	0.001		10/4/45	0.152	0.036	
7/26/45	0.000	0.000		10/6/45	0.037	0.036	
7/28/45	0.005	0.008		Averages	0.080	0.056	**0.068**
Averages	0.003	0.003	**0.003**				
7/31/45	0.012	0.024		10/9/45	0.027	0.038	
8/2/45	0.029	0.034		10/11/45	0.019	0.025	
8/4/45	0.028	0.061		10/15/45	0.013	0.010	
Averages	0.023	0.040	**0.031**	Averages	0.020	0.024	**0.022**
8/7/45	0.050	0.057		10/17/45	0.009	0.012	
8/9/45	0.028	0.046		10/19/45	0.012	0.012	
8/11/45	0.023	0.046		10/22/45	0.005	0.007	
Averages	0.034	0.050	**0.042**	Averages	0.009	0.010	**0.010**

Table 5C.1: Gamma Dose Rates Measured from White Oak Creek Samples in 1945, with Checks of X-10 Averaging

Date	mr/hr	mr/hr	Avg. Mr/hr	Date	mr/hr	mr/hr	Avg. Mr/hr
10/17/45	0.009	0.012		11/19/45	0.001	0.006	
10/19/45	0.012	0.012		11/21/45	0.003	0.002	
10/22/45	0.005	0.007		Averages	0.002	0.004	**0.003**
Averages	0.009	0.010	**0.010**				
				11/27/45	0.000	0.000	
11/2/45	0.000	0.002		11/29/45	0.007	0.007	
11/6/45	0.005	0.006		Averages	0.004	0.004	**0.004**
11/8/45	0.000	0.005					
Averages	0.002	0.004	**0.003**	12/3/45	0.002	0.000	
				12/5/45	0.001	0.003	
11/12/45	0.003	0.003		Averages	0.002	0.002	**0.002**
11/14/45	0.005	0.003					
Averages	0.004	0.003	**0.004**	12/11/45	0.066	**0.166**	
				12/13/45	0.096	**0.154**	
				Averages	0.081	0.160	**0.121**
				12/17/45	0.048	0.082	
				12/18/45	0.001	0.004	
				12/20/45	0.026	0.048	
				12/26/45	0.005	0.005	
				12/28/45	0.006	0.006	
				Averages	0.017	0.029	**0.023**

	1945
Annual Averag	**0.027**

APPENDIX 5D

DETAILS REGARDING THE METHODS AND DATA USED TO APPORTION GROSS BETA RELEASES TO SPECIFIC RADIONUCLIDES

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Appendix 5D: Details Regarding the Methods and Data Used to Apportion Gross Beta Releases to Specific Radionuclides

This appendix presents the information used and evaluations performed to verify X-10's reported apportioning of gross beta releases to specific radionuclides and the methodology used to apportion the estimated annual gross beta releases for 1944 through 1948. Since gross beta measurements were not available between 1944 - 1948 and radioisotopic distributions were sparse during this early history of X-10, a direct method to distribute the annual gross beta releases from this period was not available. Starting in 1949, X-10 reported annual release estimates by radionuclide. In order to distribute the radioactivity released from White Oak Creek to individual radioisotopes, the reported gross beta curies released from White Oak Creek were used with the results of monthly radioisotopic analyses. The monthly samples for isotopic analysis, made of daily aliquots from White Oak Dam overflow, were chemically separated by X-10's radiochemistry division, then counted to quantify the contributions of specific radionuclides. The radionuclide-specific contributions were reported as percentages of released activity on a monthly basis, so that gross beta releases could be distributed among the isotopes on an annual basis.

Similar to the independent calculations to verify the reported annual gross beta releases from White Oak Creek, the evaluation performed to validate the reported isotopic percentages is limited by the available data. In order to validate the reported annual isotopic releases, the monthly reported isotopic percentages (sporadically available throughout the 1950s and 1960s) were combined with the monthly gross beta totals to calculate monthly isotopic releases that were summed annually. Unfortunately, the types of data required to conduct such an analysis were not located by the project team for an entire calendar year. As previously mentioned, weekly gross beta releases were intermittently available between 1953 - 1956, and sporadic monthly isotopic distributions were available during the same time period; however the two only co-existed for several months in 1953 and 1954.

Using the available data to reconstruct historical practices, the project team used the weekly reported gross beta totals to calculate monthly totals, then multiplied these totals by the respective isotopic percentages reported in the available monthly analyses. These monthly isotopic release estimates were then summed for the several months of data available for 1953 and 1954, and compared to the annual isotopic release totals. Since the project team did not have an entire calendar year to validate X-10's reported values, the team calculated the isotope-specific contribution for each period of data availability, in terms of fractions or percentages, and compared these values to the annual isotopic percentages. In other words, the relative contribution per isotope per time period was calculated and compared to reported annual compositions. Table 5D.1 presents the findings of this investigation.

Table 5D.1 presents the monthly reported isotopic fraction and the estimated isotopic release for the same period. These monthly isotopic release totals were then totaled for the time period (several months) and then converted back to fractional composition values. The isotopic contributions as a function of time were then compared to the annual isotopic fractions for validation purposes. In most cases, the estimated isotopic fractions mirrored the annual isotopic fractions; however, the comparisons were made using different lengths of time, and therefore serve as qualitative analyses.

Isotopic Distribution of Annual Gross Beta Releases from 1944 - 1948

Since gross beta radioactivity releases over White Oak Dam from 1944 through 1948 were not quantified until 1962, it was not possible to distribute this radioactivity among individual isotopes. The project team did recover sporadic radioactive isotopic distributions from this early period; however, these early reports were incomplete and did not represent a continuous data set. In order to compensate for the paucity of isotopic data, while attempting to incorporate the available isotopic percentages to the fullest extent possible, the project team developed distributions to reflect the uncertainty of the percent contributions of specific radionuclides.

Radionuclide- specific distributions were developed to give equal weight to each available isotopic measurement reported. Since isotopic distributions from the 1940s were incomplete, the project team combined the annual isotopic percentages from 1949 - 1952 with the available 1944 - 1948 isotopic percentages to develop a uniform distribution for each radionuclide of interest. The uniform distribution for each radionuclide ranged from the lowest to the highest percentage contribution documented within the available data set. The incorporation of annual isotopic percentages from 1949 - 1952 expanded the data base of possible isotopic percentages for defining the distributions.

Table 5D.1: Monthly Calculation of Radioisotopic Curies Released based on Reported Isotopic Fractions

1953	January		April		May		June		July		August		Sept		October		November		December	
	Reported Fraction	Estimated Ci	Reported Fraction	Estimated Ci	Reported Fraction	Estimated Ci	Reported Fraction	Estimated Ci	Reported Fraction	Estimated Ci	Reported Fraction	Estimated Ci	Reported Fraction	Estimated Ci	Reported Fraction	Estimated Ci	Reported Fraction	Estimated Ci	Reported Fraction	Estimated Ci
CS	0.065	4.542	0.023	0.338	0.021	0.374	0.035	0.250	0.019	0.154	0.000	0.000	0.029	0.165	0.020	0.105	0.026	0.158	0.024	1.006
TRE	0.000	0.000	0.373	5.436	0.428	7.795	0.466	3.332	0.434	3.507	0.407	1.537	0.498	2.794	0.385	2.017	0.471	2.854	0.457	19.148
RU	0.109	7.570	0.199	2.901	0.000	0.000	0.006	0.043	0.012	0.097	0.016	0.061	0.012	0.066	0.089	0.466	0.003	0.018	0.002	0.084
SR	0.326	22.709	0.376	5.492	0.503	9.167	0.404	2.889	0.428	3.458	0.431	1.629	0.425	2.387	0.433	2.269	0.442	2.679	0.479	20.070
CE	0.109	7.570	NA	0.000	NA	0.000	0.035	0.250	0.050	0.404	0.073	0.277	0.016	0.088	0.000	0.000	0.000	0.000	0.000	0.000
NB	0.087	6.056	0.004	0.056	0.034	0.624	0.021	0.150	0.019	0.154	0.016	0.061	0.010	0.055	0.028	0.147	0.005	0.030	0.001	0.042
ZR	0.130	9.083	0.014	0.197	0.014	0.249	0.006	0.043	0.019	0.154	0.024	0.092	0.000	0.000	0.010	0.052	0.029	0.176	0.011	0.461
I	0.000	0.000	0.012	0.169	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.031	0.010	0.055	0.028	0.147	0.000	0.000	0.008	0.335
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.026	0.186	0.019	0.154	0.024	0.092	0.000	0.000	0.006	0.031	0.024	0.145	0.017	0.712
Totals	69.64	57.53	14.59	14.59	18.21	18.21	7.15	7.14	8.08	8.08	3.78	3.78	5.61	5.61	5.24	5.23	6.06	6.06	41.90	41.86

1954	January		April		May		June		July		August		Sept		October	
	Reported Fraction	Estimated Ci	Reported Fraction	Estimated Ci	Reported Fraction	Estimated Ci	Reported Fraction	Estimated Ci	Reported Fraction	Estimated Ci	Reported Fraction	Estimated Ci	Reported Fraction	Estimated Ci	Reported Fraction	Estimated Ci
BA	0.009	0.572	0.011	0.400	0.016	0.598	0.000	0.000	0.002	0.049	0.003	0.053	0.012	0.175	0.000	0.002
CB	0.009	0.572	0.127	4.620	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.177	0.000	0.000	0.000	0.000
CE	0.044	2.797	0.035	1.273	0.023	0.859	0.086	1.615	0.027	0.663	0.039	0.690	0.045	0.657	0.123	1.400
CO	NA		NA		NA		NA		NA		NA		NA		NA	
CS	0.079	5.022	0.000	0.000	0.110	4.109	0.080	1.502	0.199	4.883	0.330	5.841	0.362	5.289	0.373	4.245
I	0.007	0.445	0.000	0.000	0.019	0.710	0.019	0.357	0.014	0.344	0.002	0.035	0.000	0.000	0.004	0.046
RU	0.033	2.098	0.011	0.400	0.008	0.299	0.003	0.056	0.009	0.221	0.010	0.177	0.009	0.131	0.011	0.125
SR	0.355	22.567	0.312	11.351	0.343	12.811	0.311	5.841	0.275	6.749	0.223	3.947	0.245	3.579	0.124	1.411
TRE	0.455	28.924	0.477	17.353	0.218	8.142	0.498	9.352	0.374	9.178	0.364	6.443	0.319	4.661	0.365	4.154
ZR	0.009	0.572	0.110	4.002	0.126	4.706	0.000	0.000	0.007	0.172	0.019	0.336	0.009	0.131	0.000	0.000
Totals	63.57	63.57	36.38	39.40	37.35	32.23	18.78	18.72	24.54	22.26	17.70	17.70	14.61	14.62	11.38	11.38

NA = No analysis was reported for this isotope

Comparison of Estimated with Reported for 1953

	Estimated		Reported	
	Total Ci	Fraction	Total Ci	Fraction
CS	7.09	0.042	6.57	0.022
TRE	48.42	0.288	113.23	0.371
RU	11.31	0.067	26.59	0.087
SR	72.75	0.433	133.57	0.437
CE	8.59	0.051	6.88	0.023
NB	7.37	0.044	3.75	0.012
ZR	10.51	0.063	7.82	0.026
I	0.74	0.004	2.19	0.007
Ba	1.32	0.008	4.90	0.016
Overall Total	168.09		305.50	

Comparison of Estimated with Reported for 1954 (partial year of data)

	Estimated		Reported	
	Total Ci	Fraction	Total Ci	Fraction
BA	1.85	0.008	3.10	0.007
CB	5.37	0.024	9.48	0.023
CE	9.95	0.045	24.90	0.060
CO	NA	NA	17.30	0.042
CS	30.89	0.140	22.53	0.054
I	1.94	0.009	3.60	0.009
RU	3.51	0.016	11.46	0.028
SR	68.26	0.310	144.25	0.347
TRE	88.21	0.401	164.40	0.396
ZR	9.92	0.045	14.23	0.034
Overall Total	219.89		415.24	

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APPENDIX 6A

SUMMARY OF PREDICTED ANNUAL AVERAGE CONCENTRATIONS OF RADIONUCLIDES IN CLINCH RIVER WATER AND SHORELINE SEDIMENTS OBTAINED WITH THE HEC-6-R MODEL

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Appendix 6A: Summary of Predicted Annual Average Concentrations of Radionuclides in Clinch River Water and Shoreline Sediments Obtained with the HEC-6-R Model

The following tables contain the annual average concentrations of radionuclides in Clinch River water (Tables 6A.1 through 6A.5) and shoreline sediments (Tables 6A.6 through 6A.12) that were predicted by the HEC-6-R model (Sections 6.4-6.11). These are not the final concentrations, with uncertainties, that were used as the starting point of the assessment (see Sections 6.3, 6.12-6.13, and Appendices 6-B and 6-C). The tables contain the lower bound, best estimate, and upper bound produced by the HEC-6-R model (2.5th, 50th, and 97.5th percentiles, respectively) for CRM 20.5, CRM 14, CRM 3.5, and CRM 0. The confidence intervals represent only the uncertainty about the annual release estimate (source term; all radionuclides) and the K_d values (^{131}I, ^{144}Ce, ^{95}Nb, and ^{95}Zr).

Table 6A.1 Predicted annual average concentrations of ^{137}Cs in water (Bq L^{-1}) obtained from the HEC-6-R model*.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	2.20E-01	1.05E+00	2.53E+00	2.06E-01	9.81E-01	2.37E+00	1.38E-01	6.57E-01	1.59E+00	1.35E-01	6.41E-01	1.55E+00
1945	2.09E-01	9.26E-01	2.30E+00	1.96E-01	8.70E-01	2.16E+00	1.17E-01	5.18E-01	1.28E+00	1.14E-01	5.05E-01	1.25E+00
1946	3.90E-01	1.57E+00	3.96E+00	3.62E-01	1.46E+00	3.68E+00	2.41E-01	9.75E-01	2.46E+00	2.34E-01	9.48E-01	2.39E+00
1947	7.77E-02	4.02E-01	1.02E+00	8.30E-02	4.17E-01	1.06E+00	6.30E-02	3.10E-01	7.84E-01	6.13E-02	3.01E-01	7.62E-01
1948	2.07E-01	8.26E-01	1.57E+00	1.96E-01	7.85E-01	1.50E+00	1.18E-01	4.73E-01	9.19E-01	1.17E-01	4.73E-01	9.24E-01
1949	4.18E-01	5.86E-01	8.07E-01	3.96E-01	5.67E-01	7.94E-01	2.52E-01	3.78E-01	5.49E-01	2.45E-01	3.70E-01	5.38E-01
1950	8.68E-02	1.22E-01	1.69E-01	9.48E-02	1.53E-01	2.39E-01	6.72E-02	1.11E-01	1.76E-01	6.75E-02	1.11E-01	1.77E-01
1951	9.44E-02	1.33E-01	1.84E-01	9.07E-02	1.28E-01	1.78E-01	6.15E-02	8.92E-02	1.27E-01	6.08E-02	8.84E-02	1.26E-01
1952	6.09E-02	8.60E-02	1.19E-01	5.62E-02	7.94E-02	1.10E-01	3.86E-02	5.46E-02	7.58E-02	3.74E-02	5.29E-02	7.34E-02
1953	4.35E-02	5.83E-02	7.84E-02	3.96E-02	5.32E-02	7.16E-02	2.51E-02	3.38E-02	4.55E-02	2.42E-02	3.25E-02	4.38E-02
1954	2.16E-01	2.86E-01	3.80E-01	1.89E-01	2.49E-01	3.31E-01	9.92E-02	1.31E-01	1.75E-01	9.72E-02	1.29E-01	1.71E-01
1955	4.06E-01	5.45E-01	7.19E-01	3.76E-01	5.04E-01	6.66E-01	2.35E-01	3.16E-01	4.18E-01	2.30E-01	3.10E-01	4.09E-01
1956	1.12E+00	1.51E+00	2.02E+00	1.04E+00	1.40E+00	1.88E+00	6.18E-01	8.30E-01	1.11E+00	6.05E-01	8.13E-01	1.09E+00
1957	4.90E-01	6.56E-01	8.70E-01	5.10E-01	6.83E-01	9.07E-01	3.43E-01	4.60E-01	6.10E-01	3.37E-01	4.51E-01	5.99E-01
1958	3.30E-01	4.42E-01	5.86E-01	2.92E-01	3.91E-01	5.19E-01	1.92E-01	2.57E-01	3.41E-01	1.86E-01	2.50E-01	3.31E-01
1959	7.44E-01	9.85E-01	1.28E+00	6.65E-01	8.80E-01	1.15E+00	3.61E-01	4.78E-01	6.23E-01	3.54E-01	4.68E-01	6.11E-01
1960	2.36E-01	3.13E-01	4.09E-01	2.12E-01	2.80E-01	3.67E-01	1.22E-01	1.61E-01	2.11E-01	1.18E-01	1.56E-01	2.04E-01
1961	1.15E-01	1.35E-01	1.60E-01	1.20E-01	1.43E-01	1.72E-01	8.54E-02	1.04E-01	1.27E-01	8.42E-02	1.03E-01	1.25E-01
1962	3.51E-02	4.20E-02	5.00E-02	8.11E-02	1.11E-01	1.54E-01	5.63E-02	7.68E-02	1.06E-01	5.45E-02	7.43E-02	1.02E-01
1963	2.85E-02	3.46E-02	4.20E-02	5.32E-02	7.05E-02	9.43E-02	4.21E-02	5.63E-02	7.57E-02	4.10E-02	5.49E-02	7.41E-02
1964	5.74E-02	6.79E-02	7.97E-02	5.57E-02	6.60E-02	7.76E-02	2.93E-02	3.47E-02	4.08E-02	2.85E-02	3.37E-02	3.97E-02
1965	1.66E-02	1.99E-02	2.36E-02	1.81E-02	2.21E-02	2.69E-02	1.44E-02	1.75E-02	2.13E-02	1.49E-02	1.82E-02	2.23E-02
1966	1.92E-02	2.30E-02	2.76E-02	1.90E-02	2.27E-02	2.73E-02	1.05E-02	1.26E-02	1.52E-02	1.03E-02	1.23E-02	1.48E-02
1967	1.64E-02	1.95E-02	2.32E-02	1.72E-02	2.06E-02	2.48E-02	1.40E-02	1.69E-02	2.03E-02	1.39E-02	1.67E-02	2.01E-02
1968	1.01E-02	1.22E-02	1.49E-02	1.01E-02	1.22E-02	1.48E-02	6.99E-03	8.47E-03	1.03E-02	7.10E-03	8.58E-03	1.04E-02
1969	1.23E-02	1.49E-02	1.81E-02	1.23E-02	1.50E-02	1.82E-02	9.44E-03	1.15E-02	1.41E-02	1.02E-02	1.25E-02	1.53E-02
1970	1.55E-02	1.85E-02	2.19E-02	1.52E-02	1.82E-02	2.16E-02	9.40E-03	1.12E-02	1.34E-02	9.18E-03	1.10E-02	1.31E-02
1971	7.29E-03	8.95E-03	1.10E-02	7.29E-03	8.95E-03	1.10E-02	4.85E-03	5.96E-03	7.29E-03	4.77E-03	5.85E-03	7.14E-03
1972	9.58E-03	1.15E-02	1.37E-02	9.99E-03	1.22E-02	1.47E-02	7.92E-03	9.62E-03	1.17E-02	7.73E-03	9.44E-03	1.14E-02
1973	1.02E-02	1.23E-02	1.46E-02	1.02E-02	1.22E-02	1.46E-02	7.07E-03	8.62E-03	1.04E-02	7.03E-03	8.58E-03	1.04E-02
1974	4.55E-03	5.55E-03	6.73E-03	3.18E-02	4.18E-02	5.48E-02	2.41E-02	3.17E-02	4.16E-02	2.34E-02	3.09E-02	4.04E-02
1975	3.59E-03	4.48E-03	5.62E-03	3.70E-03	4.63E-03	5.85E-03	3.11E-03	3.92E-03	4.96E-03	3.77E-03	4.81E-03	6.14E-03
1976	2.81E-03	3.81E-03	5.25E-03	2.85E-03	3.85E-03	5.25E-03	1.92E-03	2.63E-03	3.55E-03	1.89E-03	2.55E-03	3.48E-03
1977	1.78E-03	2.41E-03	3.22E-03	1.89E-03	2.55E-03	3.44E-03	1.67E-03	2.26E-03	3.03E-03	1.70E-03	2.29E-03	3.11E-03
1978	2.44E-03	3.18E-03	4.22E-03	2.48E-03	3.22E-03	4.26E-03	1.78E-03	2.33E-03	3.07E-03	1.78E-03	2.33E-03	3.07E-03
1979	1.33E-03	1.78E-03	2.41E-03	1.41E-03	1.85E-03	2.52E-03	1.04E-03	1.37E-03	1.85E-03	1.04E-03	1.37E-03	1.81E-03
1980	4.40E-03	5.44E-03	6.66E-03	4.37E-03	5.37E-03	6.59E-03	3.26E-03	4.03E-03	5.00E-03	3.22E-03	4.00E-03	4.96E-03
1981	3.18E-03	4.03E-03	5.14E-03	1.31E-02	1.73E-02	2.28E-02	1.61E-02	2.08E-02	2.69E-02	1.61E-02	2.08E-02	2.68E-02
1982	8.14E-03	9.69E-03	1.14E-02	8.10E-03	9.66E-03	1.14E-02	5.55E-03	6.62E-03	7.81E-03	5.44E-03	6.48E-03	7.66E-03
1983	8.84E-03	1.06E-02	1.26E-02	8.66E-03	1.04E-02	1.24E-02	5.07E-03	6.11E-03	7.29E-03	4.96E-03	5.99E-03	7.10E-03
1984	4.40E-03	5.37E-03	6.59E-03	4.51E-03	5.51E-03	6.73E-03	3.03E-03	3.70E-03	4.55E-03	3.07E-03	3.77E-03	4.63E-03
1985	4.77E-03	5.88E-03	7.22E-03	4.66E-03	5.74E-03	7.07E-03	2.92E-03	3.59E-03	4.40E-03	2.85E-03	3.52E-03	4.29E-03
1986	1.14E-02	1.37E-02	1.61E-02	1.11E-02	1.33E-02	1.57E-02	6.33E-03	7.59E-03	8.99E-03	6.14E-03	7.36E-03	8.73E-03
1987	4.77E-03	5.74E-03	6.88E-03	4.81E-03	5.81E-03	6.92E-03	3.77E-03	4.55E-03	5.40E-03	3.66E-03	4.40E-03	5.25E-03
1988	7.14E-03	8.73E-03	1.07E-02	6.96E-03	8.51E-03	1.04E-02	3.92E-03	4.81E-03	5.88E-03	4.03E-03	4.96E-03	6.11E-03
1989	6.44E-03	7.73E-03	9.32E-03	6.36E-03	7.66E-03	9.25E-03	3.77E-03	4.55E-03	5.51E-03	3.74E-03	4.48E-03	5.40E-03
1990	7.36E-03	8.88E-03	1.07E-02	7.59E-03	9.18E-03	1.11E-02	6.14E-03	7.44E-03	9.07E-03	6.33E-03	7.70E-03	9.36E-03
1991	1.82E-02	2.16E-02	2.52E-02	1.82E-02	2.15E-02	2.52E-02	1.11E-02	1.32E-02	1.54E-02	1.10E-02	1.31E-02	1.53E-02

* The lower and upper bounds represent only the uncertainty on the source term.

Table 6A.2 Predicted annual average concentrations of ^{90}Sr in water (Bq L^{-1}) obtained from the HEC-6-R model*.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	3.62E-01	1.01E+00	2.13E+00	3.62E-01	1.01E+00	2.13E+00	2.76E-01	7.72E-01	1.62E+00	2.76E-01	7.71E-01	1.62E+00
1945	3.34E-01	9.07E-01	1.98E+00	3.34E-01	9.06E-01	1.98E+00	2.31E-01	6.28E-01	1.37E+00	2.31E-01	6.28E-01	1.37E+00
1946	5.71E-01	1.56E+00	3.25E+00	5.71E-01	1.56E+00	3.25E+00	4.26E-01	1.17E+00	2.42E+00	4.26E-01	1.17E+00	2.42E+00
1947	1.57E-01	3.94E-01	8.01E-01	1.57E-01	3.94E-01	8.01E-01	1.20E-01	3.01E-01	6.12E-01	1.20E-01	3.01E-01	6.12E-01
1948	4.21E-01	7.61E-01	1.30E+00	4.21E-01	7.61E-01	1.30E+00	2.72E-01	4.92E-01	8.39E-01	2.72E-01	4.92E-01	8.39E-01
1949	8.76E-01	1.22E+00	1.68E+00	8.76E-01	1.22E+00	1.68E+00	6.26E-01	8.75E-01	1.20E+00	6.26E-01	8.75E-01	1.20E+00
1950	1.84E-01	2.56E-01	3.51E-01	1.84E-01	2.57E-01	3.52E-01	1.28E-01	1.79E-01	2.46E-01	1.28E-01	1.79E-01	2.46E-01
1951	1.46E-01	2.04E-01	2.80E-01	1.46E-01	2.04E-01	2.80E-01	1.02E-01	1.42E-01	1.94E-01	1.02E-01	1.42E-01	1.94E-01
1952	4.78E-01	6.67E-01	9.14E-01	4.77E-01	6.66E-01	9.13E-01	3.73E-01	5.21E-01	7.14E-01	3.73E-01	5.21E-01	7.14E-01
1953	9.53E-01	1.26E+00	1.66E+00	9.51E-01	1.26E+00	1.66E+00	7.09E-01	9.41E-01	1.24E+00	7.09E-01	9.41E-01	1.24E+00
1954	1.52E+00	2.00E+00	2.64E+00	1.51E+00	2.00E+00	2.64E+00	9.26E-01	1.22E+00	1.62E+00	9.26E-01	1.22E+00	1.61E+00
1955	6.54E-01	8.75E-01	1.16E+00	6.54E-01	8.75E-01	1.15E+00	4.71E-01	6.30E-01	8.33E-01	4.71E-01	6.30E-01	8.33E-01
1956	7.10E-01	9.56E-01	1.28E+00	7.10E-01	9.55E-01	1.28E+00	4.72E-01	6.35E-01	8.53E-01	4.72E-01	6.35E-01	8.52E-01
1957	4.88E-01	6.53E-01	8.63E-01	4.88E-01	6.53E-01	8.64E-01	3.28E-01	4.38E-01	5.79E-01	3.27E-01	4.38E-01	5.79E-01
1958	9.96E-01	1.33E+00	1.76E+00	9.96E-01	1.33E+00	1.76E+00	8.01E-01	1.07E+00	1.42E+00	8.01E-01	1.07E+00	1.42E+00
1959	6.44E-01	8.51E-01	1.11E+00	6.43E-01	8.50E-01	1.11E+00	4.16E-01	5.50E-01	7.16E-01	4.16E-01	5.50E-01	7.16E-01
1960	2.37E-01	3.13E-01	4.08E-01	2.37E-01	2.80E-01	4.08E-01	1.67E-01	2.21E-01	2.88E-01	1.67E-01	2.21E-01	2.88E-01
1961	1.76E-01	2.05E-01	2.37E-01	1.76E-01	2.05E-01	2.37E-01	1.17E-01	1.36E-01	1.58E-01	1.17E-01	1.36E-01	1.58E-01
1962	5.71E-02	6.67E-02	7.70E-02	5.82E-02	6.81E-02	7.90E-02	4.10E-02	4.81E-02	5.57E-02	4.10E-02	4.81E-02	5.57E-02
1963	5.54E-02	6.47E-02	7.47E-02	5.55E-02	6.49E-02	7.50E-02	4.37E-02	5.11E-02	5.90E-02	4.37E-02	5.11E-02	5.90E-02
1964	6.47E-02	7.56E-02	8.72E-02	6.47E-02	7.55E-02	8.72E-02	4.20E-02	4.90E-02	5.66E-02	4.20E-02	4.90E-02	5.66E-02
1965	2.63E-02	3.07E-02	3.55E-02	2.63E-02	3.07E-02	3.55E-02	1.98E-02	2.31E-02	2.67E-02	1.98E-02	2.31E-02	2.67E-02
1966	3.56E-02	4.14E-02	4.79E-02	3.55E-02	4.14E-02	4.79E-02	2.38E-02	2.78E-02	3.21E-02	2.38E-02	2.78E-02	3.21E-02
1967	3.05E-02	3.56E-02	4.11E-02	3.06E-02	3.56E-02	4.11E-02	2.16E-02	2.53E-02	2.92E-02	2.16E-02	2.53E-02	2.92E-02
1968	2.46E-02	2.87E-02	3.32E-02	2.46E-02	2.87E-02	3.32E-02	1.88E-02	2.20E-02	2.55E-02	1.88E-02	2.20E-02	2.55E-02
1969	3.49E-02	4.09E-02	4.71E-02	3.49E-02	4.09E-02	4.71E-02	2.24E-02	2.63E-02	3.03E-02	2.24E-02	2.63E-02	3.03E-02
1970	3.13E-02	3.67E-02	4.23E-02	3.13E-02	3.67E-02	4.23E-02	2.24E-02	2.64E-02	3.04E-02	2.24E-02	2.64E-02	3.04E-02
1971	2.04E-02	2.39E-02	2.76E-02	2.04E-02	2.39E-02	2.76E-02	1.48E-02	1.74E-02	2.01E-02	1.48E-02	1.74E-02	2.01E-02
1972	2.92E-02	3.42E-02	3.94E-02	2.92E-02	3.43E-02	3.95E-02	2.12E-02	2.49E-02	2.87E-02	2.12E-02	2.49E-02	2.87E-02
1973	3.56E-02	4.17E-02	4.81E-02	3.56E-02	4.17E-02	4.81E-02	2.40E-02	2.82E-02	3.24E-02	2.40E-02	2.81E-02	3.24E-02
1974	2.60E-02	3.05E-02	3.51E-02	2.63E-02	3.09E-02	3.57E-02	2.02E-02	2.36E-02	2.73E-02	2.02E-02	2.36E-02	2.73E-02
1975	3.57E-02	4.20E-02	4.84E-02	3.57E-02	4.20E-02	4.84E-02	2.54E-02	2.98E-02	3.43E-02	2.54E-02	2.98E-02	3.43E-02
1976	4.34E-02	5.08E-02	5.86E-02	4.34E-02	5.08E-02	5.86E-02	3.13E-02	3.67E-02	4.23E-02	3.13E-02	3.67E-02	4.23E-02
1977	1.77E-02	2.08E-02	2.39E-02	1.77E-02	2.08E-02	2.39E-02	1.27E-02	1.48E-02	1.71E-02	1.27E-02	1.48E-02	1.71E-02
1978	1.22E-02	1.43E-02	1.65E-02	1.22E-02	1.44E-02	1.65E-02	9.36E-03	1.10E-02	1.27E-02	9.36E-03	1.10E-02	1.27E-02
1979	1.05E-02	1.24E-02	1.43E-02	1.05E-02	1.24E-02	1.43E-02	7.55E-03	8.88E-03	1.02E-02	7.55E-03	8.88E-03	1.02E-02
1980	1.08E-02	1.27E-02	1.46E-02	1.08E-02	1.27E-02	1.46E-02	8.33E-03	9.81E-03	1.12E-02	8.33E-03	9.81E-03	1.12E-02
1981	1.86E-02	2.18E-02	2.51E-02	1.87E-02	2.20E-02	2.53E-02	1.31E-02	1.54E-02	1.78E-02	1.31E-02	1.54E-02	1.77E-02
1982	1.51E-02	1.77E-02	2.05E-02	1.51E-02	1.77E-02	2.05E-02	1.11E-02	1.30E-02	1.51E-02	1.11E-02	1.30E-02	1.51E-02
1983	1.60E-02	1.87E-02	2.16E-02	1.60E-02	1.87E-02	2.16E-02	1.10E-02	1.29E-02	1.48E-02	1.10E-02	1.29E-02	1.48E-02
1984	1.81E-02	2.12E-02	2.45E-02	1.81E-02	2.12E-02	2.45E-02	1.24E-02	1.46E-02	1.69E-02	1.24E-02	1.46E-02	1.69E-02
1985	3.44E-02	4.03E-02	4.65E-02	3.44E-02	4.03E-02	4.65E-02	2.43E-02	2.85E-02	3.29E-02	2.43E-02	2.85E-02	3.29E-02
1986	2.20E-02	2.58E-02	2.97E-02	2.20E-02	2.58E-02	2.97E-02	1.52E-02	1.79E-02	2.06E-02	1.52E-02	1.79E-02	2.06E-02
1987	9.84E-03	1.16E-02	1.34E-02	9.84E-03	1.16E-02	1.34E-02	7.92E-03	9.32E-03	1.08E-02	7.92E-03	9.32E-03	1.08E-02
1988	1.96E-02	2.30E-02	2.65E-02	1.96E-02	2.30E-02	2.65E-02	1.18E-02	1.38E-02	1.59E-02	1.18E-02	1.38E-02	1.59E-02
1989	1.57E-02	1.84E-02	2.13E-02	1.57E-02	1.84E-02	2.13E-02	1.06E-02	1.24E-02	1.43E-02	1.06E-02	1.24E-02	1.43E-02
1990	2.13E-02	2.49E-02	2.87E-02	2.13E-02	2.49E-02	2.87E-02	1.48E-02	1.73E-02	2.00E-02	1.48E-02	1.73E-02	2.00E-02
1991	3.15E-02	3.70E-02	4.26E-02	3.15E-02	3.70E-02	4.26E-02	2.03E-02	2.38E-02	2.74E-02	2.03E-02	2.38E-02	2.74E-02

* The lower and upper bounds represent only the uncertainty on the source term.

Table 6A.3 Predicted annual average concentrations of ^{106}Ru in water (Bq L^{-1}) obtained from the HEC-6-R model*.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	1.89E-01	5.27E-01	1.09E+00	1.88E-01	5.26E-01	1.09E+00	1.43E-01	4.00E-01	8.28E-01	1.43E-01	3.99E-01	8.27E-01
1945	1.53E-01	4.68E-01	9.85E-01	1.53E-01	4.66E-01	9.81E-01	1.05E-01	3.22E-01	6.77E-01	1.05E-01	3.21E-01	6.76E-01
1946	2.88E-01	7.94E-01	1.77E+00	2.88E-01	7.91E-01	1.77E+00	2.14E-01	5.88E-01	1.31E+00	2.13E-01	5.87E-01	1.31E+00
1947	7.05E-02	1.98E-01	4.56E-01	7.05E-02	1.98E-01	4.56E-01	5.38E-02	1.51E-01	3.48E-01	5.38E-02	1.51E-01	3.47E-01
1948	1.97E-01	3.90E-01	7.06E-01	1.96E-01	3.89E-01	7.03E-01	1.26E-01	2.50E-01	4.53E-01	1.26E-01	2.50E-01	4.53E-01
1949	6.42E-01	8.99E-01	1.23E+00	6.40E-01	8.97E-01	1.23E+00	4.56E-01	6.38E-01	8.74E-01	4.55E-01	6.38E-01	8.73E-01
1950	1.10E-01	1.54E-01	2.11E-01	1.10E-01	1.54E-01	2.11E-01	7.71E-02	1.07E-01	1.47E-01	7.71E-02	1.07E-01	1.47E-01
1951	9.05E-02	1.27E-01	1.74E-01	9.02E-02	1.26E-01	1.73E-01	6.24E-02	8.72E-02	1.20E-01	6.23E-02	8.71E-02	1.19E-01
1952	9.94E-02	1.39E-01	1.91E-01	9.89E-02	1.38E-01	1.90E-01	7.68E-02	1.07E-01	1.47E-01	7.67E-02	1.07E-01	1.47E-01
1953	1.90E-01	2.51E-01	3.31E-01	1.89E-01	2.49E-01	3.28E-01	1.40E-01	1.84E-01	2.43E-01	1.39E-01	1.83E-01	2.42E-01
1954	1.21E-01	1.60E-01	2.10E-01	1.20E-01	1.59E-01	2.08E-01	7.30E-02	9.66E-02	1.27E-01	7.29E-02	9.64E-02	1.27E-01
1955	2.18E-01	2.92E-01	3.84E-01	2.17E-01	2.90E-01	3.82E-01	1.55E-01	2.07E-01	2.73E-01	1.55E-01	2.07E-01	2.73E-01
1956	2.06E-01	2.77E-01	3.71E-01	2.06E-01	2.76E-01	3.70E-01	1.36E-01	1.83E-01	2.45E-01	1.36E-01	1.82E-01	2.45E-01
1957	3.52E-01	4.71E-01	6.23E-01	3.52E-01	4.71E-01	6.23E-01	2.35E-01	3.15E-01	4.16E-01	2.35E-01	3.14E-01	4.16E-01
1958	2.77E-01	3.71E-01	4.91E-01	2.76E-01	3.69E-01	4.89E-01	2.20E-01	2.95E-01	3.91E-01	2.20E-01	2.95E-01	3.90E-01
1959	5.58E+00	7.36E+00	9.60E+00	5.55E+00	7.32E+00	9.54E+00	3.55E+00	4.69E+00	6.11E+00	3.55E+00	4.68E+00	6.10E+00
1960	1.58E+01	2.09E+01	2.72E+01	1.57E+01	2.80E-01	2.70E+01	1.10E+01	1.45E+01	1.88E+01	1.10E+01	1.45E+01	1.88E+01
1961	1.57E+01	1.84E+01	2.12E+01	1.57E+01	1.84E+01	2.12E+01	1.04E+01	1.21E+01	1.40E+01	1.04E+01	1.21E+01	1.40E+01
1962	8.55E+00	9.98E+00	1.15E+01	8.55E+00	9.98E+00	1.15E+01	6.01E+00	7.02E+00	8.12E+00	6.01E+00	7.01E+00	8.11E+00
1963	3.16E+00	3.69E+00	4.26E+00	3.17E+00	3.71E+00	4.28E+00	2.49E+00	2.91E+00	3.36E+00	2.49E+00	2.91E+00	3.35E+00
1964	1.89E+00	2.20E+00	2.54E+00	1.89E+00	2.20E+00	2.53E+00	1.22E+00	1.42E+00	1.64E+00	1.22E+00	1.42E+00	1.64E+00
1965	5.30E-01	6.19E-01	7.14E-01	5.31E-01	6.20E-01	7.15E-01	4.00E-01	4.67E-01	5.38E-01	4.00E-01	4.67E-01	5.39E-01
1966	3.40E-01	3.97E-01	4.59E-01	3.39E-01	3.97E-01	4.58E-01	2.26E-01	2.65E-01	3.06E-01	2.26E-01	2.64E-01	3.05E-01
1967	1.02E-01	1.18E-01	1.36E-01	1.02E-01	1.18E-01	1.37E-01	7.24E-02	8.43E-02	9.72E-02	7.24E-02	8.43E-02	9.72E-02
1968	4.39E-02	5.13E-02	5.93E-02	4.39E-02	5.13E-02	5.93E-02	3.36E-02	3.92E-02	4.53E-02	3.36E-02	3.92E-02	4.53E-02
1969	2.31E-02	2.71E-02	3.13E-02	2.31E-02	2.71E-02	3.13E-02	1.49E-02	1.75E-02	2.02E-02	1.49E-02	1.75E-02	2.02E-02
1970	7.81E-03	9.18E-03	1.06E-02	7.81E-03	9.18E-03	1.06E-02	5.59E-03	6.55E-03	7.59E-03	5.59E-03	6.55E-03	7.59E-03
1971	3.40E-03	4.00E-03	4.59E-03	3.40E-03	4.00E-03	4.59E-03	2.48E-03	2.89E-03	3.33E-03	2.48E-03	2.89E-03	3.33E-03
1972	2.48E-03	2.89E-03	3.33E-03	2.48E-03	2.89E-03	3.33E-03	1.78E-03	2.11E-03	2.41E-03	1.78E-03	2.11E-03	2.41E-03
1973	3.55E-03	4.18E-03	4.81E-03	3.55E-03	4.18E-03	4.81E-03	2.41E-03	2.81E-03	3.26E-03	2.41E-03	2.81E-03	3.26E-03
1974	8.88E-04	1.04E-03	1.18E-03	8.88E-04	1.04E-03	1.18E-03	6.66E-04	7.77E-04	8.88E-04	6.66E-04	7.77E-04	8.88E-04
1975	1.55E-03	1.81E-03	2.11E-03	1.55E-03	1.81E-03	2.11E-03	1.11E-03	1.30E-03	1.48E-03	1.11E-03	1.30E-03	1.48E-03
1976	1.74E-03	2.04E-03	2.37E-03	1.74E-03	2.04E-03	2.37E-03	1.26E-03	1.48E-03	1.70E-03	1.26E-03	1.48E-03	1.70E-03
1977	1.18E-03	1.37E-03	1.59E-03	1.18E-03	1.37E-03	1.59E-03	8.51E-04	9.99E-04	1.15E-03	8.51E-04	9.99E-04	1.15E-03
1978	1.22E-03	1.44E-03	1.67E-03	1.22E-03	1.44E-03	1.67E-03	9.25E-04	1.11E-03	1.26E-03	9.25E-04	1.11E-03	1.26E-03
1979	4.44E-04	5.18E-04	5.92E-04	4.44E-04	5.18E-04	5.92E-04	3.33E-04	3.70E-04	4.44E-04	3.33E-04	3.70E-04	4.44E-04
1980	3.70E-12	4.07E-12	4.44E-12	3.70E-12	4.07E-12	4.44E-12	3.70E-12	4.07E-12	4.44E-12	3.70E-12	4.07E-12	4.44E-12
1981	1.22E-03	1.44E-03	1.63E-03	1.22E-03	1.44E-03	1.63E-03	8.51E-04	9.99E-04	1.15E-03	8.51E-04	9.99E-04	1.15E-03
1982	1.15E-03	1.33E-03	1.52E-03	1.15E-03	1.33E-03	1.52E-03	8.14E-04	9.62E-04	1.11E-03	8.14E-04	9.62E-04	1.11E-03
1983	1.52E-03	1.78E-03	2.07E-03	1.52E-03	1.78E-03	2.07E-03	1.04E-03	1.22E-03	1.41E-03	1.04E-03	1.22E-03	1.41E-03
1984	1.41E-03	1.63E-03	1.89E-03	1.41E-03	1.63E-03	1.89E-03	9.62E-04	1.11E-03	1.30E-03	9.62E-04	1.11E-03	1.30E-03
1985	7.03E-05	7.40E-05	7.77E-05	7.03E-05	7.40E-05	7.77E-05	7.03E-05	7.40E-05	7.77E-05	7.03E-05	7.40E-05	7.77E-05
1986	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1987	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1988	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1989	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1990	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1991	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

* The lower and upper bounds represent only the uncertainty on the source term.

Table 6A.4 Predicted annual average concentrations of ^{60}Co in water (Bq L^{-1}) obtained from the HEC-6-R model*.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1945	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1946	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1947	1.05E-02	6.48E-02	1.92E-01	1.02E-02	6.28E-02	1.86E-01	7.33E-03	4.52E-02	1.34E-01	7.22E-03	4.46E-02	1.32E-01
1948	2.48E-02	1.31E-01	2.97E-01	2.41E-02	1.27E-01	2.88E-01	1.49E-02	7.87E-02	1.79E-01	1.48E-02	7.84E-02	1.78E-01
1949	4.29E-02	2.50E-01	5.26E-01	4.18E-02	2.43E-01	5.13E-01	2.85E-02	1.65E-01	3.49E-01	2.82E-02	1.64E-01	3.45E-01
1950	9.66E-03	5.48E-02	1.19E-01	9.84E-03	5.57E-02	1.21E-01	6.81E-03	3.87E-02	8.37E-02	6.81E-03	3.86E-02	8.35E-02
1951	5.40E-03	3.11E-02	6.35E-02	5.33E-03	3.06E-02	6.25E-02	3.66E-03	2.10E-02	4.30E-02	3.63E-03	2.09E-02	4.28E-02
1952	1.50E-02	8.47E-02	1.80E-01	1.45E-02	8.16E-02	1.73E-01	1.05E-02	5.96E-02	1.27E-01	1.04E-02	5.87E-02	1.25E-01
1953	2.31E-02	1.27E-01	2.61E-01	2.20E-02	1.20E-01	2.48E-01	1.50E-02	8.23E-02	1.69E-01	1.47E-02	8.07E-02	1.66E-01
1954	4.23E-02	2.36E-01	4.85E-01	3.98E-02	2.22E-01	4.57E-01	2.27E-02	1.27E-01	2.61E-01	2.24E-02	1.25E-01	2.57E-01
1955	4.53E-02	6.12E-02	8.12E-02	4.38E-02	6.06E-02	8.15E-02	2.94E-02	4.15E-02	5.68E-02	2.91E-02	4.13E-02	5.66E-02
1956	3.21E-01	4.31E-01	5.79E-01	3.10E-01	4.16E-01	5.59E-01	1.94E-01	2.61E-01	3.50E-01	1.92E-01	2.58E-01	3.46E-01
1957	2.82E-02	3.79E-02	5.01E-02	3.12E-02	4.27E-02	5.76E-02	2.23E-02	3.06E-02	4.13E-02	2.22E-02	3.05E-02	4.11E-02
1958	5.65E-02	7.57E-02	1.00E-01	5.43E-02	7.28E-02	9.64E-02	4.04E-02	5.41E-02	7.17E-02	3.97E-02	5.34E-02	7.07E-02
1959	8.08E-01	1.07E+00	1.38E+00	7.70E-01	1.02E+00	1.32E+00	4.57E-01	6.04E-01	7.84E-01	4.51E-01	5.96E-01	7.73E-01
1960	5.91E-01	7.81E-01	1.02E+00	5.66E-01	2.80E-01	9.74E-01	3.66E-01	4.84E-01	6.30E-01	3.61E-01	4.77E-01	6.22E-01
1961	2.44E-01	2.86E-01	3.32E-01	2.47E-01	2.90E-01	3.38E-01	1.65E-01	1.95E-01	2.29E-01	1.64E-01	1.94E-01	2.28E-01
1962	8.55E-02	9.98E-02	1.16E-01	9.56E-02	1.14E-01	1.35E-01	6.74E-02	8.05E-02	9.53E-02	6.67E-02	7.97E-02	9.44E-02
1963	1.03E-01	1.20E-01	1.39E-01	1.13E-01	1.33E-01	1.55E-01	8.64E-02	1.02E-01	1.19E-01	8.55E-02	1.01E-01	1.18E-01
1964	1.46E-01	1.71E-01	1.97E-01	1.44E-01	1.69E-01	1.95E-01	8.88E-02	1.04E-01	1.20E-01	8.79E-02	1.03E-01	1.19E-01
1965	9.15E-02	1.07E-01	1.23E-01	9.18E-02	1.07E-01	1.23E-01	6.82E-02	7.96E-02	9.16E-02	6.83E-02	7.96E-02	9.17E-02
1966	8.13E-02	9.51E-02	1.10E-01	8.08E-02	9.45E-02	1.09E-01	5.14E-02	6.01E-02	6.94E-02	5.10E-02	5.97E-02	6.89E-02
1967	1.81E-02	2.11E-02	2.44E-02	1.86E-02	2.17E-02	2.51E-02	1.49E-02	1.75E-02	2.03E-02	1.50E-02	1.76E-02	2.04E-02
1968	8.92E-03	1.05E-02	1.21E-02	8.95E-03	1.05E-02	1.22E-02	7.10E-03	8.33E-03	9.69E-03	7.14E-03	8.40E-03	9.73E-03
1969	1.17E-02	1.37E-02	1.59E-02	1.17E-02	1.38E-02	1.59E-02	8.40E-03	9.84E-03	1.14E-02	8.77E-03	1.03E-02	1.20E-02
1970	7.84E-03	9.18E-03	1.07E-02	7.84E-03	9.18E-03	1.07E-02	5.55E-03	6.51E-03	7.59E-03	5.51E-03	6.48E-03	7.51E-03
1971	6.77E-03	7.96E-03	9.18E-03	6.77E-03	7.96E-03	9.18E-03	4.92E-03	5.77E-03	6.66E-03	4.88E-03	5.74E-03	6.66E-03
1972	4.85E-03	5.66E-03	6.59E-03	4.88E-03	5.74E-03	6.66E-03	3.66E-03	4.29E-03	5.00E-03	3.66E-03	4.29E-03	5.00E-03
1973	5.07E-03	5.96E-03	6.88E-03	5.07E-03	5.92E-03	6.88E-03	3.48E-03	4.11E-03	4.74E-03	3.48E-03	4.11E-03	4.74E-03
1974	2.59E-03	3.03E-03	3.52E-03	3.63E-03	4.40E-03	5.25E-03	2.85E-03	3.44E-03	4.11E-03	2.85E-03	3.44E-03	4.11E-03
1975	2.55E-03	2.96E-03	3.44E-03	2.55E-03	2.96E-03	3.44E-03	1.85E-03	2.18E-03	2.52E-03	1.85E-03	2.18E-03	2.52E-03
1976	7.66E-03	8.99E-03	1.04E-02	7.62E-03	8.95E-03	1.04E-02	5.33E-03	6.25E-03	7.25E-03	5.29E-03	6.22E-03	7.22E-03
1977	2.37E-03	2.78E-03	3.22E-03	2.37E-03	2.78E-03	3.22E-03	1.78E-03	2.07E-03	2.41E-03	1.78E-03	2.11E-03	2.44E-03
1978	2.44E-03	2.89E-03	3.29E-03	2.44E-03	2.85E-03	3.29E-03	1.85E-03	2.18E-03	2.52E-03	1.85E-03	2.18E-03	2.52E-03
1979	1.74E-03	2.07E-03	2.37E-03	1.74E-03	2.07E-03	2.37E-03	1.26E-03	1.48E-03	1.70E-03	1.26E-03	1.48E-03	1.70E-03
1980	2.85E-03	3.33E-03	3.85E-03	2.81E-03	3.33E-03	3.81E-03	2.15E-03	2.55E-03	2.92E-03	2.15E-03	2.52E-03	2.92E-03
1981	8.44E-03	9.92E-03	1.14E-02	8.58E-03	1.01E-02	1.17E-02	6.29E-03	7.40E-03	8.58E-03	6.25E-03	7.36E-03	8.51E-03
1982	5.55E-03	6.55E-03	7.51E-03	5.55E-03	6.55E-03	7.51E-03	4.03E-03	4.74E-03	5.44E-03	4.00E-03	4.70E-03	5.40E-03
1983	2.29E-03	2.70E-03	3.11E-03	2.29E-03	2.66E-03	3.07E-03	1.52E-03	1.78E-03	2.07E-03	1.52E-03	1.78E-03	2.07E-03
1984	1.41E-03	1.63E-03	1.89E-03	1.41E-03	1.67E-03	1.92E-03	9.62E-04	1.15E-03	1.30E-03	9.62E-04	1.15E-03	1.33E-03
1985	6.73E-03	7.88E-03	9.10E-03	6.70E-03	7.84E-03	9.07E-03	4.55E-03	5.33E-03	6.14E-03	4.51E-03	5.29E-03	6.11E-03
1986	6.44E-03	7.51E-03	8.70E-03	6.40E-03	7.47E-03	8.62E-03	4.18E-03	4.92E-03	5.66E-03	4.14E-03	4.88E-03	5.62E-03
1987	1.04E-03	1.18E-03	1.37E-03	1.04E-03	1.22E-03	1.41E-03	8.88E-04	1.04E-03	1.22E-03	8.88E-04	1.04E-03	1.22E-03
1988	1.30E-03	1.52E-03	1.74E-03	1.30E-03	1.52E-03	1.74E-03	7.77E-04	9.25E-04	1.07E-03	7.77E-04	9.25E-04	1.07E-03
1989	7.03E-04	8.14E-04	9.62E-04	7.03E-04	8.14E-04	9.62E-04	4.81E-04	5.55E-04	6.29E-04	4.81E-04	5.55E-04	6.29E-04
1990	8.14E-04	9.25E-04	1.07E-03	8.14E-04	9.62E-04	1.11E-03	5.92E-04	7.03E-04	8.14E-04	5.92E-04	7.03E-04	8.14E-04
1991	1.33E-03	1.59E-03	1.81E-03	1.33E-03	1.59E-03	1.81E-03	8.51E-04	9.99E-04	1.15E-03	8.51E-04	9.99E-04	1.15E-03

* The lower and upper bounds represent only the uncertainty on the source term.

Table 6A.5 Predicted annual average concentrations of ^{131}I in water (Bq L^{-1}) obtained from the HEC-6-R model*.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	5.30E-02	3.68E-01	1.08E+00	5.30E-02	3.68E-01	1.08E+00	4.05E-02	2.81E-01	8.28E-01	4.05E-02	2.81E-01	8.28E-01
1945	4.53E-02	3.30E-01	9.41E-01	4.53E-02	3.30E-01	9.41E-01	3.15E-02	2.29E-01	6.52E-01	3.15E-02	2.29E-01	6.52E-01
1946	8.62E-02	5.70E-01	1.61E+00	8.62E-02	5.70E-01	1.61E+00	6.43E-02	4.25E-01	1.20E+00	6.43E-02	4.25E-01	1.20E+00
1947	2.03E-02	1.45E-01	3.94E-01	2.03E-02	1.45E-01	3.94E-01	1.55E-02	1.11E-01	3.01E-01	1.55E-02	1.11E-01	3.01E-01
1948	4.83E-02	2.91E-01	6.61E-01	4.83E-02	2.91E-01	6.60E-01	3.13E-02	1.88E-01	4.27E-01	3.13E-02	1.88E-01	4.27E-01
1949	4.49E-01	6.28E-01	8.60E-01	4.49E-01	6.28E-01	8.60E-01	3.22E-01	4.50E-01	6.15E-01	3.22E-01	4.50E-01	6.15E-01
1950	9.15E-02	1.28E-01	1.75E-01	9.15E-02	1.28E-01	1.74E-01	6.39E-02	8.92E-02	1.22E-01	6.39E-02	8.92E-02	1.22E-01
1951	9.06E-02	1.27E-01	1.74E-01	9.06E-02	1.27E-01	1.73E-01	6.29E-02	8.80E-02	1.20E-01	6.29E-02	8.80E-02	1.20E-01
1952	1.33E-01	1.85E-01	2.53E-01	1.33E-01	1.85E-01	2.53E-01	1.04E-01	1.45E-01	1.98E-01	1.04E-01	1.45E-01	1.97E-01
1953	1.57E-02	2.07E-02	2.73E-02	1.57E-02	2.07E-02	2.72E-02	1.17E-02	1.55E-02	2.03E-02	1.17E-02	1.55E-02	2.03E-02
1954	3.80E-02	5.01E-02	6.59E-02	3.80E-02	5.01E-02	6.58E-02	2.33E-02	3.07E-02	4.03E-02	2.33E-02	3.07E-02	4.03E-02
1955	4.91E-02	6.59E-02	8.66E-02	4.91E-02	6.59E-02	8.65E-02	3.55E-02	4.76E-02	6.24E-02	3.55E-02	4.76E-02	6.23E-02
1956	2.48E-02	3.32E-02	4.46E-02	2.48E-02	3.32E-02	4.45E-02	1.65E-02	2.21E-02	2.96E-02	1.65E-02	2.21E-02	2.96E-02
1957	7.00E-03	9.34E-03	1.24E-02	7.00E-03	9.34E-03	1.24E-02	4.70E-03	6.26E-03	8.28E-03	4.70E-03	6.26E-03	8.28E-03
1958	5.41E-02	7.23E-02	9.56E-02	5.41E-02	7.23E-02	9.55E-02	4.36E-02	5.83E-02	7.68E-02	4.36E-02	5.83E-02	7.68E-02
1959	5.04E-03	6.65E-03	8.66E-03	5.04E-03	6.65E-03	8.65E-03	3.27E-03	4.30E-03	5.58E-03	3.27E-03	4.30E-03	5.58E-03
1960	4.38E-02	5.79E-02	7.53E-02	4.38E-02	2.80E-01	7.51E-02	3.09E-02	4.08E-02	5.29E-02	3.09E-02	4.08E-02	5.29E-02
1961	2.80E-02	3.27E-02	3.80E-02	2.80E-02	3.27E-02	3.79E-02	1.86E-02	2.17E-02	2.51E-02	1.86E-02	2.17E-02	2.51E-02
1962	2.20E-03	2.57E-03	2.97E-03	2.20E-03	2.57E-03	2.97E-03	1.55E-03	1.81E-03	2.09E-03	1.55E-03	1.81E-03	2.09E-03
1963	3.11E-03	3.64E-03	4.19E-03	3.11E-03	3.64E-03	4.18E-03	2.45E-03	2.86E-03	3.28E-03	2.45E-03	2.86E-03	3.28E-03
1964	2.77E-03	3.24E-03	3.72E-03	2.77E-03	3.24E-03	3.71E-03	1.80E-03	2.10E-03	2.40E-03	1.80E-03	2.10E-03	2.40E-03
1965	1.54E-03	1.79E-03	2.06E-03	1.54E-03	1.79E-03	2.06E-03	1.15E-03	1.35E-03	1.54E-03	1.15E-03	1.35E-03	1.54E-03
1966	2.83E-03	3.29E-03	3.78E-03	2.83E-03	3.29E-03	3.78E-03	1.90E-03	2.21E-03	2.52E-03	1.90E-03	2.21E-03	2.52E-03
1967	5.49E-03	6.40E-03	7.37E-03	5.49E-03	6.40E-03	7.37E-03	3.89E-03	4.53E-03	5.21E-03	3.89E-03	4.53E-03	5.21E-03
1968	2.66E-03	3.12E-03	3.60E-03	2.66E-03	3.12E-03	3.60E-03	2.04E-03	2.39E-03	2.75E-03	2.04E-03	2.39E-03	2.75E-03
1969	5.84E-03	6.84E-03	7.87E-03	5.84E-03	6.84E-03	7.87E-03	3.75E-03	4.39E-03	5.04E-03	3.75E-03	4.39E-03	5.04E-03
1970	2.35E-03	2.76E-03	3.19E-03	2.35E-03	2.76E-03	3.18E-03	1.69E-03	1.98E-03	2.28E-03	1.69E-03	1.98E-03	2.28E-03
1971	1.61E-07	1.61E-07	1.64E-07	1.61E-07	1.61E-07	1.65E-07	1.17E-07	1.17E-07	1.23E-07	1.17E-07	1.17E-07	1.23E-07
1972	1.45E-03	1.70E-03	1.96E-03	1.45E-03	1.70E-03	1.96E-03	1.05E-03	1.24E-03	1.42E-03	1.05E-03	1.24E-03	1.42E-03
1973	2.53E-03	2.97E-03	3.42E-03	2.53E-03	2.97E-03	3.42E-03	1.70E-03	2.00E-03	2.31E-03	1.70E-03	2.00E-03	2.31E-03
1974	8.71E-04	1.03E-03	1.18E-03	8.71E-04	1.03E-03	1.18E-03	6.67E-04	7.85E-04	9.01E-04	6.67E-04	7.85E-04	9.01E-04
1975	1.51E-03	1.77E-03	2.04E-03	1.51E-03	1.77E-03	2.04E-03	1.07E-03	1.26E-03	1.45E-03	1.07E-03	1.26E-03	1.45E-03
1976	2.58E-04	3.02E-04	3.49E-04	2.58E-04	3.02E-04	3.48E-04	1.87E-04	2.18E-04	2.51E-04	1.87E-04	2.18E-04	2.51E-04
1977	1.76E-04	2.06E-04	2.38E-04	1.76E-04	2.06E-04	2.38E-04	1.25E-04	1.47E-04	1.70E-04	1.25E-04	1.47E-04	1.70E-04
1978	2.52E-04	2.95E-04	3.42E-04	2.52E-04	2.95E-04	3.42E-04	1.93E-04	2.26E-04	2.62E-04	1.93E-04	2.26E-04	2.62E-04
1979	1.80E-04	2.11E-04	2.43E-04	1.80E-04	2.11E-04	2.43E-04	1.29E-04	1.51E-04	1.74E-04	1.29E-04	1.51E-04	1.74E-04
1980	2.93E-04	3.42E-04	3.93E-04	2.93E-04	3.42E-04	3.93E-04	2.25E-04	2.63E-04	3.02E-04	2.25E-04	2.63E-04	3.02E-04
1981	5.07E-04	5.91E-04	6.75E-04	5.07E-04	5.91E-04	6.74E-04	3.55E-04	4.14E-04	4.70E-04	3.55E-04	4.14E-04	4.70E-04
1982	3.36E-04	3.94E-04	4.54E-04	3.36E-04	3.94E-04	4.54E-04	2.47E-04	2.90E-04	3.34E-04	2.47E-04	2.90E-04	3.34E-04
1983	2.74E-05	3.18E-05	3.80E-05	2.74E-05	3.18E-05	3.80E-05	1.88E-05	2.19E-05	2.61E-05	1.88E-05	2.19E-05	2.61E-05
1984	3.56E-04	4.17E-04	4.80E-04	3.56E-04	4.17E-04	4.80E-04	2.45E-04	2.87E-04	3.30E-04	2.45E-04	2.87E-04	3.30E-04
1985	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1986	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1987	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1988	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1989	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1990	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1991	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

* The lower and upper bounds represent only the uncertainty on the source term and k_d values.

Table 6A.6 Predicted annual average concentrations of ^{137}Cs in shoreline sediment (Bq kg^{-1}) obtained from the HEC-6-R model*.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	7.06E+01	3.36E+02	8.11E+02	5.77E+00	2.74E+01	6.61E+01	1.66E+01	7.90E+01	1.91E+02	1.58E+01	7.53E+01	1.82E+02
1945	2.71E+02	1.26E+03	3.07E+03	1.33E+02	6.19E+02	1.51E+03	1.06E+02	4.93E+02	1.20E+03	1.17E+02	5.49E+02	1.34E+03
1946	3.98E+02	1.73E+03	4.30E+03	2.26E+02	1.03E+03	2.52E+03	2.32E+02	1.03E+03	2.54E+03	2.41E+02	1.06E+03	2.62E+03
1947	5.12E+02	2.18E+03	5.45E+03	2.77E+02	1.22E+03	3.02E+03	2.81E+02	1.18E+03	2.96E+03	2.72E+02	1.15E+03	2.89E+03
1948	3.17E+02	1.40E+03	3.47E+03	2.48E+02	1.09E+03	2.67E+03	2.39E+02	1.03E+03	2.56E+03	3.88E+02	1.65E+03	4.10E+03
1949	2.72E+02	1.10E+03	2.57E+03	2.51E+02	7.97E+02	1.69E+03	2.50E+02	8.71E+02	1.98E+03	5.40E+02	1.90E+03	4.36E+03
1950	5.22E+02	1.36E+03	2.78E+03	4.00E+02	7.66E+02	1.32E+03	3.47E+02	7.59E+02	1.41E+03	4.44E+02	9.80E+02	1.84E+03
1951	3.65E+02	9.06E+02	1.81E+03	2.38E+02	4.00E+02	6.39E+02	2.20E+02	4.42E+02	7.84E+02	2.93E+02	5.69E+02	9.96E+02
1952	1.89E+02	4.17E+02	7.84E+02	7.71E+01	1.22E+02	1.88E+02	7.91E+01	1.28E+02	1.99E+02	9.36E+01	1.50E+02	2.30E+02
1953	1.04E+02	2.00E+02	3.44E+02	3.74E+01	6.05E+01	9.74E+01	6.49E+01	9.44E+01	1.36E+02	6.88E+01	9.88E+01	1.40E+02
1954	9.49E+01	1.50E+02	2.28E+02	8.27E+01	1.19E+02	1.73E+02	8.08E+01	1.11E+02	1.53E+02	9.36E+01	1.27E+02	1.73E+02
1955	1.72E+02	2.44E+02	3.36E+02	2.23E+02	3.06E+02	4.18E+02	1.88E+02	2.53E+02	3.39E+02	2.45E+02	3.29E+02	4.38E+02
1956	3.86E+02	5.33E+02	7.24E+02	4.28E+02	5.84E+02	7.93E+02	5.76E+02	7.75E+02	1.04E+03	7.10E+02	9.55E+02	1.28E+03
1957	6.49E+02	8.86E+02	1.20E+03	7.79E+02	1.05E+03	1.42E+03	7.66E+02	1.03E+03	1.38E+03	9.26E+02	1.24E+03	1.66E+03
1958	8.40E+02	1.14E+03	1.53E+03	9.24E+02	1.25E+03	1.67E+03	6.46E+02	8.67E+02	1.16E+03	7.01E+02	9.41E+02	1.25E+03
1959	9.28E+02	1.25E+03	1.68E+03	1.04E+03	1.40E+03	1.85E+03	7.76E+02	1.04E+03	1.38E+03	7.85E+02	1.05E+03	1.39E+03
1960	8.64E+02	1.17E+03	1.56E+03	3.10E+02	2.80E-01	5.59E+02	8.16E+02	1.09E+03	1.43E+03	7.87E+02	1.05E+03	1.38E+03
1961	7.32E+02	9.89E+02	1.32E+03	3.21E+02	4.29E+02	5.69E+02	7.76E+02	1.03E+03	1.35E+03	7.22E+02	9.58E+02	1.26E+03
1962	7.08E+02	9.57E+02	1.28E+03	3.46E+02	4.55E+02	5.96E+02	5.09E+02	6.81E+02	9.06E+02	4.88E+02	6.47E+02	8.52E+02
1963	5.84E+02	7.78E+02	1.03E+03	1.15E+03	1.52E+03	1.99E+03	2.19E+02	3.14E+02	4.53E+02	3.03E+02	4.14E+02	5.68E+02
1964	4.76E+02	6.35E+02	8.39E+02	7.62E+02	1.01E+03	1.33E+03	1.93E+02	2.71E+02	3.82E+02	2.63E+02	3.57E+02	4.85E+02
1965	4.40E+02	5.89E+02	7.81E+02	1.09E+03	1.44E+03	1.88E+03	1.82E+02	2.49E+02	3.43E+02	2.37E+02	3.18E+02	4.26E+02
1966	4.04E+02	5.40E+02	7.16E+02	9.66E+02	1.28E+03	1.66E+03	1.79E+02	2.44E+02	3.34E+02	2.31E+02	3.07E+02	4.10E+02
1967	3.97E+02	5.33E+02	7.08E+02	9.33E+02	1.23E+03	1.60E+03	1.68E+02	2.28E+02	3.13E+02	2.04E+02	2.69E+02	3.57E+02
1968	3.82E+02	5.13E+02	6.83E+02	8.68E+02	1.14E+03	1.49E+03	1.46E+02	2.02E+02	2.82E+02	1.19E+02	1.60E+02	2.15E+02
1969	3.97E+02	5.37E+02	7.18E+02	7.56E+02	9.96E+02	1.30E+03	1.50E+02	1.99E+02	2.67E+02	1.08E+02	1.42E+02	1.88E+02
1970	3.98E+02	5.39E+02	7.22E+02	9.11E+02	1.20E+03	1.55E+03	1.47E+02	1.93E+02	2.57E+02	9.11E+01	1.20E+02	1.59E+02
1971	3.89E+02	5.26E+02	7.05E+02	8.12E+02	1.07E+03	1.38E+03	1.38E+02	1.83E+02	2.43E+02	6.89E+01	9.12E+01	1.22E+02
1972	3.80E+02	5.15E+02	6.89E+02	6.55E+02	8.62E+02	1.12E+03	1.30E+02	1.71E+02	2.26E+02	2.64E+01	3.65E+01	5.08E+01
1973	3.72E+02	5.03E+02	6.73E+02	7.87E+02	1.03E+03	1.33E+03	1.36E+02	1.79E+02	2.38E+02	1.35E+02	1.74E+02	2.26E+02
1974	3.63E+02	4.91E+02	6.58E+02	9.95E+02	1.33E+03	1.75E+03	1.33E+02	1.78E+02	2.40E+02	1.39E+02	1.79E+02	2.31E+02
1975	3.55E+02	4.80E+02	6.43E+02	9.95E+02	1.33E+03	1.78E+03	1.92E+02	2.49E+02	3.23E+02	1.35E+02	1.75E+02	2.26E+02
1976	3.47E+02	4.69E+02	6.28E+02	8.50E+02	1.14E+03	1.52E+03	1.53E+02	1.99E+02	2.60E+02	1.32E+02	1.71E+02	2.21E+02
1977	3.39E+02	4.59E+02	6.14E+02	8.51E+02	1.14E+03	1.52E+03	1.42E+02	1.88E+02	2.52E+02	1.16E+02	1.50E+02	1.95E+02
1978	3.31E+02	4.48E+02	6.00E+02	7.70E+02	1.03E+03	1.38E+03	1.39E+02	1.84E+02	2.47E+02	1.07E+02	1.40E+02	1.82E+02
1979	3.24E+02	4.38E+02	5.86E+02	6.55E+02	8.80E+02	1.18E+03	1.34E+02	1.79E+02	2.40E+02	1.05E+02	1.36E+02	1.78E+02
1980	3.16E+02	4.28E+02	5.73E+02	6.33E+02	8.50E+02	1.14E+03	1.29E+02	1.73E+02	2.33E+02	1.03E+02	1.33E+02	1.74E+02
1981	2.76E+02	3.71E+02	4.93E+02	5.49E+02	7.38E+02	9.87E+02	1.24E+02	1.67E+02	2.26E+02	1.00E+02	1.30E+02	1.70E+02
1982	2.16E+02	2.85E+02	3.73E+02	2.43E+02	3.28E+02	4.43E+02	1.06E+02	1.48E+02	2.07E+02	9.80E+01	1.27E+02	1.66E+02
1983	2.11E+02	2.78E+02	3.64E+02	2.27E+02	3.07E+02	4.14E+02	1.05E+02	1.48E+02	2.10E+02	9.57E+01	1.24E+02	1.62E+02
1984	2.06E+02	2.72E+02	3.56E+02	5.77E+02	7.74E+02	1.03E+03	9.86E+01	1.32E+02	1.77E+02	9.34E+01	1.20E+02	1.55E+02
1985	2.01E+02	2.65E+02	3.48E+02	5.81E+02	7.80E+02	1.04E+03	9.40E+01	1.25E+02	1.67E+02	9.17E+01	1.17E+02	1.50E+02
1986	1.96E+02	2.59E+02	3.40E+02	5.66E+02	7.60E+02	1.01E+03	8.85E+01	1.19E+02	1.60E+02	8.95E+01	1.14E+02	1.47E+02
1987	1.92E+02	2.53E+02	3.32E+02	5.51E+02	7.39E+02	9.80E+02	8.19E+01	1.11E+02	1.51E+02	8.75E+01	1.12E+02	1.43E+02
1988	1.87E+02	2.46E+02	3.23E+02	5.35E+02	7.18E+02	9.53E+02	7.76E+01	1.06E+02	1.45E+02	8.55E+01	1.09E+02	1.40E+02
1989	1.81E+02	2.39E+02	3.14E+02	5.11E+02	6.86E+02	9.09E+02	7.78E+01	1.05E+02	1.43E+02	7.77E+01	9.90E+01	1.27E+02
1990	1.76E+02	2.32E+02	3.05E+02	4.82E+02	6.45E+02	8.55E+02	7.88E+01	1.06E+02	1.42E+02	7.07E+01	9.00E+01	1.15E+02
1991	1.72E+02	2.28E+02	2.99E+02	4.62E+02	6.18E+02	8.19E+02	7.44E+01	9.88E+01	1.32E+02	6.12E+01	7.84E+01	1.01E+02

* The lower and upper bounds represent only the uncertainty on the source term.

Table 6A.7 Predicted annual average concentrations of ^{90}Sr in shoreline sediment (Bq kg^{-1}) obtained from the HEC-6-R model*.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	7.40E-01	2.11E+00	4.44E+00	7.40E-02	2.59E-01	5.55E-01	2.22E-01	5.55E-01	1.18E+00	2.22E-01	5.92E-01	1.26E+00
1945	2.96E+00	8.14E+00	1.75E+01	1.48E+00	4.14E+00	8.81E+00	1.30E+00	3.55E+00	7.59E+00	1.63E+00	4.51E+00	9.58E+00
1946	3.92E+00	1.07E+01	2.29E+01	9.99E-01	2.70E+00	5.77E+00	3.48E+00	9.51E+00	2.02E+01	3.81E+00	1.05E+01	2.22E+01
1947	4.77E+00	1.30E+01	2.73E+01	9.99E-01	2.66E+00	5.70E+00	4.48E+00	1.23E+01	2.56E+01	4.11E+00	1.11E+01	2.31E+01
1948	1.89E+00	4.85E+00	1.00E+01	1.59E+00	4.00E+00	8.10E+00	3.52E+00	9.29E+00	1.92E+01	5.29E+00	1.40E+01	2.89E+01
1949	1.52E+00	2.96E+00	5.25E+00	3.44E+00	5.88E+00	9.69E+00	4.92E+00	9.84E+00	1.79E+01	1.01E+01	2.05E+01	3.76E+01
1950	6.33E+00	9.81E+00	1.49E+01	8.25E+00	1.20E+01	1.71E+01	8.77E+00	1.34E+01	2.01E+01	1.09E+01	1.68E+01	2.54E+01
1951	2.96E+00	4.59E+00	6.92E+00	3.37E+00	4.85E+00	6.85E+00	5.18E+00	7.73E+00	1.13E+01	6.44E+00	9.47E+00	1.37E+01
1952	2.29E+00	3.37E+00	4.85E+00	3.03E+00	4.26E+00	5.85E+00	4.11E+00	5.81E+00	8.03E+00	6.18E+00	8.70E+00	1.20E+01
1953	5.37E+00	7.33E+00	9.84E+00	7.22E+00	9.69E+00	1.28E+01	1.23E+01	1.65E+01	2.21E+01	1.48E+01	2.00E+01	2.66E+01
1954	7.22E+00	9.58E+00	1.27E+01	9.99E+00	1.33E+01	1.75E+01	1.97E+01	2.62E+01	3.46E+01	2.49E+01	3.30E+01	4.36E+01
1955	7.29E+00	9.66E+00	1.28E+01	1.14E+01	1.52E+01	2.01E+01	2.61E+01	3.46E+01	4.56E+01	2.99E+01	3.97E+01	5.23E+01
1956	4.51E+00	6.03E+00	8.03E+00	5.33E+00	7.14E+00	9.51E+00	1.29E+01	1.72E+01	2.29E+01	1.57E+01	2.10E+01	2.79E+01
1957	2.52E+00	3.37E+00	4.48E+00	7.10E+00	9.55E+00	1.28E+01	1.15E+01	1.54E+01	2.05E+01	1.28E+01	1.71E+01	2.28E+01
1958	7.36E+00	9.88E+00	1.31E+01	1.36E+01	1.82E+01	2.42E+01	1.30E+01	1.73E+01	2.29E+01	1.54E+01	2.07E+01	2.74E+01
1959	9.92E+00	1.33E+01	1.75E+01	1.80E+01	2.41E+01	3.18E+01	1.87E+01	2.49E+01	3.29E+01	1.94E+01	2.59E+01	3.42E+01
1960	4.70E+00	6.29E+00	8.33E+00	2.07E+00	2.80E-01	3.63E+00	1.35E+01	1.80E+01	2.36E+01	1.26E+01	1.68E+01	2.21E+01
1961	1.52E+00	2.07E+00	2.74E+00	1.96E+00	2.55E+00	3.26E+00	1.19E+01	1.57E+01	2.04E+01	1.11E+01	1.46E+01	1.91E+01
1962	1.44E+00	1.96E+00	2.59E+00	2.15E+00	2.74E+00	3.44E+00	5.66E+00	7.33E+00	9.36E+00	5.51E+00	7.10E+00	9.07E+00
1963	2.37E+00	3.03E+00	3.85E+00	9.07E+00	1.19E+01	1.55E+01	1.70E+00	2.15E+00	2.63E+00	2.81E+00	3.52E+00	4.37E+00
1964	2.18E+00	2.74E+00	3.44E+00	5.96E+00	7.84E+00	1.02E+01	1.48E+00	1.81E+00	2.22E+00	2.26E+00	2.81E+00	3.44E+00
1965	1.96E+00	2.48E+00	3.07E+00	8.66E+00	1.12E+01	1.44E+01	1.30E+00	1.59E+00	1.89E+00	1.89E+00	2.33E+00	2.81E+00
1966	2.00E+00	2.44E+00	3.03E+00	5.48E+00	7.07E+00	8.99E+00	1.15E+00	1.37E+00	1.67E+00	1.67E+00	2.00E+00	2.44E+00
1967	1.81E+00	2.26E+00	2.81E+00	6.25E+00	8.07E+00	1.03E+01	1.04E+00	1.22E+00	1.48E+00	1.41E+00	1.70E+00	2.04E+00
1968	1.63E+00	2.00E+00	2.52E+00	4.88E+00	6.22E+00	7.88E+00	6.66E-01	8.14E-01	9.62E-01	6.29E-01	7.77E-01	9.25E-01
1969	1.33E+00	1.70E+00	2.15E+00	3.63E+00	4.63E+00	5.81E+00	9.99E-01	1.18E+00	1.41E+00	7.40E-01	8.88E-01	1.04E+00
1970	1.22E+00	1.55E+00	2.00E+00	7.62E+00	9.73E+00	1.23E+01	9.99E-01	1.22E+00	1.44E+00	6.29E-01	7.40E-01	8.88E-01
1971	1.18E+00	1.52E+00	1.92E+00	6.11E+00	7.77E+00	9.84E+00	9.25E-01	1.11E+00	1.33E+00	4.81E-01	5.55E-01	6.66E-01
1972	1.15E+00	1.48E+00	1.89E+00	3.59E+00	4.59E+00	5.77E+00	8.88E-01	1.07E+00	1.26E+00	1.85E-01	2.22E-01	2.59E-01
1973	1.11E+00	1.44E+00	1.85E+00	6.62E+00	8.44E+00	1.06E+01	9.62E-01	1.15E+00	1.37E+00	8.14E-01	9.62E-01	1.15E+00
1974	1.11E+00	1.41E+00	1.81E+00	1.21E+01	1.60E+01	2.11E+01	8.14E-01	9.62E-01	1.15E+00	8.14E-01	9.99E-01	1.18E+00
1975	1.07E+00	1.37E+00	1.74E+00	1.17E+01	1.56E+01	2.08E+01	1.67E+00	2.00E+00	2.37E+00	8.14E-01	9.62E-01	1.15E+00
1976	1.04E+00	1.33E+00	1.70E+00	7.59E+00	1.01E+01	1.35E+01	1.15E+00	1.37E+00	1.63E+00	7.77E-01	9.25E-01	1.11E+00
1977	1.04E+00	1.30E+00	1.67E+00	8.55E+00	1.14E+01	1.51E+01	9.62E-01	1.18E+00	1.41E+00	6.66E-01	7.77E-01	9.25E-01
1978	9.99E-01	1.26E+00	1.63E+00	5.88E+00	7.84E+00	1.04E+01	9.62E-01	1.15E+00	1.37E+00	5.92E-01	7.03E-01	8.51E-01
1979	9.62E-01	1.26E+00	1.59E+00	2.22E+00	2.92E+00	3.89E+00	8.88E-01	1.07E+00	1.26E+00	5.92E-01	7.03E-01	8.14E-01
1980	9.62E-01	1.22E+00	1.55E+00	2.07E+00	2.74E+00	3.63E+00	8.14E-01	9.62E-01	1.15E+00	5.55E-01	6.66E-01	8.14E-01
1981	1.18E+00	1.48E+00	1.85E+00	1.63E+00	2.15E+00	2.85E+00	7.40E-01	8.88E-01	1.04E+00	5.55E-01	6.66E-01	7.77E-01
1982	1.67E+00	2.00E+00	2.41E+00	1.52E+00	2.04E+00	2.70E+00	3.33E-01	3.70E-01	4.44E-01	5.55E-01	6.29E-01	7.77E-01
1983	1.59E+00	1.92E+00	2.33E+00	1.44E+00	1.92E+00	2.55E+00	2.22E-01	2.59E-01	2.96E-01	5.18E-01	6.29E-01	7.40E-01
1984	1.55E+00	1.89E+00	2.26E+00	1.15E+01	1.53E+01	2.02E+01	6.66E-01	7.77E-01	9.25E-01	6.29E-01	7.40E-01	8.88E-01
1985	1.52E+00	1.85E+00	2.22E+00	1.16E+01	1.55E+01	2.05E+01	6.66E-01	7.77E-01	9.25E-01	6.66E-01	7.77E-01	9.25E-01
1986	1.48E+00	1.78E+00	2.15E+00	1.11E+01	1.48E+01	1.97E+01	5.55E-01	6.66E-01	7.77E-01	6.29E-01	7.77E-01	8.88E-01
1987	1.44E+00	1.74E+00	2.07E+00	1.06E+01	1.41E+01	1.87E+01	4.44E-01	5.55E-01	6.29E-01	6.29E-01	7.40E-01	8.88E-01
1988	1.41E+00	1.67E+00	2.00E+00	1.01E+01	1.34E+01	1.78E+01	3.70E-01	4.44E-01	5.18E-01	6.29E-01	7.40E-01	8.51E-01
1989	1.33E+00	1.59E+00	1.92E+00	8.84E+00	1.18E+01	1.55E+01	4.07E-01	5.18E-01	5.92E-01	5.92E-01	7.03E-01	8.51E-01
1990	1.26E+00	1.52E+00	1.85E+00	7.10E+00	9.47E+00	1.25E+01	4.81E-01	5.92E-01	6.66E-01	5.92E-01	7.03E-01	8.14E-01
1991	1.22E+00	1.48E+00	1.78E+00	5.55E+00	7.40E+00	9.77E+00	4.81E-01	5.92E-01	6.66E-01	4.44E-01	5.18E-01	5.92E-01

* The lower and upper bounds represent only the uncertainty on the source term.

Table 6A.8 Predicted annual average concentrations of ^{106}Ru in shoreline sediment (Bq kg^{-1}) obtained from the HEC-6-R model*.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	1.18E+00	3.29E+00	6.85E+00	1.48E-01	4.07E-01	8.51E-01	4.44E-01	1.22E+00	2.55E+00	4.44E-01	1.26E+00	2.55E+00
1945	3.63E+00	1.06E+01	2.20E+01	2.44E+00	7.03E+00	1.47E+01	1.89E+00	5.44E+00	1.13E+01	2.29E+00	6.59E+00	1.37E+01
1946	4.11E+00	1.18E+01	2.54E+01	2.18E+00	6.44E+00	1.36E+01	4.74E+00	1.35E+01	2.92E+01	5.40E+00	1.54E+01	3.34E+01
1947	4.14E+00	1.17E+01	2.58E+01	1.78E+00	5.07E+00	1.10E+01	6.44E+00	1.78E+01	3.96E+01	4.74E+00	1.31E+01	2.95E+01
1948	1.63E+00	4.29E+00	9.32E+00	1.78E+00	4.55E+00	9.69E+00	2.81E+00	7.62E+00	1.69E+01	4.44E+00	1.20E+01	2.66E+01
1949	2.07E+00	3.74E+00	6.40E+00	6.92E+00	1.10E+01	1.70E+01	6.66E+00	1.08E+01	1.73E+01	1.26E+01	2.11E+01	3.47E+01
1950	8.25E+00	1.20E+01	1.71E+01	1.29E+01	1.83E+01	2.54E+01	1.32E+01	1.88E+01	2.62E+01	1.66E+01	2.37E+01	3.33E+01
1951	3.00E+00	4.29E+00	6.11E+00	5.33E+00	7.47E+00	1.03E+01	5.11E+00	7.22E+00	9.99E+00	7.22E+00	1.02E+01	1.41E+01
1952	2.04E+00	2.85E+00	3.96E+00	3.00E+00	4.18E+00	5.77E+00	3.81E+00	5.33E+00	7.33E+00	5.18E+00	7.25E+00	9.95E+00
1953	2.96E+00	4.00E+00	5.33E+00	4.18E+00	5.59E+00	7.40E+00	7.55E+00	1.01E+01	1.34E+01	9.32E+00	1.25E+01	1.66E+01
1954	3.22E+00	4.26E+00	5.62E+00	3.59E+00	4.74E+00	6.25E+00	6.73E+00	8.92E+00	1.18E+01	8.58E+00	1.14E+01	1.50E+01
1955	3.11E+00	4.11E+00	5.44E+00	5.00E+00	6.66E+00	8.77E+00	7.44E+00	9.88E+00	1.30E+01	9.55E+00	1.27E+01	1.67E+01
1956	3.29E+00	4.40E+00	5.85E+00	5.11E+00	6.81E+00	9.07E+00	8.44E+00	1.13E+01	1.51E+01	1.10E+01	1.47E+01	1.97E+01
1957	2.37E+00	3.18E+00	4.22E+00	6.96E+00	9.36E+00	1.25E+01	9.29E+00	1.24E+01	1.65E+01	1.09E+01	1.46E+01	1.94E+01
1958	7.10E+00	9.51E+00	1.26E+01	1.51E+01	2.02E+01	2.67E+01	1.38E+01	1.85E+01	2.45E+01	1.52E+01	2.04E+01	2.71E+01
1959	1.32E+01	1.75E+01	2.30E+01	8.65E+01	1.14E+02	1.49E+02	7.68E+01	1.02E+02	1.33E+02	6.97E+01	9.21E+01	1.20E+02
1960	9.32E+00	1.24E+01	1.61E+01	1.88E+02	2.80E-01	3.23E+02	3.15E+02	4.16E+02	5.41E+02	3.05E+02	4.03E+02	5.24E+02
1961	3.96E+01	5.22E+01	6.78E+01	3.81E+02	4.85E+02	6.09E+02	5.14E+02	6.53E+02	8.21E+02	4.81E+02	6.12E+02	7.71E+02
1962	2.12E+01	2.78E+01	3.59E+01	3.14E+02	3.86E+02	4.70E+02	4.72E+02	5.70E+02	6.81E+02	5.13E+02	6.17E+02	7.35E+02
1963	1.32E+02	1.56E+02	1.83E+02	1.59E+02	1.93E+02	2.32E+02	3.41E+02	4.00E+02	4.66E+02	3.42E+02	4.03E+02	4.71E+02
1964	9.24E+01	1.09E+02	1.27E+02	4.62E+01	5.65E+01	6.85E+01	1.70E+02	1.99E+02	2.30E+02	1.90E+02	2.23E+02	2.59E+02
1965	6.18E+01	7.25E+01	8.39E+01	8.48E+01	1.00E+02	1.17E+02	8.72E+01	1.02E+02	1.18E+02	1.04E+02	1.22E+02	1.41E+02
1966	3.83E+01	4.49E+01	5.19E+01	4.39E+01	5.19E+01	6.07E+01	4.62E+01	5.40E+01	6.25E+01	5.15E+01	6.02E+01	6.98E+01
1967	1.94E+01	2.26E+01	2.61E+01	2.25E+01	2.66E+01	3.11E+01	2.19E+01	2.56E+01	2.97E+01	2.51E+01	2.94E+01	3.40E+01
1968	9.32E+00	1.09E+01	1.26E+01	1.19E+01	1.41E+01	1.64E+01	1.01E+01	1.18E+01	1.37E+01	7.77E+00	9.10E+00	1.05E+01
1969	4.51E+00	5.29E+00	6.11E+00	5.37E+00	6.36E+00	7.40E+00	4.63E+00	5.40E+00	6.25E+00	3.03E+00	3.55E+00	4.11E+00
1970	2.22E+00	2.63E+00	3.00E+00	3.70E+00	4.37E+00	5.07E+00	2.48E+00	2.92E+00	3.37E+00	1.44E+00	1.67E+00	1.92E+00
1971	1.11E+00	1.30E+00	1.52E+00	1.70E+00	2.00E+00	2.33E+00	1.22E+00	1.44E+00	1.67E+00	5.55E-01	6.66E-01	7.77E-01
1972	5.55E-01	6.66E-01	7.77E-01	6.66E-01	7.77E-01	9.25E-01	5.92E-01	6.66E-01	7.77E-01	1.11E-01	1.30E-01	1.48E-01
1973	2.96E-01	3.33E-01	3.70E-01	4.44E-01	5.18E-01	6.29E-01	2.59E-01	3.33E-01	3.70E-01	2.22E-01	2.59E-01	2.96E-01
1974	1.48E-01	1.67E-01	1.85E-01	7.40E-02	9.25E-02	1.11E-01	1.48E-01	1.85E-01	2.22E-01	1.11E-01	1.48E-01	1.85E-01
1975	7.40E-02	9.25E-02	1.11E-01	0.00E+00	0.00E+00	0.00E+00	1.11E-01	1.30E-01	1.48E-01	7.40E-02	7.77E-02	8.14E-02
1976	3.70E-02	4.07E-02	4.44E-02	0.00E+00	0.00E+00	0.00E+00	3.70E-02	5.55E-02	7.40E-02	3.70E-02	4.07E-02	4.44E-02
1977	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1978	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1979	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1980	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1981	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1982	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1983	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1984	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1985	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1986	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1987	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1988	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1989	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1990	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1991	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

* The lower and upper bounds represent only the uncertainty on the source term.

Table 6A.9 Predicted annual average concentrations of ^{60}Co in shoreline sediment (Bq kg^{-1}) obtained from the HEC-6-R model*.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1945	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1946	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1947	1.11E+00	6.81E+00	2.01E+01	2.22E-01	1.37E+00	4.00E+00	5.55E-01	3.55E+00	1.05E+01	1.78E+00	1.10E+01	3.24E+01
1948	2.41E+00	1.44E+01	4.03E+01	1.89E+00	1.11E+01	3.01E+01	2.41E+00	1.45E+01	4.12E+01	4.03E+00	2.40E+01	6.75E+01
1949	3.40E+00	1.91E+01	4.60E+01	6.48E+00	3.65E+01	8.16E+01	6.51E+00	3.73E+01	8.61E+01	1.34E+01	7.63E+01	1.75E+02
1950	1.23E+01	7.08E+01	1.54E+02	1.45E+01	8.36E+01	1.79E+02	1.41E+01	8.11E+01	1.75E+02	1.83E+01	1.05E+02	2.26E+02
1951	6.44E+00	3.69E+01	8.06E+01	6.85E+00	3.92E+01	8.38E+01	8.66E+00	4.95E+01	1.07E+02	1.15E+01	6.58E+01	1.41E+02
1952	3.74E+00	2.13E+01	4.56E+01	3.37E+00	1.91E+01	4.03E+01	4.00E+00	2.28E+01	4.82E+01	5.77E+00	3.27E+01	6.93E+01
1953	5.18E+00	2.90E+01	6.07E+01	5.55E+00	3.08E+01	6.40E+01	9.03E+00	5.02E+01	1.05E+02	1.09E+01	6.03E+01	1.26E+02
1954	7.36E+00	4.07E+01	8.40E+01	8.33E+00	4.61E+01	9.50E+01	1.35E+01	7.45E+01	1.54E+02	1.70E+01	9.41E+01	1.94E+02
1955	9.58E+00	3.40E+01	6.56E+01	1.37E+01	5.27E+01	1.03E+02	2.08E+01	9.10E+01	1.82E+02	2.56E+01	1.04E+02	2.06E+02
1956	2.78E+01	4.20E+01	6.08E+01	4.49E+01	6.16E+01	8.39E+01	6.54E+01	9.57E+01	1.36E+02	8.56E+01	1.24E+02	1.74E+02
1957	3.63E+01	5.03E+01	6.90E+01	8.61E+01	1.16E+02	1.56E+02	8.61E+01	1.19E+02	1.62E+02	1.08E+02	1.47E+02	2.00E+02
1958	4.26E+01	5.82E+01	7.89E+01	6.38E+01	8.56E+01	1.14E+02	4.78E+01	6.52E+01	8.80E+01	5.51E+01	7.47E+01	1.00E+02
1959	4.78E+01	6.44E+01	8.59E+01	1.46E+02	1.94E+02	2.54E+02	1.42E+02	1.89E+02	2.48E+02	1.38E+02	1.84E+02	2.40E+02
1960	3.71E+01	5.00E+01	6.65E+01	1.34E+02	2.80E-01	2.30E+02	3.12E+02	4.14E+02	5.39E+02	3.21E+02	4.24E+02	5.52E+02
1961	4.34E+01	5.81E+01	7.66E+01	1.77E+02	2.31E+02	2.98E+02	4.05E+02	5.31E+02	6.87E+02	3.88E+02	5.10E+02	6.59E+02
1962	3.79E+01	5.07E+01	6.68E+01	1.82E+02	2.33E+02	2.95E+02	2.61E+02	3.37E+02	4.28E+02	2.77E+02	3.54E+02	4.47E+02
1963	9.68E+01	1.22E+02	1.52E+02	3.07E+02	4.00E+02	5.13E+02	1.14E+02	1.41E+02	1.74E+02	1.65E+02	2.06E+02	2.55E+02
1964	7.35E+01	9.13E+01	1.13E+02	1.77E+02	2.31E+02	2.98E+02	1.01E+02	1.23E+02	1.49E+02	1.38E+02	1.70E+02	2.07E+02
1965	5.47E+01	6.69E+01	8.14E+01	2.36E+02	3.03E+02	3.84E+02	9.42E+01	1.14E+02	1.36E+02	1.23E+02	1.50E+02	1.80E+02
1966	5.18E+01	6.26E+01	7.52E+01	1.71E+02	2.20E+02	2.79E+02	8.56E+01	1.03E+02	1.22E+02	1.13E+02	1.36E+02	1.62E+02
1967	4.09E+01	4.94E+01	5.91E+01	1.62E+02	2.07E+02	2.61E+02	7.56E+01	9.05E+01	1.07E+02	9.97E+01	1.20E+02	1.42E+02
1968	3.10E+01	3.74E+01	4.49E+01	1.31E+02	1.66E+02	2.09E+02	5.22E+01	6.23E+01	7.37E+01	4.87E+01	5.81E+01	6.86E+01
1969	2.05E+01	2.49E+01	3.00E+01	9.64E+01	1.23E+02	1.55E+02	5.95E+01	7.09E+01	8.36E+01	4.40E+01	5.24E+01	6.19E+01
1970	1.64E+01	2.00E+01	2.42E+01	1.34E+02	1.69E+02	2.11E+02	5.47E+01	6.51E+01	7.66E+01	3.37E+01	4.01E+01	4.74E+01
1971	1.44E+01	1.75E+01	2.13E+01	1.02E+02	1.29E+02	1.61E+02	4.56E+01	5.43E+01	6.40E+01	2.26E+01	2.69E+01	3.18E+01
1972	1.26E+01	1.54E+01	1.86E+01	6.42E+01	8.18E+01	1.03E+02	3.76E+01	4.48E+01	5.27E+01	7.25E+00	8.66E+00	1.02E+01
1973	1.10E+01	1.34E+01	1.63E+01	8.28E+01	1.05E+02	1.30E+02	3.32E+01	3.96E+01	4.67E+01	2.90E+01	3.45E+01	4.06E+01
1974	9.66E+00	1.18E+01	1.43E+01	4.66E+01	6.05E+01	7.77E+01	2.58E+01	3.07E+01	3.63E+01	2.70E+01	3.21E+01	3.77E+01
1975	8.47E+00	1.03E+01	1.25E+01	2.22E+01	2.95E+01	3.88E+01	3.93E+01	4.68E+01	5.53E+01	2.36E+01	2.81E+01	3.31E+01
1976	7.44E+00	9.07E+00	1.10E+01	1.44E+01	1.90E+01	2.50E+01	2.36E+01	2.81E+01	3.32E+01	2.07E+01	2.46E+01	2.90E+01
1977	6.51E+00	7.92E+00	9.62E+00	1.37E+01	1.82E+01	2.38E+01	1.77E+01	2.13E+01	2.53E+01	1.55E+01	1.84E+01	2.17E+01
1978	5.70E+00	6.96E+00	8.44E+00	9.99E+00	1.32E+01	1.73E+01	1.58E+01	1.89E+01	2.25E+01	1.25E+01	1.49E+01	1.75E+01
1979	5.00E+00	6.11E+00	7.40E+00	5.70E+00	7.51E+00	9.81E+00	1.34E+01	1.61E+01	1.91E+01	1.10E+01	1.31E+01	1.54E+01
1980	4.37E+00	5.33E+00	6.48E+00	4.92E+00	6.48E+00	8.47E+00	1.12E+01	1.34E+01	1.60E+01	9.62E+00	1.14E+01	1.35E+01
1981	5.03E+00	6.07E+00	7.29E+00	3.85E+00	5.11E+00	6.66E+00	9.25E+00	1.11E+01	1.32E+01	8.44E+00	1.00E+01	1.18E+01
1982	6.44E+00	7.70E+00	9.10E+00	2.00E+00	2.66E+00	3.48E+00	5.03E+00	6.03E+00	7.18E+00	7.40E+00	8.77E+00	1.03E+01
1983	5.62E+00	6.73E+00	7.96E+00	1.52E+00	2.04E+00	2.70E+00	3.70E+00	4.44E+00	5.29E+00	6.48E+00	7.70E+00	9.07E+00
1984	4.92E+00	5.88E+00	6.96E+00	2.48E+00	3.77E+00	5.48E+00	6.33E+00	7.59E+00	8.95E+00	6.40E+00	7.62E+00	8.92E+00
1985	4.33E+00	5.14E+00	6.11E+00	2.29E+00	3.48E+00	5.03E+00	5.74E+00	6.85E+00	8.10E+00	5.99E+00	7.10E+00	8.33E+00
1986	3.77E+00	4.51E+00	5.33E+00	2.04E+00	3.07E+00	4.44E+00	4.59E+00	5.48E+00	6.48E+00	5.25E+00	6.22E+00	7.29E+00
1987	3.29E+00	3.92E+00	4.66E+00	1.78E+00	2.70E+00	3.89E+00	3.55E+00	4.22E+00	5.00E+00	4.59E+00	5.44E+00	6.40E+00
1988	2.85E+00	3.40E+00	4.03E+00	1.59E+00	2.41E+00	3.40E+00	2.85E+00	3.40E+00	4.03E+00	4.03E+00	4.77E+00	5.59E+00
1989	2.44E+00	2.92E+00	3.48E+00	1.44E+00	2.11E+00	2.96E+00	3.00E+00	3.59E+00	4.22E+00	3.85E+00	4.55E+00	5.29E+00
1990	2.11E+00	2.52E+00	3.00E+00	1.30E+00	1.85E+00	2.52E+00	3.15E+00	3.74E+00	4.37E+00	3.59E+00	4.26E+00	4.96E+00
1991	1.89E+00	2.26E+00	2.70E+00	1.11E+00	1.55E+00	2.11E+00	2.92E+00	3.44E+00	4.03E+00	2.55E+00	3.03E+00	3.52E+00

* The lower and upper bounds represent only the uncertainty on the source term.

Table 6A.10 Predicted annual average concentrations of ^{144}Ce in shoreline sediment (Bq kg^{-1}) obtained from the HEC-6-R model*.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	4.67E+00	3.94E+01	1.48E+02	4.37E-01	2.77E+00	9.49E+00	1.36E+00	5.02E+00	2.33E+01	1.17E+00	4.65E+00	2.11E+01
1945	1.41E+01	1.06E+02	4.03E+02	7.59E+00	3.66E+01	1.57E+02	6.33E+00	2.87E+01	1.08E+02	7.04E+00	3.44E+01	1.23E+02
1946	1.66E+01	1.61E+02	5.62E+02	7.83E+00	2.11E+01	1.52E+02	1.51E+01	7.50E+01	2.42E+02	1.55E+01	7.97E+01	2.60E+02
1947	1.62E+01	1.83E+02	6.13E+02	7.24E+00	2.10E+01	1.45E+02	1.87E+01	1.04E+02	3.09E+02	1.33E+01	7.57E+01	2.30E+02
1948	6.43E+00	4.64E+01	2.20E+02	5.85E+00	2.53E+01	1.14E+02	7.35E+00	4.07E+01	1.23E+02	1.12E+01	6.31E+01	1.92E+02
1949	6.15E+00	2.39E+01	1.10E+02	1.47E+01	3.46E+01	1.01E+02	1.33E+01	3.69E+01	8.11E+01	2.36E+01	7.61E+01	1.71E+02
1950	1.82E+01	4.82E+01	1.11E+02	2.42E+01	4.48E+01	7.83E+01	2.45E+01	4.34E+01	7.36E+01	2.97E+01	5.63E+01	9.48E+01
1951	6.72E+00	1.45E+01	3.85E+01	9.53E+00	1.47E+01	3.00E+01	9.81E+00	1.64E+01	2.55E+01	1.12E+01	2.03E+01	3.17E+01
1952	7.13E+00	1.30E+01	2.63E+01	2.31E+01	2.92E+01	6.50E+01	2.66E+01	2.69E+01	7.17E+01	3.31E+01	3.83E+01	8.06E+01
1953	1.59E+01	2.67E+01	5.22E+01	1.89E+01	2.61E+01	4.60E+01	3.00E+01	3.66E+01	6.88E+01	3.41E+01	4.28E+01	7.51E+01
1954	2.32E+01	3.67E+01	7.50E+01	3.38E+01	4.63E+01	8.53E+01	3.61E+01	4.35E+01	6.14E+01	4.52E+01	5.76E+01	7.71E+01
1955	8.30E+01	1.30E+02	2.27E+02	1.02E+02	1.38E+02	2.65E+02	9.91E+01	1.22E+02	1.73E+02	1.36E+02	1.71E+02	2.44E+02
1956	9.58E+01	1.44E+02	2.86E+02	1.04E+02	1.38E+02	2.67E+02	1.34E+02	1.64E+02	2.81E+02	1.72E+02	2.15E+02	3.55E+02
1957	5.22E+01	7.58E+01	1.87E+02	9.20E+01	1.39E+02	2.33E+02	9.80E+01	1.29E+02	2.10E+02	1.07E+02	1.45E+02	2.34E+02
1958	5.54E+01	8.90E+01	1.37E+02	9.55E+01	1.40E+02	2.37E+02	7.28E+01	9.09E+01	1.35E+02	8.21E+01	1.11E+02	1.55E+02
1959	7.08E+01	1.10E+02	2.23E+02	1.58E+02	2.23E+02	3.81E+02	1.10E+02	1.38E+02	1.87E+02	1.09E+02	1.45E+02	1.92E+02
1960	3.35E+01	4.34E+01	1.15E+02	8.83E+01	2.80E-01	1.74E+02	1.08E+02	1.39E+02	1.87E+02	1.02E+02	1.40E+02	1.83E+02
1961	2.01E+01	2.07E+01	7.54E+01	5.63E+01	6.47E+01	1.30E+02	7.37E+01	1.05E+02	1.38E+02	7.20E+01	1.11E+02	1.41E+02
1962	8.25E+00	8.41E+00	3.12E+01	2.51E+01	3.23E+01	6.29E+01	3.00E+01	4.41E+01	5.98E+01	2.94E+01	4.65E+01	6.20E+01
1963	7.80E+00	1.42E+01	2.10E+01	1.77E+01	2.42E+01	4.24E+01	7.36E+00	1.02E+01	1.42E+01	9.20E+00	1.44E+01	1.93E+01
1964	4.02E+00	6.62E+00	9.29E+00	7.03E+00	8.77E+00	1.56E+01	3.71E+00	4.91E+00	6.97E+00	4.68E+00	6.94E+00	9.60E+00
1965	1.72E+00	2.51E+00	3.87E+00	3.37E+00	4.81E+00	8.95E+00	1.97E+00	2.57E+00	3.71E+00	2.42E+00	3.54E+00	4.96E+00
1966	8.53E-01	1.30E+00	1.91E+00	1.46E+00	1.62E+00	3.62E+00	9.12E-01	1.15E+00	1.73E+00	1.05E+00	1.51E+00	2.17E+00
1967	3.79E-01	5.71E-01	8.50E-01	6.14E-01	8.11E-01	1.64E+00	3.97E-01	5.06E-01	7.55E-01	5.09E-01	8.06E-01	1.12E+00
1968	2.04E-01	3.16E-01	4.58E-01	3.28E-01	5.42E-01	1.04E+00	1.82E-01	1.89E-01	3.22E-01	2.16E-01	2.97E-01	4.42E-01
1969	5.65E-02	7.82E-02	1.33E-01	1.22E-01	1.67E-01	3.60E-01	1.31E-01	1.93E-01	2.44E-01	9.19E-02	1.63E-01	2.06E-01
1970	1.53E-02	1.65E-02	3.59E-02	9.27E-02	2.45E-01	3.92E-01	7.81E-02	1.18E-01	1.47E-01	3.82E-02	6.81E-02	8.62E-02
1971	6.29E-03	6.81E-03	1.48E-02	4.12E-02	1.11E-01	1.89E-01	4.12E-02	6.04E-02	7.83E-02	1.97E-02	3.40E-02	4.51E-02
1972	2.57E-03	2.77E-03	6.03E-03	1.81E-02	4.11E-02	7.94E-02	4.34E-02	6.65E-02	9.34E-02	1.06E-02	1.40E-02	2.51E-02
1973	1.05E-03	1.14E-03	2.47E-03	3.29E-02	1.26E-01	1.95E-01	2.85E-02	5.35E-02	6.85E-02	5.15E-02	5.80E-02	1.28E-01
1974	4.29E-04	4.63E-04	1.01E-03	5.99E-03	2.21E-02	3.32E-02	1.57E-02	3.12E-02	4.07E-02	2.46E-02	2.80E-02	6.13E-02
1975	1.77E-04	1.91E-04	4.14E-04	3.69E-03	1.52E-02	2.46E-02	1.98E-02	4.86E-02	6.01E-02	1.01E-02	1.15E-02	2.51E-02
1976	7.33E-05	8.03E-05	1.72E-04	1.75E-03	7.33E-03	1.20E-02	7.77E-03	1.60E-02	2.10E-02	4.11E-03	4.70E-03	1.03E-02
1977	2.98E-05	3.25E-05	7.03E-05	8.70E-04	3.96E-03	6.44E-03	2.15E-03	3.62E-03	5.22E-03	1.74E-03	2.18E-03	4.44E-03
1978	1.23E-05	1.36E-05	2.92E-05	3.04E-04	1.33E-03	2.19E-03	9.88E-04	1.67E-03	2.39E-03	6.99E-04	9.25E-04	1.81E-03
1979	5.00E-06	5.48E-06	1.18E-05	4.85E-05	9.88E-05	2.19E-04	3.92E-04	6.55E-04	9.51E-04	2.86E-04	3.77E-04	7.44E-04
1980	2.07E-06	2.30E-06	4.92E-06	1.88E-05	3.44E-05	8.03E-05	1.51E-04	2.49E-04	3.68E-04	1.17E-04	1.55E-04	3.04E-04
1981	2.27E-06	5.07E-06	7.36E-06	6.59E-06	7.47E-06	2.15E-05	5.85E-05	9.25E-05	1.42E-04	4.81E-05	6.33E-05	1.24E-04
1982	2.72E-06	7.14E-06	1.04E-05	1.87E-06	2.56E-06	3.35E-06	1.89E-05	1.89E-05	4.88E-05	1.97E-05	2.60E-05	5.11E-05
1983	1.11E-06	2.93E-06	4.55E-06	5.88E-07	8.44E-07	1.21E-06	3.70E-06	4.18E-06	2.56E-05	8.07E-06	1.07E-05	2.09E-05
1984	4.55E-07	1.20E-06	1.89E-06	1.35E-07	6.11E-07	2.32E-06	2.42E-06	3.85E-06	3.35E-04	3.43E-06	5.74E-06	2.40E-04
1985	1.86E-07	4.88E-07	7.84E-07	6.22E-08	3.00E-07	1.56E-06	1.13E-06	1.89E-06	1.87E-04	1.51E-06	2.84E-06	1.67E-04
1986	7.62E-08	2.00E-07	3.25E-07	2.51E-08	1.21E-07	8.95E-07	4.40E-07	6.85E-07	8.55E-05	6.18E-07	1.17E-06	6.85E-05
1987	3.12E-08	8.14E-08	1.36E-07	1.01E-08	4.85E-08	4.81E-07	1.62E-07	2.28E-07	4.48E-05	2.54E-07	4.77E-07	2.80E-05
1988	1.27E-08	3.30E-08	5.77E-08	4.00E-09	1.92E-08	2.45E-07	6.18E-08	7.88E-08	2.35E-05	1.04E-07	1.95E-07	1.15E-05
1989	5.11E-09	1.31E-08	2.56E-08	1.54E-09	7.29E-09	1.35E-07	2.28E-08	3.06E-08	2.48E-05	3.70E-08	6.96E-08	2.41E-05
1990	2.06E-09	5.22E-09	1.11E-08	5.18E-10	2.35E-09	1.54E-07	8.92E-09	1.43E-08	2.18E-05	1.23E-08	2.29E-08	2.22E-05
1991	1.10E-09	2.75E-09	6.36E-09	2.26E-10	9.51E-10	9.18E-07	4.22E-09	7.03E-09	1.54E-04	5.48E-09	8.29E-09	8.51E-05

* The lower and upper bounds represent only the uncertainty on the source term and k_d values.

Table 6A.11 Predicted annual average concentrations of ^{95}Nb in shoreline sediment (Bq kg^{-1}) obtained from the HEC-6-R model*.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	9.62E-02	2.07E+00	9.62E+00	9.25E-03	1.96E-01	8.14E-01	1.04E-02	2.26E-01	9.25E-01	1.22E-02	2.66E-01	1.07E+00
1945	2.26E-01	4.07E+00	2.00E+01	9.99E-02	2.15E+00	8.88E+00	4.81E-02	9.99E-01	4.44E+00	7.40E-02	1.44E+00	6.29E+00
1946	2.48E-01	4.81E+00	2.41E+01	4.07E-02	9.25E-01	4.07E+00	2.85E-01	6.29E+00	2.70E+01	3.40E-01	8.14E+00	3.29E+01
1947	1.52E-01	2.92E+00	1.41E+01	2.07E-02	5.92E-01	2.29E+00	3.26E-01	7.40E+00	3.11E+01	8.88E-02	1.85E+00	7.77E+00
1948	7.77E-02	1.44E+00	5.55E+00	5.18E-02	1.04E+00	3.37E+00	2.59E-02	4.81E-01	1.81E+00	5.18E-02	9.25E-01	3.52E+00
1949	5.55E-02	3.70E-01	1.18E+00	2.66E-01	1.96E+00	5.55E+00	2.15E-01	7.40E-01	1.96E+00	3.22E-01	1.33E+00	4.07E+00
1950	2.59E-01	5.55E-01	1.33E+00	4.44E-01	9.99E-01	2.33E+00	5.55E-01	1.44E+00	3.44E+00	9.25E-01	2.52E+00	5.55E+00
1951	5.55E-02	1.41E-01	3.26E-01	3.70E-01	1.15E+00	2.33E+00	1.67E-01	4.44E-01	9.62E-01	2.63E-01	7.03E-01	1.52E+00
1952	1.11E-01	2.70E-01	5.92E-01	2.92E-01	7.77E-01	1.59E+00	4.81E-01	1.30E+00	2.37E+00	3.55E-01	8.51E-01	1.70E+00
1953	7.03E-02	1.70E-01	3.63E-01	9.25E-02	2.15E-01	4.44E-01	1.04E-01	2.48E-01	4.81E-01	1.44E-01	3.44E-01	6.66E-01
1954	1.04E-01	2.33E-01	4.81E-01	1.92E-01	4.81E-01	8.88E-01	1.22E-01	2.63E-01	5.55E-01	1.81E-01	3.70E-01	7.77E-01
1955	1.30E-01	3.00E-01	5.92E-01	2.15E-01	5.18E-01	9.99E-01	1.26E-01	2.78E-01	5.55E-01	2.00E-01	4.44E-01	8.51E-01
1956	1.92E-01	4.44E-01	9.62E-01	3.48E-01	8.51E-01	1.74E+00	3.70E-01	9.25E-01	1.78E+00	5.55E-01	1.37E+00	2.59E+00
1957	1.07E-01	2.33E-01	5.92E-01	3.15E-01	7.77E-01	1.63E+00	2.07E-01	4.81E-01	1.04E+00	1.92E-01	4.44E-01	9.62E-01
1958	1.18E-01	2.44E-01	6.29E-01	3.26E-01	8.14E-01	1.74E+00	2.48E-01	6.29E-01	1.26E+00	2.26E-01	5.55E-01	1.15E+00
1959	4.81E-02	1.15E-01	2.52E-01	7.77E-01	2.00E+00	4.07E+00	3.55E-01	8.51E-01	1.70E+00	4.07E-01	9.99E-01	1.96E+00
1960	9.25E-03	2.52E-02	5.18E-02	9.99E-01	2.80E-01	5.92E+00	5.55E-01	1.30E+00	2.70E+00	5.55E-01	1.26E+00	2.63E+00
1961	3.63E-02	1.18E-01	2.26E-01	1.52E+00	3.70E+00	6.66E+00	6.66E-01	1.48E+00	2.74E+00	8.14E-01	1.74E+00	3.29E+00
1962	1.67E-03	3.33E-03	7.77E-03	3.66E-01	8.14E-01	1.55E+00	5.55E-01	1.33E+00	2.44E+00	7.77E-01	1.81E+00	3.40E+00
1963	3.11E-02	5.55E-02	1.37E-01	4.81E-02	9.62E-02	2.04E-01	8.88E-02	2.18E-01	4.07E-01	4.44E-02	1.11E-01	2.11E-01
1964	5.55E-04	8.88E-04	1.55E-03	6.66E-04	1.26E-03	2.37E-03	1.15E-03	2.44E-03	4.44E-03	1.74E-03	3.70E-03	6.66E-03
1965	1.22E-03	1.96E-03	4.07E-03	4.81E-04	8.14E-04	1.59E-03	2.48E-04	5.92E-04	1.18E-03	3.70E-04	1.04E-03	1.85E-03
1966	1.18E-03	1.89E-03	3.48E-03	4.07E-04	7.03E-04	1.11E-03	6.66E-04	1.33E-03	2.59E-03	1.55E-03	3.70E-03	7.03E-03
1967	1.33E-03	2.07E-03	4.44E-03	6.29E-04	1.15E-03	2.18E-03	9.25E-04	2.04E-03	4.07E-03	3.70E-03	8.51E-03	1.67E-02
1968	9.25E-04	1.55E-03	3.48E-03	1.11E-03	1.89E-03	3.70E-03	7.03E-04	1.48E-03	2.78E-03	2.26E-03	5.18E-03	1.07E-02
1969	5.18E-04	7.40E-04	1.22E-03	7.03E-05	1.48E-04	2.70E-04	4.44E-04	8.51E-04	1.48E-03	3.29E-04	6.29E-04	1.15E-03
1970	4.44E-06	9.25E-06	1.52E-05	9.99E-05	1.85E-04	4.44E-04	1.55E-04	2.85E-04	4.81E-04	2.55E-05	4.81E-05	9.62E-05
1971	0.00E+00	0.00E+00	0.00E+00	8.14E-06	1.52E-05	2.96E-05	9.25E-06	2.26E-05	4.44E-05	2.92E-05	7.03E-05	1.41E-04
1972	0.00E+00	0.00E+00	0.00E+00	1.15E-05	2.26E-05	4.81E-05	8.14E-05	2.07E-04	4.07E-04	5.55E-05	1.85E-04	3.29E-04
1973	0.00E+00	0.00E+00	0.00E+00	4.81E-05	9.25E-05	2.15E-04	4.44E-05	8.88E-05	2.00E-04	3.18E-05	6.66E-05	1.48E-04
1974	0.00E+00	0.00E+00	0.00E+00	3.11E-06	6.29E-06	1.48E-05	1.52E-05	3.33E-05	7.77E-05	1.15E-07	2.29E-07	5.18E-07
1975	0.00E+00	0.00E+00	0.00E+00	3.18E-05	2.04E-04	3.52E-04	1.50E-04	7.81E-04	1.10E-03	0.00E+00	0.00E+00	0.00E+00
1976	0.00E+00	0.00E+00	0.00E+00	1.70E-06	1.13E-05	1.86E-05	6.85E-06	3.96E-05	5.22E-05	0.00E+00	0.00E+00	0.00E+00
1977	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1978	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1979	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1980	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1981	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1982	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1983	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1984	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1985	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1986	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1987	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1988	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1989	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1990	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1991	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

* The lower and upper bounds represent only the uncertainty on the source term and k_d values.

Table 6A.12 Predicted annual average concentrations of ^{95}Zr in shoreline sediment (Bq kg^{-1}) obtained from the HEC-6-R model*.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	2.39E+00	2.42E+01	8.26E+01	2.48E-01	1.77E+00	5.88E+00	5.14E-01	2.51E+00	1.02E+01	4.11E-01	2.22E+00	9.83E+00
1945	5.10E+00	4.75E+01	1.49E+02	3.03E+00	1.73E+01	6.54E+01	1.64E+00	1.03E+01	3.68E+01	1.61E+00	1.11E+01	4.32E+01
1946	5.34E+00	5.72E+01	1.74E+02	1.45E+00	6.28E+00	3.21E+01	6.76E+00	3.89E+01	1.30E+02	6.63E+00	3.71E+01	1.50E+02
1947	4.53E+00	4.71E+01	1.42E+02	1.06E+00	3.86E+00	2.62E+01	8.32E+00	5.29E+01	1.69E+02	2.56E+00	1.71E+01	6.07E+01
1948	1.94E+00	9.75E+00	3.40E+01	1.51E+00	6.44E+00	2.27E+01	9.73E-01	6.00E+00	1.65E+01	1.64E+00	1.08E+01	3.01E+01
1949	2.62E+00	1.12E+01	2.94E+01	1.10E+01	3.15E+01	8.26E+01	8.71E+00	2.55E+01	5.37E+01	9.71E+00	3.77E+01	9.05E+01
1950	3.23E+00	1.42E+01	3.11E+01	5.90E+00	1.93E+01	3.78E+01	6.94E+00	1.97E+01	4.12E+01	9.74E+00	3.20E+01	7.45E+01
1951	2.98E-01	1.08E+00	2.40E+00	1.31E+00	3.48E+00	9.06E+00	6.62E-01	2.05E+00	4.14E+00	8.84E-01	3.01E+00	6.64E+00
1952	5.99E-01	2.04E+00	3.97E+00	1.94E+00	4.76E+00	1.07E+01	2.49E+00	4.53E+00	1.12E+01	2.12E+00	5.56E+00	1.11E+01
1953	7.03E-01	2.15E+00	4.55E+00	1.05E+00	2.92E+00	5.49E+00	1.34E+00	3.27E+00	6.27E+00	1.57E+00	4.24E+00	8.07E+00
1954	7.55E-01	2.15E+00	4.69E+00	1.68E+00	4.37E+00	8.64E+00	1.38E+00	3.56E+00	5.87E+00	1.52E+00	4.69E+00	7.74E+00
1955	6.40E-01	1.69E+00	3.70E+00	1.38E+00	3.67E+00	7.25E+00	1.02E+00	2.75E+00	4.51E+00	1.28E+00	4.08E+00	6.68E+00
1956	8.47E-01	2.25E+00	5.49E+00	1.37E+00	3.43E+00	7.05E+00	1.71E+00	3.57E+00	7.48E+00	2.07E+00	4.64E+00	9.87E+00
1957	1.10E+00	2.88E+00	5.22E+00	2.36E+00	6.56E+00	1.30E+01	2.30E+00	4.99E+00	1.03E+01	1.85E+00	4.92E+00	1.03E+01
1958	1.66E+00	4.81E+00	7.38E+00	2.88E+00	7.95E+00	1.66E+01	2.48E+00	6.06E+00	1.26E+01	1.67E+00	4.72E+00	1.01E+01
1959	2.01E-01	5.11E-01	1.45E+00	4.12E+00	1.09E+01	2.20E+01	2.28E+00	6.29E+00	1.16E+01	1.70E+00	5.32E+00	1.08E+01
1960	2.14E-02	6.62E-02	1.33E-01	4.73E+00	2.80E-01	2.50E+01	3.32E+00	9.73E+00	1.78E+01	2.28E+00	8.56E+00	1.59E+01
1961	4.37E-02	1.13E-01	1.81E-01	3.61E+00	7.89E+00	1.84E+01	1.84E+00	5.25E+00	9.31E+00	1.60E+00	5.67E+00	1.04E+01
1962	2.07E-02	5.96E-02	8.95E-02	7.81E-01	1.97E+00	4.37E+00	1.05E+00	2.72E+00	6.60E+00	9.73E-01	2.91E+00	7.12E+00
1963	1.01E-01	3.03E-01	4.22E-01	1.08E-01	2.78E-01	5.55E-01	2.26E-01	6.07E-01	1.18E+00	9.44E-02	2.81E-01	6.88E-01
1964	8.18E-03	1.92E-02	2.78E-02	6.11E-03	1.52E-02	2.90E-02	1.16E-02	2.96E-02	5.62E-02	9.81E-03	2.84E-02	5.99E-02
1965	8.81E-03	1.90E-02	2.88E-02	4.40E-03	1.18E-02	2.11E-02	5.70E-03	1.43E-02	2.89E-02	4.92E-03	1.27E-02	3.33E-02
1966	1.55E-02	2.98E-02	4.55E-02	3.15E-03	5.99E-03	1.18E-02	5.37E-03	1.45E-02	2.69E-02	6.40E-03	1.72E-02	3.92E-02
1967	1.18E-02	2.48E-02	3.77E-02	6.73E-03	1.68E-02	3.19E-02	1.13E-02	2.92E-02	5.74E-02	1.79E-02	5.48E-02	1.25E-01
1968	9.25E-03	2.54E-02	3.77E-02	2.90E-03	7.07E-03	1.59E-02	1.31E-02	3.01E-02	7.14E-02	1.14E-02	3.43E-02	8.07E-02
1969	2.88E-03	5.96E-03	8.36E-03	1.78E-03	3.13E-03	7.66E-03	6.51E-03	1.47E-02	2.72E-02	1.51E-03	4.63E-03	9.29E-03
1970	3.58E-05	5.92E-05	1.25E-04	3.41E-03	9.21E-03	1.50E-02	2.41E-03	5.59E-03	1.08E-02	1.71E-05	4.48E-05	9.40E-05
1971	0.00E+00	0.00E+00	0.00E+00	5.14E-04	1.32E-03	2.96E-03	6.55E-04	1.95E-03	4.18E-03	0.00E+00	0.00E+00	0.00E+00
1972	0.00E+00	0.00E+00	0.00E+00	1.16E-04	3.54E-04	7.84E-04	6.48E-04	1.97E-03	4.33E-03	0.00E+00	0.00E+00	0.00E+00
1973	0.00E+00	0.00E+00	0.00E+00	5.99E-04	2.88E-03	4.22E-03	4.37E-04	1.60E-03	2.39E-03	0.00E+00	0.00E+00	0.00E+00
1974	0.00E+00	0.00E+00	0.00E+00	2.97E-05	1.81E-04	3.00E-04	2.94E-04	1.17E-03	1.70E-03	0.00E+00	0.00E+00	0.00E+00
1975	0.00E+00	0.00E+00	0.00E+00	3.18E-05	2.04E-04	3.52E-04	1.50E-04	7.81E-04	1.10E-03	0.00E+00	0.00E+00	0.00E+00
1976	0.00E+00	0.00E+00	0.00E+00	1.70E-06	1.13E-05	1.86E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1977	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1978	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1979	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1980	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1981	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1982	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1983	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1984	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1985	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1986	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1987	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1988	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1989	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1990	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1991	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

* The lower and upper bounds represent only the uncertainty on the source term and k_d values.

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APPENDIX 6B

SUMMARY OF ANNUAL AVERAGE CONCENTRATIONS OF RADIONUCLIDES IN CLINCH RIVER WATER USED IN THE ASSESSMENT

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Appendix 6B: Summary of Annual Average Concentrations of Radionuclides in Clinch River Water Used in the Assessment

The following tables contain the annual average concentrations of radionuclides in Clinch River water, with uncertainties, that were used as the starting point of the assessment. The tables contain the 2.5th, 50th, and 97.5th percentiles, corresponding to the median (central value) and 95% subjective confidence interval of the distributions describing the annual average concentrations at CRM 20.5, CRM 14, CRM 3.5, and CRM 0. For ^{137}Cs, ^{90}Sr, ^{106}Ru, and ^{60}Co, the concentrations from 1960-1990 were based on measurements to the extent available (Section 6.3). Concentrations for remaining years for these radionuclides and all concentrations for ^{131}I were based on the HEC-6-R output (Sections 6.11-6.12 and Appendix 6A). The subjective confidence intervals for all concentrations are intended to include all sources of uncertainty about the true annual average concentrations.

Table 6B.1 Annual average concentration of ^{137}Cs in water (Bq L^{-1}) used in the assessment, with all uncertainties and adjustments.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	1.87E-01	1.04E+00	5.69E+00	1.63E-01	9.54E-01	5.35E+00	1.13E-01	6.60E-01	3.90E+00	1.11E-01	6.33E-01	3.68E+00
1945	2.07E-01	9.71E-01	4.74E+00	1.82E-01	8.82E-01	4.32E+00	9.00E-02	5.22E-01	3.13E+00	8.29E-02	5.23E-01	2.62E+00
1946	3.53E-01	1.58E+00	7.69E+00	3.11E-01	1.45E+00	6.71E+00	2.31E-01	9.85E-01	5.01E+00	1.65E-01	1.00E+00	4.67E+00
1947	6.28E-02	4.36E-01	2.24E+00	6.36E-02	4.20E-01	2.52E+00	5.43E-02	2.97E-01	1.70E+00	4.24E-02	3.23E-01	1.59E+00
1948	1.77E-01	8.27E-01	4.19E+00	1.63E-01	8.12E-01	3.61E+00	9.42E-02	4.55E-01	2.41E+00	9.29E-02	4.80E-01	2.25E+00
1949	2.78E-01	5.90E-01	1.21E+00	2.68E-01	5.73E-01	1.28E+00	1.66E-01	3.66E-01	8.75E-01	1.65E-01	3.71E-01	8.06E-01
1950	5.85E-02	1.19E-01	2.67E-01	6.42E-02	1.54E-01	3.51E-01	4.60E-02	1.10E-01	2.60E-01	5.00E-02	1.09E-01	2.72E-01
1951	6.53E-02	1.31E-01	2.86E-01	5.54E-02	1.27E-01	2.87E-01	4.02E-02	8.63E-02	1.93E-01	4.02E-02	8.86E-02	1.99E-01
1952	3.81E-02	8.76E-02	1.87E-01	3.63E-02	8.00E-02	1.70E-01	2.49E-02	5.54E-02	1.16E-01	2.35E-02	5.33E-02	1.22E-01
1953	2.76E-02	5.75E-02	1.20E-01	2.65E-02	5.27E-02	1.13E-01	1.61E-02	3.38E-02	7.03E-02	1.54E-02	3.24E-02	7.09E-02
1954	1.37E-01	2.87E-01	6.40E-01	1.18E-01	2.45E-01	5.16E-01	6.41E-02	1.34E-01	2.72E-01	6.18E-02	1.29E-01	2.79E-01
1955	2.61E-01	5.34E-01	1.25E+00	2.34E-01	5.06E-01	1.03E+00	1.48E-01	3.12E-01	6.66E-01	1.50E-01	3.11E-01	6.48E-01
1956	7.16E-01	1.52E+00	3.26E+00	6.53E-01	1.37E+00	2.98E+00	3.92E-01	8.53E-01	1.74E+00	4.05E-01	8.05E-01	1.67E+00
1957	3.06E-01	6.48E-01	1.39E+00	3.21E-01	6.86E-01	1.47E+00	2.19E-01	4.64E-01	9.58E-01	2.15E-01	4.53E-01	9.48E-01
1958	2.20E-01	4.41E-01	9.38E-01	1.87E-01	3.97E-01	8.20E-01	1.18E-01	2.56E-01	5.31E-01	1.17E-01	2.47E-01	5.09E-01
1959	4.83E-01	9.88E-01	2.00E+00	4.23E-01	8.61E-01	1.86E+00	2.33E-01	4.74E-01	1.00E+00	2.22E-01	4.77E-01	9.84E-01
1960	3.93E-02	9.36E-02	2.23E-01	4.85E-02	9.36E-02	1.81E-01	4.83E-02	8.47E-02	1.49E-01	3.57E-02	8.51E-02	2.03E-01
1961	8.54E-03	2.04E-02	4.85E-02	1.06E-02	2.04E-02	3.93E-02	1.05E-02	1.84E-02	3.23E-02	7.76E-03	1.85E-02	4.41E-02
1962	1.20E-02	2.85E-02	6.79E-02	1.48E-02	2.85E-02	5.50E-02	1.47E-02	2.58E-02	4.52E-02	1.09E-02	2.59E-02	6.17E-02
1963	3.93E-02	9.36E-02	2.23E-01	4.85E-02	9.36E-02	1.81E-01	4.83E-02	8.47E-02	1.49E-01	3.57E-02	8.51E-02	2.03E-01
1964	5.64E-02	1.34E-01	3.20E-01	6.96E-02	1.34E-01	2.59E-01	6.93E-02	1.22E-01	2.13E-01	5.12E-02	1.22E-01	2.91E-01
1965	2.90E-02	6.92E-02	1.65E-01	3.59E-02	6.92E-02	1.33E-01	3.57E-02	6.26E-02	1.10E-01	2.64E-02	6.29E-02	1.50E-01
1966	2.73E-02	6.51E-02	1.55E-01	3.38E-02	6.51E-02	1.26E-01	3.36E-02	5.89E-02	1.03E-01	2.48E-02	5.92E-02	1.41E-01
1967	2.56E-02	6.11E-02	1.46E-01	3.17E-02	6.11E-02	1.18E-01	3.15E-02	5.52E-02	9.69E-02	2.33E-02	5.55E-02	1.32E-01
1968	2.39E-02	5.70E-02	1.36E-01	2.95E-02	5.70E-02	1.10E-01	2.94E-02	5.15E-02	9.04E-02	2.17E-02	5.18E-02	1.23E-01
1969	3.25E-02	7.73E-02	1.84E-01	4.01E-02	7.73E-02	1.49E-01	3.99E-02	7.00E-02	1.23E-01	2.95E-02	7.03E-02	1.68E-01
1970	3.25E-02	7.73E-02	1.84E-01	4.01E-02	7.73E-02	1.49E-01	3.99E-02	7.00E-02	1.23E-01	2.95E-02	7.03E-02	1.68E-01
1971	2.02E-02	4.81E-02	1.15E-01	3.29E-02	4.82E-02	7.06E-02	1.89E-02	3.31E-02	5.81E-02	1.40E-02	3.33E-02	7.94E-02
1972	1.09E-02	2.59E-02	6.17E-02	1.77E-02	2.60E-02	3.80E-02	1.05E-02	1.84E-02	3.23E-02	7.76E-03	1.85E-02	4.41E-02
1973	7.76E-03	1.85E-02	4.41E-02	1.27E-02	1.86E-02	2.72E-02	8.40E-03	1.47E-02	2.58E-02	6.21E-03	1.48E-02	3.53E-02
1974	7.76E-04	1.85E-03	4.41E-03	1.27E-03	1.86E-03	2.72E-03	1.68E-03	2.95E-03	5.17E-03	1.24E-03	2.96E-03	7.05E-03
1975	1.09E-03	2.59E-03	6.17E-03	1.77E-03	2.60E-03	3.80E-03	1.05E-03	1.84E-03	3.23E-03	7.76E-04	1.85E-03	4.41E-03
1976	4.66E-04	1.11E-03	2.65E-03	7.60E-04	1.11E-03	1.63E-03	4.20E-04	7.36E-04	1.29E-03	3.11E-04	7.40E-04	1.76E-03
1977	4.66E-04	1.11E-03	2.65E-03	7.60E-04	1.11E-03	1.63E-03	1.05E-02	1.84E-02	3.23E-02	7.76E-03	1.85E-02	4.41E-02
1978	1.82E-02	4.33E-02	1.03E-01	2.98E-02	4.34E-02	6.36E-02	1.49E-02	2.61E-02	4.58E-02	1.10E-02	2.63E-02	6.26E-02
1979	3.11E-04	7.40E-04	1.76E-03	5.06E-04	7.42E-04	1.09E-03	4.20E-04	7.36E-04	1.29E-03	3.11E-04	7.40E-04	1.76E-03
1980	1.24E-03	2.96E-03	7.05E-03	2.03E-03	2.97E-03	4.35E-03	1.38E-03	2.66E-03	5.14E-03	1.12E-03	2.69E-03	6.49E-03
1981	1.79E-03	4.26E-03	1.01E-02	2.91E-03	4.27E-03	6.25E-03	1.99E-03	3.83E-03	7.39E-03	1.61E-03	3.87E-03	9.32E-03
1982	1.04E-02	2.48E-02	5.91E-02	1.70E-02	2.49E-02	3.64E-02	1.16E-02	2.23E-02	4.30E-02	9.37E-03	2.26E-02	5.43E-02
1983	4.35E-03	1.04E-02	2.47E-02	7.09E-03	1.04E-02	1.52E-02	4.83E-03	9.32E-03	1.80E-02	3.92E-03	9.43E-03	2.27E-02
1984	2.65E-03	5.35E-03	1.07E-02	2.72E-03	5.55E-03	1.07E-02	1.82E-03	3.73E-03	7.36E-03	1.87E-03	3.82E-03	7.66E-03
1985	2.64E-03	6.29E-03	1.50E-02	4.30E-03	6.31E-03	9.24E-03	2.94E-03	5.66E-03	1.09E-02	2.38E-03	5.72E-03	1.38E-02
1986	6.70E-03	1.36E-02	2.75E-02	6.61E-03	1.35E-02	2.70E-02	3.70E-03	7.48E-03	1.53E-02	3.62E-03	7.32E-03	1.46E-02
1987	2.89E-03	5.89E-03	1.13E-02	2.93E-03	5.84E-03	1.19E-02	2.24E-03	4.55E-03	9.02E-03	2.25E-03	4.40E-03	8.58E-03
1988	4.32E-03	8.71E-03	1.80E-02	4.17E-03	8.44E-03	1.77E-02	2.31E-03	4.88E-03	9.31E-03	2.47E-03	4.85E-03	1.00E-02
1989	7.61E-03	1.81E-02	4.32E-02	1.24E-02	1.82E-02	2.66E-02	8.46E-03	1.63E-02	3.15E-02	6.85E-03	1.65E-02	3.97E-02
1990	2.48E-03	5.92E-03	1.41E-02	4.05E-03	5.94E-03	8.70E-03	2.76E-03	5.33E-03	1.03E-02	2.24E-03	5.39E-03	1.30E-02
1991	1.10E-02	2.15E-02	4.38E-02	1.09E-02	2.14E-02	4.26E-02	6.66E-03	1.31E-02	2.62E-02	6.49E-03	1.30E-02	2.60E-02

Table 6B.2 Annual average concentration of ^{90}Sr in water (Bq L^{-1}) used in the assessment, with all uncertainties and adjustments.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	2.36E-01	9.91E-01	3.74E+00	2.90E-01	9.70E-01	3.73E+00	2.40E-01	7.47E-01	2.56E+00	2.18E-01	8.32E-01	2.66E+00
1945	2.49E-01	9.06E-01	3.19E+00	2.65E-01	9.20E-01	3.11E+00	1.97E-01	6.41E-01	2.05E+00	1.81E-01	6.37E-01	2.14E+00
1946	4.09E-01	1.55E+00	6.03E+00	4.35E-01	1.60E+00	5.97E+00	3.61E-01	1.14E+00	4.58E+00	3.28E-01	1.18E+00	4.16E+00
1947	1.12E-01	3.96E-01	1.37E+00	1.07E-01	4.02E-01	1.30E+00	1.00E-01	2.98E-01	9.70E-01	9.24E-02	2.91E-01	1.07E+00
1948	2.69E-01	7.59E-01	1.93E+00	2.76E-01	7.60E-01	1.86E+00	1.90E-01	4.87E-01	1.38E+00	1.89E-01	4.75E-01	1.21E+00
1949	5.49E-01	1.21E+00	2.54E+00	5.56E-01	1.23E+00	2.62E+00	4.19E-01	8.63E-01	1.89E+00	4.09E-01	8.66E-01	1.83E+00
1950	1.25E-01	2.59E-01	5.68E-01	1.19E-01	2.57E-01	5.61E-01	8.08E-02	1.76E-01	3.76E-01	8.29E-02	1.77E-01	3.89E-01
1951	9.10E-02	2.09E-01	4.54E-01	9.46E-02	2.03E-01	4.47E-01	6.86E-02	1.41E-01	3.06E-01	6.42E-02	1.40E-01	3.08E-01
1952	3.02E-01	6.68E-01	1.35E+00	3.17E-01	6.59E-01	1.41E+00	2.34E-01	5.14E-01	1.16E+00	2.38E-01	5.21E-01	1.13E+00
1953	6.25E-01	1.28E+00	2.55E+00	6.01E-01	1.28E+00	2.72E+00	4.39E-01	9.60E-01	1.93E+00	4.63E-01	9.46E-01	2.02E+00
1954	9.85E-01	2.01E+00	4.35E+00	9.43E-01	1.97E+00	4.13E+00	5.91E-01	1.20E+00	2.62E+00	5.93E-01	1.24E+00	2.44E+00
1955	4.18E-01	8.81E-01	1.80E+00	4.13E-01	8.54E-01	1.81E+00	2.90E-01	6.35E-01	1.32E+00	3.08E-01	6.10E-01	1.32E+00
1956	4.32E-01	9.69E-01	2.04E+00	4.35E-01	9.62E-01	1.99E+00	2.97E-01	6.31E-01	1.39E+00	3.02E-01	6.30E-01	1.34E+00
1957	2.99E-01	6.38E-01	1.38E+00	3.02E-01	6.49E-01	1.31E+00	2.11E-01	4.42E-01	9.16E-01	2.10E-01	4.35E-01	8.99E-01
1958	5.98E-01	1.32E+00	2.83E+00	5.86E-01	1.33E+00	2.72E+00	4.93E-01	1.08E+00	2.31E+00	4.94E-01	1.07E+00	2.23E+00
1959	4.12E-01	8.60E-01	1.71E+00	4.00E-01	8.35E-01	1.85E+00	2.60E-01	5.52E-01	1.15E+00	2.67E-01	5.50E-01	1.12E+00
1960	1.62E-01	3.87E-01	9.21E-01	2.01E-01	3.87E-01	7.46E-01	1.99E-01	3.50E-01	6.13E-01	1.48E-01	3.52E-01	8.38E-01
1961	7.35E-02	1.75E-01	4.17E-01	9.07E-02	1.75E-01	3.38E-01	9.03E-02	1.58E-01	2.78E-01	6.68E-02	1.59E-01	3.79E-01
1962	5.81E-02	1.38E-01	3.30E-01	7.18E-02	1.38E-01	2.67E-01	7.14E-02	1.25E-01	2.20E-01	5.28E-02	1.26E-01	3.00E-01
1963	4.95E-02	1.18E-01	2.81E-01	6.12E-02	1.18E-01	2.28E-01	6.09E-02	1.07E-01	1.87E-01	4.50E-02	1.07E-01	2.56E-01
1964	4.78E-02	1.14E-01	2.72E-01	5.91E-02	1.14E-01	2.20E-01	5.88E-02	1.03E-01	1.81E-01	4.35E-02	1.04E-01	2.47E-01
1965	2.56E-02	6.11E-02	1.46E-01	3.17E-02	6.11E-02	1.18E-01	3.15E-02	5.52E-02	9.69E-02	2.33E-02	5.55E-02	1.32E-01
1966	3.59E-02	8.55E-02	2.04E-01	4.43E-02	8.55E-02	1.65E-01	4.41E-02	7.73E-02	1.36E-01	3.26E-02	7.77E-02	1.85E-01
1967	2.05E-02	4.88E-02	1.16E-01	2.53E-02	4.88E-02	9.42E-02	2.52E-02	4.42E-02	7.75E-02	1.86E-02	4.44E-02	1.06E-01
1968	2.56E-02	6.11E-02	1.46E-01	3.17E-02	6.11E-02	1.18E-01	3.15E-02	5.52E-02	9.69E-02	2.33E-02	5.55E-02	1.32E-01
1969	1.88E-02	4.48E-02	1.07E-01	2.32E-02	4.48E-02	8.64E-02	2.31E-02	4.05E-02	7.10E-02	1.71E-02	4.07E-02	9.70E-02
1970	1.88E-02	4.48E-02	1.07E-01	2.32E-02	4.48E-02	8.64E-02	2.31E-02	4.05E-02	7.10E-02	1.71E-02	4.07E-02	9.70E-02
1971	2.80E-02	6.66E-02	1.59E-01	4.56E-02	6.68E-02	9.78E-02	2.10E-02	3.68E-02	6.46E-02	1.55E-02	3.70E-02	8.82E-02
1972	2.33E-02	5.55E-02	1.32E-01	3.80E-02	5.56E-02	8.15E-02	2.31E-02	4.05E-02	7.10E-02	1.71E-02	4.07E-02	9.70E-02
1973	1.86E-02	4.44E-02	1.06E-01	3.04E-02	4.45E-02	6.52E-02	3.57E-02	6.26E-02	1.10E-01	2.64E-02	6.29E-02	1.50E-01
1974	9.01E-03	2.15E-02	5.11E-02	1.47E-02	2.15E-02	3.15E-02	9.45E-03	1.66E-02	2.91E-02	6.99E-03	1.67E-02	3.97E-02
1975	6.52E-03	1.55E-02	3.70E-02	1.06E-02	1.56E-02	2.28E-02	6.51E-03	1.14E-02	2.00E-02	4.81E-03	1.15E-02	2.73E-02
1976	4.04E-03	9.62E-03	2.29E-02	6.58E-03	9.64E-03	1.41E-02	5.04E-03	8.84E-03	1.55E-02	3.73E-03	8.88E-03	2.12E-02
1977	2.80E-03	6.66E-03	1.59E-02	4.56E-03	6.68E-03	9.78E-03	5.67E-03	9.94E-03	1.74E-02	4.19E-03	9.99E-03	2.38E-02
1978	1.71E-03	4.07E-03	9.70E-03	2.79E-03	4.08E-03	5.98E-03	2.10E-03	3.68E-03	6.46E-03	1.55E-03	3.70E-03	8.82E-03
1979	6.21E-03	1.48E-02	3.53E-02	1.01E-02	1.48E-02	2.17E-02	6.93E-03	1.22E-02	2.13E-02	5.12E-03	1.22E-02	2.91E-02
1980	1.17E-02	2.78E-02	6.61E-02	1.90E-02	2.78E-02	4.08E-02	1.30E-02	2.50E-02	4.82E-02	1.05E-02	2.53E-02	6.08E-02
1981	2.23E-02	5.32E-02	1.27E-01	3.64E-02	5.34E-02	7.82E-02	2.49E-02	4.79E-02	9.24E-02	2.01E-02	4.85E-02	1.17E-01
1982	2.80E-02	6.66E-02	1.59E-01	4.56E-02	6.68E-02	9.78E-02	3.11E-02	5.99E-02	1.16E-01	2.52E-02	6.06E-02	1.46E-01
1983	3.11E-02	7.40E-02	1.76E-01	5.06E-02	7.42E-02	1.09E-01	3.45E-02	6.66E-02	1.29E-01	2.80E-02	6.73E-02	1.62E-01
1984	1.71E-02	4.07E-02	9.70E-02	2.79E-02	4.08E-02	5.98E-02	1.90E-02	3.66E-02	7.07E-02	1.54E-02	3.70E-02	8.92E-02
1985	2.95E-02	7.03E-02	1.68E-01	4.81E-02	7.05E-02	1.03E-01	3.28E-02	6.33E-02	1.22E-01	2.66E-02	6.40E-02	1.54E-01
1986	2.95E-02	7.03E-02	1.68E-01	4.81E-02	7.05E-02	1.03E-01	3.28E-02	6.33E-02	1.22E-01	2.66E-02	6.40E-02	1.54E-01
1987	5.12E-02	1.22E-01	2.91E-01	8.36E-02	1.22E-01	1.79E-01	5.70E-02	1.10E-01	2.12E-01	4.61E-02	1.11E-01	2.68E-01
1988	2.95E-02	7.03E-02	1.68E-01	4.81E-02	7.05E-02	1.03E-01	3.28E-02	6.33E-02	1.22E-01	2.66E-02	6.40E-02	1.54E-01
1989	3.42E-02	8.14E-02	1.94E-01	5.57E-02	8.16E-02	1.20E-01	3.80E-02	7.33E-02	1.41E-01	3.08E-02	7.41E-02	1.78E-01
1990	1.32E-02	3.15E-02	7.49E-02	2.15E-02	3.15E-02	4.62E-02	1.47E-02	2.83E-02	5.46E-02	1.19E-02	2.86E-02	6.89E-02
1991	1.89E-02	3.71E-02	7.20E-02	1.90E-02	3.61E-02	7.42E-02	1.16E-02	2.37E-02	4.67E-02	1.18E-02	2.34E-02	4.74E-02

Table 6B.3 Annual average concentration of ^{106}Ru in water (Bq L^{-1}) used in the assessment, with all uncertainties and adjustments.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	1.35E-01	5.27E-01	1.86E+00	1.64E-01	5.34E-01	1.77E+00	1.14E-01	4.06E-01	1.34E+00	1.13E-01	4.03E-01	1.27E+00
1945	1.33E-01	4.63E-01	1.66E+00	1.14E-01	4.73E-01	1.77E+00	9.77E-02	3.28E-01	1.32E+00	9.23E-02	3.16E-01	1.27E+00
1946	2.26E-01	7.82E-01	2.83E+00	2.20E-01	8.04E-01	2.92E+00	1.62E-01	5.91E-01	2.05E+00	1.75E-01	5.87E-01	2.01E+00
1947	5.66E-02	1.93E-01	6.25E-01	5.71E-02	2.03E-01	6.98E-01	4.64E-02	1.49E-01	5.78E-01	3.91E-02	1.56E-01	5.11E-01
1948	1.46E-01	3.92E-01	1.05E+00	1.47E-01	3.81E-01	9.71E-01	9.71E-02	2.42E-01	7.38E-01	9.71E-02	2.40E-01	6.97E-01
1949	4.10E-01	8.94E-01	1.92E+00	3.99E-01	8.98E-01	1.93E+00	3.07E-01	6.47E-01	1.35E+00	2.90E-01	6.52E-01	1.34E+00
1950	7.21E-02	1.50E-01	3.24E-01	6.95E-02	1.60E-01	3.41E-01	5.08E-02	1.10E-01	2.32E-01	5.00E-02	1.09E-01	2.45E-01
1951	5.64E-02	1.28E-01	2.79E-01	5.84E-02	1.22E-01	2.77E-01	3.94E-02	8.41E-02	2.00E-01	4.03E-02	8.70E-02	1.96E-01
1952	6.72E-02	1.41E-01	2.87E-01	6.43E-02	1.36E-01	3.17E-01	4.91E-02	1.07E-01	2.34E-01	5.10E-02	1.06E-01	2.30E-01
1953	1.19E-01	2.44E-01	5.34E-01	1.17E-01	2.46E-01	5.24E-01	8.63E-02	1.84E-01	3.84E-01	8.74E-02	1.83E-01	3.76E-01
1954	7.84E-02	1.59E-01	3.51E-01	7.70E-02	1.56E-01	3.40E-01	4.77E-02	9.72E-02	2.05E-01	4.58E-02	9.78E-02	2.00E-01
1955	1.34E-01	2.92E-01	6.18E-01	1.41E-01	2.92E-01	6.07E-01	1.01E-01	2.05E-01	4.24E-01	9.89E-02	2.07E-01	4.35E-01
1956	1.38E-01	2.75E-01	5.67E-01	1.29E-01	2.74E-01	5.62E-01	8.91E-02	1.79E-01	3.83E-01	8.86E-02	1.83E-01	3.84E-01
1957	2.17E-01	4.73E-01	9.88E-01	2.35E-01	4.61E-01	1.03E+00	1.46E-01	3.20E-01	6.57E-01	1.47E-01	3.17E-01	6.74E-01
1958	1.77E-01	3.72E-01	8.10E-01	1.77E-01	3.69E-01	7.71E-01	1.40E-01	2.98E-01	6.27E-01	1.36E-01	3.00E-01	6.13E-01
1959	3.61E+00	7.56E+00	1.52E+01	3.64E+00	7.46E+00	1.52E+01	2.21E+00	4.67E+00	9.87E+00	2.18E+00	4.60E+00	1.01E+01
1960	6.23E+00	1.49E+01	3.54E+01	7.70E+00	1.49E+01	2.87E+01	7.66E+00	1.34E+01	2.36E+01	5.67E+00	1.35E+01	3.22E+01
1961	4.78E+00	1.14E+01	2.72E+01	5.91E+00	1.14E+01	2.20E+01	5.88E+00	1.03E+01	1.81E+01	4.35E+00	1.04E+01	2.47E+01
1962	2.73E+00	6.51E+00	1.55E+01	3.38E+00	6.51E+00	1.26E+01	3.36E+00	5.89E+00	1.03E+01	2.48E+00	5.92E+00	1.41E+01
1963	1.42E+00	3.38E+00	8.05E+00	1.75E+00	3.38E+00	6.52E+00	1.74E+00	3.06E+00	5.36E+00	1.29E+00	3.07E+00	7.32E+00
1964	7.69E-01	1.83E+00	4.36E+00	9.50E-01	1.83E+00	3.53E+00	9.45E-01	1.66E+00	2.91E+00	6.99E-01	1.67E+00	3.97E+00
1965	2.05E-01	4.88E-01	1.16E+00	2.53E-01	4.88E-01	9.42E-01	2.52E-01	4.42E-01	7.75E-01	1.86E-01	4.44E-01	1.06E+00
1966	6.66E-02	1.59E-01	3.78E-01	8.23E-02	1.59E-01	3.06E-01	8.19E-02	1.44E-01	2.52E-01	6.06E-02	1.44E-01	3.44E-01
1967	1.03E-02	2.44E-02	5.82E-02	1.27E-02	2.44E-02	4.71E-02	1.26E-02	2.21E-02	3.87E-02	9.32E-03	2.22E-02	5.29E-02
1968	1.20E-02	2.85E-02	6.79E-02	1.48E-02	2.85E-02	5.50E-02	1.47E-02	2.58E-02	4.52E-02	1.09E-02	2.59E-02	6.17E-02
1969	2.39E-02	5.70E-02	1.36E-01	2.95E-02	5.70E-02	1.10E-01	2.94E-02	5.15E-02	9.04E-02	2.17E-02	5.18E-02	1.23E-01
1970	8.54E-03	2.04E-02	4.85E-02	1.06E-02	2.04E-02	3.93E-02	1.05E-02	1.84E-02	3.23E-02	7.76E-03	1.85E-02	4.41E-02
1971	4.19E-02	9.99E-02	2.38E-01	6.84E-02	1.00E-01	1.47E-01	4.20E-02	7.36E-02	1.29E-01	3.11E-02	7.40E-02	1.76E-01
1972	1.24E-02	2.96E-02	7.05E-02	2.03E-02	2.97E-02	4.35E-02	1.26E-02	2.21E-02	3.87E-02	9.32E-03	2.22E-02	5.29E-02
1973	7.76E-03	1.85E-02	4.41E-02	1.27E-02	1.86E-02	2.72E-02	1.05E-02	1.84E-02	3.23E-02	7.76E-03	1.85E-02	4.41E-02
1974	2.02E-03	4.81E-03	1.15E-02	3.29E-03	4.82E-03	7.06E-03	6.51E-03	1.14E-02	2.00E-02	4.81E-03	1.15E-02	2.73E-02
1975	2.02E-03	4.81E-03	1.15E-02	3.29E-03	4.82E-03	7.06E-03	3.99E-03	7.00E-03	1.23E-02	2.95E-03	7.03E-03	1.68E-02
1976	2.17E-03	5.18E-03	1.23E-02	3.55E-03	5.19E-03	7.61E-03	3.15E-03	5.52E-03	9.69E-03	2.33E-03	5.55E-03	1.32E-02
1977	2.33E-03	5.55E-03	1.32E-02	3.80E-03	5.56E-03	8.15E-03	3.99E-03	7.00E-03	1.23E-02	2.95E-03	7.03E-03	1.68E-02
1978	1.32E-02	3.15E-02	7.49E-02	2.15E-02	3.15E-02	4.62E-02	1.53E-02	2.69E-02	4.71E-02	1.13E-02	2.70E-02	6.44E-02
1979	1.24E-03	2.96E-03	7.05E-03	2.03E-03	2.97E-03	4.35E-03	2.31E-03	4.05E-03	7.10E-03	1.71E-03	4.07E-03	9.70E-03
1980	2.64E-03	6.29E-03	1.50E-02	4.30E-03	6.31E-03	9.24E-03	2.94E-03	5.66E-03	1.09E-02	2.38E-03	5.72E-03	1.38E-02
1981	7.14E-04	1.44E-03	2.88E-03	7.24E-04	1.46E-03	2.87E-03	5.04E-04	9.65E-04	1.96E-03	4.89E-04	1.01E-03	1.98E-03
1982	6.75E-04	1.35E-03	2.63E-03	6.71E-04	1.34E-03	2.70E-03	4.96E-04	9.81E-04	1.93E-03	4.83E-04	9.73E-04	1.91E-03
1983	9.03E-04	1.76E-03	3.52E-03	9.21E-04	1.75E-03	3.45E-03	6.05E-04	1.21E-03	2.43E-03	6.04E-04	1.22E-03	2.42E-03
1984	8.20E-04	1.63E-03	3.24E-03	8.30E-04	1.64E-03	3.20E-03	5.58E-04	1.11E-03	2.24E-03	5.50E-04	1.15E-03	2.15E-03
1985	3.81E-05	7.44E-05	1.43E-04	3.80E-05	7.38E-05	1.42E-04	3.81E-05	7.32E-05	1.42E-04	3.85E-05	7.40E-05	1.42E-04
1986	2.03E-12	4.11E-12	7.82E-12	2.07E-12	4.07E-12	7.97E-12	2.15E-12	4.08E-12	7.94E-12	2.10E-12	4.07E-12	7.89E-12
1987	2.09E-12	4.08E-12	7.85E-12	2.07E-12	4.06E-12	7.77E-12	2.11E-12	4.05E-12	7.93E-12	2.12E-12	4.01E-12	7.92E-12
1988	2.10E-12	4.05E-12	8.02E-12	2.10E-12	4.03E-12	8.07E-12	2.10E-12	4.09E-12	7.79E-12	2.09E-12	4.09E-12	7.86E-12
1989	2.09E-12	3.99E-12	8.07E-12	2.09E-12	4.09E-12	7.91E-12	2.09E-12	4.10E-12	7.78E-12	2.12E-12	4.03E-12	8.01E-12
1990	2.09E-12	4.05E-12	7.99E-12	2.12E-12	4.11E-12	8.03E-12	2.09E-12	4.10E-12	7.99E-12	2.07E-12	4.04E-12	7.89E-12
1991	2.03E-12	4.06E-12	7.84E-12	2.11E-12	4.04E-12	7.99E-12	2.03E-12	4.09E-12	7.87E-12	2.09E-12	4.09E-12	8.13E-12

Table 6B.4 Annual average concentration of ^{60}Co in water (Bq L^{-1}) used in the assessment, with all uncertainties and adjustments.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1945	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1946	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1947	9.30E-03	6.20E-02	5.18E-01	1.02E-02	6.34E-02	4.48E-01	5.60E-03	4.44E-02	3.64E-01	6.33E-03	4.30E-02	3.12E-01
1948	2.05E-02	1.37E-01	7.08E-01	1.91E-02	1.28E-01	7.33E-01	1.51E-02	7.13E-02	4.75E-01	1.32E-02	7.69E-02	4.99E-01
1949	3.66E-02	2.54E-01	1.44E+00	3.98E-02	2.41E-01	1.85E+00	2.22E-02	1.64E-01	1.19E+00	2.94E-02	1.60E-01	1.27E+00
1950	8.58E-03	5.51E-02	3.41E-01	8.53E-03	5.58E-02	3.54E-01	5.70E-03	3.93E-02	1.94E-01	6.29E-03	3.70E-02	2.76E-01
1951	4.31E-03	3.21E-02	2.28E-01	4.39E-03	3.21E-02	1.72E-01	3.19E-03	2.21E-02	1.23E-01	3.27E-03	2.04E-02	1.27E-01
1952	1.18E-02	8.74E-02	4.90E-01	1.49E-02	7.77E-02	5.59E-01	9.38E-03	6.09E-02	4.18E-01	8.92E-03	5.94E-02	4.15E-01
1953	1.99E-02	1.27E-01	8.55E-01	1.93E-02	1.24E-01	7.51E-01	1.15E-02	8.21E-02	5.52E-01	1.13E-02	7.77E-02	5.60E-01
1954	4.16E-02	2.17E-01	1.40E+00	3.82E-02	2.11E-01	1.66E+00	1.84E-02	1.25E-01	7.91E-01	1.99E-02	1.25E-01	8.85E-01
1955	2.84E-02	6.08E-02	1.29E-01	2.80E-02	6.23E-02	1.31E-01	1.96E-02	4.10E-02	8.80E-02	1.87E-02	4.05E-02	9.34E-02
1956	2.12E-01	4.34E-01	8.66E-01	2.02E-01	4.08E-01	8.75E-01	1.23E-01	2.56E-01	5.41E-01	1.21E-01	2.60E-01	5.44E-01
1957	1.79E-02	3.83E-02	7.77E-02	1.98E-02	4.26E-02	9.21E-02	1.47E-02	3.08E-02	6.42E-02	1.43E-02	3.08E-02	6.51E-02
1958	3.52E-02	7.63E-02	1.63E-01	3.25E-02	7.38E-02	1.57E-01	2.74E-02	5.29E-02	1.12E-01	2.55E-02	5.53E-02	1.10E-01
1959	5.17E-01	1.05E+00	2.28E+00	4.76E-01	1.03E+00	2.12E+00	2.96E-01	6.13E-01	1.23E+00	2.94E-01	5.86E-01	1.24E+00
1960	9.05E-02	2.16E-01	5.14E-01	1.12E-01	2.16E-01	4.16E-01	1.11E-01	1.95E-01	3.42E-01	8.23E-02	1.96E-01	4.67E-01
1961	6.66E-02	1.59E-01	3.78E-01	8.23E-02	1.59E-01	3.06E-01	8.19E-02	1.44E-01	2.52E-01	6.06E-02	1.44E-01	3.44E-01
1962	5.47E-02	1.30E-01	3.10E-01	6.75E-02	1.30E-01	2.51E-01	6.72E-02	1.18E-01	2.07E-01	4.97E-02	1.18E-01	2.82E-01
1963	8.03E-02	1.91E-01	4.56E-01	9.92E-02	1.91E-01	3.69E-01	9.87E-02	1.73E-01	3.04E-01	7.30E-02	1.74E-01	4.14E-01
1964	7.35E-02	1.75E-01	4.17E-01	9.07E-02	1.75E-01	3.38E-01	9.03E-02	1.58E-01	2.78E-01	6.68E-02	1.59E-01	3.79E-01
1965	3.93E-02	9.36E-02	2.23E-01	4.85E-02	9.36E-02	1.81E-01	4.83E-02	8.47E-02	1.49E-01	3.57E-02	8.51E-02	2.03E-01
1966	6.32E-02	1.51E-01	3.59E-01	7.81E-02	1.51E-01	2.90E-01	7.77E-02	1.36E-01	2.39E-01	5.75E-02	1.37E-01	3.26E-01
1967	2.05E-02	4.88E-02	1.16E-01	2.53E-02	4.88E-02	9.42E-02	2.52E-02	4.42E-02	7.75E-02	1.86E-02	4.44E-02	1.06E-01
1968	4.61E-02	1.10E-01	2.62E-01	5.70E-02	1.10E-01	2.12E-01	5.67E-02	9.94E-02	1.74E-01	4.19E-02	9.99E-02	2.38E-01
1969	5.98E-02	1.43E-01	3.39E-01	7.39E-02	1.43E-01	2.75E-01	7.35E-02	1.29E-01	2.26E-01	5.44E-02	1.30E-01	3.09E-01
1970	1.71E-02	4.07E-02	9.70E-02	2.11E-02	4.07E-02	7.85E-02	2.10E-02	3.68E-02	6.46E-02	1.55E-02	3.70E-02	8.82E-02
1971	9.32E-03	2.22E-02	5.29E-02	1.52E-02	2.23E-02	3.26E-02	1.68E-02	2.95E-02	5.17E-02	1.24E-02	2.96E-02	7.05E-02
1972	2.82E-03	5.63E-03	1.11E-02	2.91E-03	5.74E-03	1.14E-02	2.16E-03	4.29E-03	8.56E-03	2.17E-03	4.25E-03	8.58E-03
1973	2.98E-03	5.95E-03	1.18E-02	3.00E-03	5.88E-03	1.18E-02	2.10E-03	4.03E-03	8.05E-03	2.05E-03	4.12E-03	8.27E-03
1974	1.54E-03	3.09E-03	6.11E-03	2.26E-03	4.43E-03	8.89E-03	1.67E-03	3.42E-03	6.81E-03	1.73E-03	3.42E-03	7.09E-03
1975	1.49E-03	3.02E-03	5.72E-03	1.49E-03	2.94E-03	5.80E-03	1.10E-03	2.19E-03	4.47E-03	1.11E-03	2.19E-03	4.39E-03
1976	4.44E-03	8.76E-03	1.86E-02	4.51E-03	8.93E-03	1.81E-02	3.16E-03	6.22E-03	1.27E-02	3.11E-03	6.23E-03	1.23E-02
1977	1.39E-03	2.78E-03	5.58E-03	1.37E-03	2.80E-03	5.45E-03	1.06E-03	2.08E-03	4.11E-03	1.06E-03	2.12E-03	4.23E-03
1978	2.48E-03	5.92E-03	1.41E-02	4.05E-03	5.94E-03	8.70E-03	2.31E-03	4.05E-03	7.10E-03	1.71E-03	4.07E-03	9.70E-03
1979	7.76E-04	1.85E-03	4.41E-03	1.27E-03	1.86E-03	2.72E-03	8.40E-04	1.47E-03	2.58E-03	6.21E-04	1.48E-03	3.53E-03
1980	3.26E-03	7.77E-03	1.85E-02	5.32E-03	7.79E-03	1.14E-02	3.63E-03	6.99E-03	1.35E-02	2.94E-03	7.07E-03	1.70E-02
1981	1.48E-03	3.52E-03	8.38E-03	2.41E-03	3.52E-03	5.16E-03	1.64E-03	3.16E-03	6.10E-03	1.33E-03	3.20E-03	7.70E-03
1982	9.32E-03	2.22E-02	5.29E-02	1.52E-02	2.23E-02	3.26E-02	1.04E-02	2.00E-02	3.85E-02	8.39E-03	2.02E-02	4.86E-02
1983	2.48E-03	5.92E-03	1.41E-02	4.05E-03	5.94E-03	8.70E-03	2.76E-03	5.33E-03	1.03E-02	2.24E-03	5.39E-03	1.30E-02
1984	8.28E-04	1.63E-03	3.22E-03	8.33E-04	1.63E-03	3.41E-03	5.69E-04	1.13E-03	2.34E-03	5.76E-04	1.14E-03	2.26E-03
1985	2.17E-03	5.18E-03	1.23E-02	3.55E-03	5.19E-03	7.61E-03	2.42E-03	4.66E-03	8.99E-03	1.96E-03	4.71E-03	1.14E-02
1986	3.71E-03	7.45E-03	1.51E-02	3.79E-03	7.58E-03	1.50E-02	2.57E-03	5.07E-03	9.66E-03	2.47E-03	4.95E-03	9.63E-03
1987	6.13E-04	1.17E-03	2.33E-03	6.04E-04	1.23E-03	2.43E-03	5.19E-04	1.04E-03	2.09E-03	5.20E-04	1.03E-03	2.05E-03
1988	7.52E-04	1.51E-03	2.96E-03	7.61E-04	1.51E-03	3.05E-03	4.55E-04	9.33E-04	1.82E-03	4.53E-04	9.23E-04	1.86E-03
1989	4.81E-03	1.15E-02	2.73E-02	7.85E-03	1.15E-02	1.69E-02	5.35E-03	1.03E-02	1.99E-02	4.34E-03	1.04E-02	2.51E-02
1990	4.50E-03	1.07E-02	2.56E-02	7.34E-03	1.08E-02	1.58E-02	5.01E-03	9.66E-03	1.86E-02	4.06E-03	9.76E-03	2.35E-02
1991	7.79E-04	1.60E-03	3.25E-03	8.01E-04	1.64E-03	3.16E-03	5.17E-04	1.01E-03	1.96E-03	4.99E-04	1.03E-03	1.94E-03

Table 6B.5 Annual average concentration of ^{131}I in water (Bq L^{-1}) used in the assessment, with all uncertainties and adjustments.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	4.56E-02	3.78E-01	2.64E+00	4.39E-02	3.57E-01	2.63E+00	3.44E-02	2.94E-01	2.75E+00	3.84E-02	2.96E-01	2.43E+00
1945	4.46E-02	3.28E-01	2.69E+00	3.76E-02	3.29E-01	2.56E+00	2.80E-02	2.21E-01	1.91E+00	2.49E-02	2.40E-01	1.71E+00
1946	5.95E-02	5.82E-01	5.13E+00	8.29E-02	5.79E-01	4.52E+00	4.99E-02	4.25E-01	3.34E+00	5.59E-02	4.38E-01	3.86E+00
1947	1.71E-02	1.47E-01	1.14E+00	1.76E-02	1.49E-01	9.88E-01	1.19E-02	1.06E-01	9.37E-01	1.42E-02	1.06E-01	8.74E-01
1948	3.54E-02	2.94E-01	2.07E+00	4.26E-02	2.81E-01	1.92E+00	2.98E-02	1.88E-01	1.21E+00	2.59E-02	1.75E-01	1.38E+00
1949	2.89E-01	6.08E-01	1.35E+00	2.93E-01	6.06E-01	1.37E+00	2.09E-01	4.48E-01	9.61E-01	2.01E-01	4.56E-01	9.52E-01
1950	5.91E-02	1.28E-01	2.71E-01	5.60E-02	1.25E-01	2.79E-01	4.23E-02	8.92E-02	1.96E-01	4.02E-02	8.74E-02	1.95E-01
1951	5.58E-02	1.27E-01	2.71E-01	5.86E-02	1.29E-01	2.79E-01	3.95E-02	8.69E-02	1.86E-01	4.23E-02	8.90E-02	1.88E-01
1952	8.47E-02	1.82E-01	4.07E-01	8.36E-02	1.83E-01	3.84E-01	6.58E-02	1.43E-01	3.17E-01	6.74E-02	1.47E-01	3.01E-01
1953	1.00E-02	2.08E-02	4.33E-02	9.98E-03	2.08E-02	4.60E-02	7.42E-03	1.53E-02	3.19E-02	7.36E-03	1.53E-02	3.25E-02
1954	2.45E-02	4.96E-02	1.09E-01	2.46E-02	5.01E-02	1.03E-01	1.50E-02	2.99E-02	6.29E-02	1.52E-02	3.05E-02	6.69E-02
1955	3.02E-02	6.57E-02	1.37E-01	3.14E-02	6.62E-02	1.42E-01	2.21E-02	4.76E-02	1.01E-01	2.20E-02	4.69E-02	1.01E-01
1956	1.60E-02	3.27E-02	6.94E-02	1.51E-02	3.30E-02	6.99E-02	1.07E-02	2.22E-02	4.61E-02	1.04E-02	2.20E-02	4.41E-02
1957	4.53E-03	9.29E-03	1.91E-02	4.42E-03	9.22E-03	1.97E-02	2.89E-03	6.26E-03	1.29E-02	2.89E-03	6.27E-03	1.31E-02
1958	3.52E-02	7.29E-02	1.56E-01	3.43E-02	7.43E-02	1.45E-01	2.67E-02	5.73E-02	1.21E-01	2.74E-02	5.72E-02	1.18E-01
1959	3.06E-03	6.66E-03	1.38E-02	3.19E-03	6.71E-03	1.41E-02	2.03E-03	4.32E-03	9.23E-03	2.01E-03	4.23E-03	9.07E-03
1960	2.83E-02	5.88E-02	1.23E-01	2.62E-02	5.87E-02	1.19E-01	1.99E-02	4.08E-02	8.60E-02	1.94E-02	4.17E-02	8.49E-02
1961	1.71E-02	3.25E-02	6.48E-02	1.64E-02	3.22E-02	6.43E-02	1.08E-02	2.18E-02	4.25E-02	1.09E-02	2.17E-02	4.19E-02
1962	1.26E-03	2.58E-03	5.17E-03	1.26E-03	2.62E-03	5.02E-03	8.88E-04	1.80E-03	3.59E-03	9.08E-04	1.82E-03	3.63E-03
1963	1.82E-03	3.61E-03	7.13E-03	1.84E-03	3.65E-03	7.30E-03	1.44E-03	2.89E-03	5.67E-03	1.45E-03	2.88E-03	5.58E-03
1964	1.60E-03	3.19E-03	6.40E-03	1.63E-03	3.25E-03	6.32E-03	1.07E-03	2.12E-03	4.16E-03	1.05E-03	2.15E-03	4.09E-03
1965	8.99E-04	1.78E-03	3.54E-03	8.93E-04	1.77E-03	3.48E-03	6.71E-04	1.32E-03	2.63E-03	6.88E-04	1.36E-03	2.64E-03
1966	1.67E-03	3.33E-03	6.47E-03	1.64E-03	3.30E-03	6.52E-03	1.13E-03	2.21E-03	4.38E-03	1.11E-03	2.23E-03	4.37E-03
1967	3.22E-03	6.31E-03	1.25E-02	3.19E-03	6.42E-03	1.28E-02	2.34E-03	4.54E-03	9.10E-03	2.32E-03	4.51E-03	9.10E-03
1968	1.57E-03	3.12E-03	6.13E-03	1.57E-03	3.16E-03	6.21E-03	1.18E-03	2.41E-03	4.65E-03	1.19E-03	2.40E-03	4.60E-03
1969	3.35E-03	6.86E-03	1.38E-02	3.46E-03	6.92E-03	1.38E-02	2.25E-03	4.40E-03	8.81E-03	2.18E-03	4.46E-03	8.67E-03
1970	1.37E-03	2.79E-03	5.46E-03	1.39E-03	2.79E-03	5.36E-03	9.84E-04	1.98E-03	4.01E-03	9.83E-04	1.95E-03	3.99E-03
1971	8.36E-08	1.61E-07	3.11E-07	8.35E-08	1.61E-07	3.11E-07	6.07E-08	1.17E-07	2.26E-07	6.08E-08	1.17E-07	2.26E-07
1972	8.64E-04	1.68E-03	3.37E-03	8.36E-04	1.69E-03	3.37E-03	6.25E-04	1.21E-03	2.50E-03	6.17E-04	1.25E-03	2.46E-03
1973	1.48E-03	2.94E-03	5.93E-03	1.50E-03	2.89E-03	5.91E-03	1.02E-03	2.01E-03	3.97E-03	1.00E-03	2.00E-03	4.04E-03
1974	5.09E-04	1.02E-03	2.06E-03	5.11E-04	1.03E-03	2.05E-03	3.81E-04	7.84E-04	1.60E-03	3.86E-04	7.82E-04	1.50E-03
1975	8.93E-04	1.77E-03	3.50E-03	8.69E-04	1.77E-03	3.49E-03	6.36E-04	1.26E-03	2.43E-03	6.38E-04	1.26E-03	2.54E-03
1976	1.57E-04	3.00E-04	5.92E-04	1.50E-04	3.02E-04	5.89E-04	1.09E-04	2.16E-04	4.29E-04	1.10E-04	2.23E-04	4.34E-04
1977	1.03E-04	2.04E-04	4.04E-04	1.05E-04	2.05E-04	4.07E-04	7.35E-05	1.45E-04	3.05E-04	7.43E-05	1.50E-04	2.83E-04
1978	1.47E-04	2.89E-04	5.80E-04	1.46E-04	3.00E-04	5.89E-04	1.12E-04	2.25E-04	4.53E-04	1.14E-04	2.27E-04	4.59E-04
1979	1.01E-04	2.10E-04	4.23E-04	1.06E-04	2.10E-04	4.11E-04	7.70E-05	1.52E-04	2.92E-04	7.51E-05	1.51E-04	3.02E-04
1980	1.75E-04	3.39E-04	6.63E-04	1.70E-04	3.42E-04	6.56E-04	1.37E-04	2.65E-04	5.23E-04	1.33E-04	2.62E-04	5.26E-04
1981	2.90E-04	5.93E-04	1.18E-03	3.00E-04	5.95E-04	1.17E-03	2.08E-04	4.11E-04	8.08E-04	2.06E-04	4.11E-04	8.30E-04
1982	2.03E-04	3.88E-04	8.04E-04	1.98E-04	3.89E-04	7.75E-04	1.43E-04	2.99E-04	5.74E-04	1.47E-04	2.90E-04	5.79E-04
1983	1.62E-05	3.17E-05	6.33E-05	1.62E-05	3.20E-05	6.09E-05	1.09E-05	2.19E-05	4.30E-05	1.11E-05	2.20E-05	4.21E-05
1984	2.11E-04	4.16E-04	8.39E-04	2.13E-04	4.11E-04	8.16E-04	1.44E-04	2.88E-04	5.77E-04	1.42E-04	2.97E-04	5.45E-04
1985	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1986	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1987	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1988	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1989	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1990	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1991	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

APPENDIX 6C:

SUMMARY OF ANNUAL AVERAGE CONCENTRATIONS OF RADIONUCLIDES IN CLINCH RIVER SHORELINE SEDIMENTS USED IN THE ASSESSMENT

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Appendix 6C: Summary of Annual Average Concentrations of Radionuclides in Clinch River Shoreline Sediments Used in the Assessment

The following tables contain the annual average concentrations of radionuclides in Clinch River shoreline sediments, with uncertainties, that were used as the starting point of the assessment. The tables contain the 2.5th, 50th, and 97.5th percentiles, corresponding to the median (central value) and 95% subjective confidence interval of the distributions describing the annual average concentrations at CRM 20.5, CRM 14, CRM 3.5, and CRM 0. All concentrations were based on the HEC-6-R output (Sections 6.11 and 6.13 and Appendix 6A). The subjective confidence intervals are intended to include all sources of uncertainty about the true annual average concentrations.

Table 6C.1 Annual average concentrations of ^{137}Cs in shoreline sediment (Bq kg^{-1}) used in the assessment, with uncertainties and adjustments.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	5.11E+01	3.36E+02	2.36E+03	3.82E+00	2.69E+01	1.98E+02	1.12E+01	7.99E+01	5.49E+02	1.05E+01	7.24E+01	6.09E+02
1945	1.98E+02	1.25E+03	1.03E+04	1.08E+02	6.37E+02	3.52E+03	5.89E+01	5.10E+02	3.38E+03	7.57E+01	5.37E+02	4.33E+03
1946	3.16E+02	1.62E+03	1.33E+04	1.36E+02	9.66E+02	7.53E+03	1.81E+02	1.08E+03	7.11E+03	1.67E+02	1.07E+03	6.85E+03
1947	3.88E+02	2.15E+03	1.66E+04	1.77E+02	1.22E+03	7.56E+03	1.88E+02	1.12E+03	7.91E+03	1.88E+02	1.12E+03	7.58E+03
1948	1.79E+02	1.37E+03	9.57E+03	1.79E+02	1.08E+03	7.16E+03	1.64E+02	1.01E+03	6.88E+03	2.26E+02	1.77E+03	9.26E+03
1949	1.85E+02	1.15E+03	7.31E+03	1.54E+02	7.87E+02	4.37E+03	1.51E+02	8.87E+02	4.39E+03	3.68E+02	1.79E+03	9.90E+03
1950	3.47E+02	1.31E+03	6.20E+03	2.09E+02	7.56E+02	2.76E+03	1.97E+02	7.18E+02	3.05E+03	2.56E+02	1.00E+03	3.52E+03
1951	2.11E+02	9.10E+02	4.09E+03	1.19E+02	3.86E+02	1.37E+03	1.21E+02	4.46E+02	1.61E+03	1.46E+02	5.29E+02	2.22E+03
1952	1.15E+02	3.92E+02	1.80E+03	3.52E+01	1.22E+02	3.81E+02	3.92E+01	1.28E+02	4.54E+02	4.31E+01	1.48E+02	4.94E+02
1953	5.26E+01	2.00E+02	6.94E+02	1.84E+01	6.05E+01	2.09E+02	3.03E+01	9.89E+01	2.84E+02	3.22E+01	9.71E+01	3.07E+02
1954	5.14E+01	1.53E+02	4.92E+02	3.81E+01	1.19E+02	3.52E+02	3.72E+01	1.11E+02	3.46E+02	4.30E+01	1.29E+02	3.77E+02
1955	8.26E+01	2.44E+02	7.17E+02	1.05E+02	3.05E+02	9.23E+02	8.40E+01	2.53E+02	7.76E+02	1.15E+02	3.27E+02	9.82E+02
1956	1.79E+02	5.24E+02	1.68E+03	1.88E+02	5.89E+02	1.80E+03	2.69E+02	7.87E+02	2.26E+03	3.13E+02	9.64E+02	2.95E+03
1957	2.89E+02	9.01E+02	2.70E+03	3.54E+02	1.05E+03	3.28E+03	3.46E+02	1.03E+03	3.23E+03	4.23E+02	1.28E+03	3.73E+03
1958	3.77E+02	1.13E+03	3.38E+03	4.27E+02	1.24E+03	3.59E+03	2.86E+02	8.78E+02	2.54E+03	2.99E+02	9.48E+02	2.96E+03
1959	4.15E+02	1.26E+03	3.99E+03	4.68E+02	1.41E+03	4.06E+03	3.56E+02	1.07E+03	3.04E+03	3.61E+02	1.01E+03	3.08E+03
1960	3.78E+02	1.18E+03	3.40E+03	1.48E+02	4.15E+02	1.28E+03	3.73E+02	1.05E+03	3.21E+03	3.65E+02	1.02E+03	3.23E+03
1961	3.20E+02	9.76E+02	3.02E+03	1.47E+02	4.25E+02	1.27E+03	3.48E+02	1.00E+03	3.12E+03	3.07E+02	9.68E+02	2.83E+03
1962	3.20E+02	9.51E+02	2.85E+03	1.53E+02	4.55E+02	1.32E+03	2.16E+02	6.80E+02	2.07E+03	2.10E+02	6.37E+02	1.99E+03
1963	2.71E+02	7.77E+02	2.34E+03	5.08E+02	1.51E+03	4.51E+03	9.56E+01	3.18E+02	9.57E+02	1.37E+02	4.18E+02	1.27E+03
1964	2.11E+02	6.44E+02	1.80E+03	3.31E+02	9.98E+02	2.93E+03	8.93E+01	2.76E+02	8.08E+02	1.14E+02	3.51E+02	1.02E+03
1965	2.05E+02	5.82E+02	1.78E+03	4.87E+02	1.47E+03	4.21E+03	8.31E+01	2.42E+02	8.02E+02	1.11E+02	3.12E+02	9.39E+02
1966	1.81E+02	5.54E+02	1.61E+03	4.41E+02	1.26E+03	3.71E+03	7.83E+01	2.38E+02	7.43E+02	1.00E+02	3.06E+02	9.13E+02
1967	1.68E+02	5.36E+02	1.64E+03	4.07E+02	1.24E+03	3.69E+03	7.39E+01	2.30E+02	6.71E+02	9.18E+01	2.70E+02	8.29E+02
1968	1.72E+02	5.07E+02	1.63E+03	4.04E+02	1.16E+03	3.30E+03	6.55E+01	2.02E+02	6.35E+02	5.34E+01	1.60E+02	4.91E+02
1969	1.83E+02	5.30E+02	1.57E+03	3.33E+02	9.89E+02	2.97E+03	6.49E+01	1.97E+02	5.78E+02	4.73E+01	1.42E+02	4.18E+02
1970	1.85E+02	5.43E+02	1.70E+03	3.95E+02	1.23E+03	3.62E+03	6.37E+01	1.94E+02	5.72E+02	3.97E+01	1.19E+02	3.77E+02
1971	1.81E+02	5.26E+02	1.50E+03	3.73E+02	1.07E+03	3.36E+03	6.24E+01	1.75E+02	5.45E+02	3.12E+01	9.13E+01	2.69E+02
1972	1.76E+02	5.16E+02	1.47E+03	2.90E+02	8.69E+02	2.57E+03	5.78E+01	1.70E+02	5.00E+02	1.23E+01	3.65E+01	1.13E+02
1973	1.54E+02	5.21E+02	1.51E+03	3.35E+02	1.00E+03	3.20E+03	6.10E+01	1.74E+02	5.37E+02	5.74E+01	1.75E+02	5.20E+02
1974	1.57E+02	4.91E+02	1.44E+03	4.54E+02	1.33E+03	3.91E+03	5.83E+01	1.72E+02	5.45E+02	5.99E+01	1.85E+02	4.99E+02
1975	1.55E+02	4.77E+02	1.57E+03	4.36E+02	1.33E+03	4.07E+03	8.31E+01	2.49E+02	7.52E+02	6.00E+01	1.80E+02	5.26E+02
1976	1.62E+02	4.59E+02	1.48E+03	3.76E+02	1.14E+03	3.54E+03	6.64E+01	1.96E+02	5.95E+02	5.47E+01	1.66E+02	5.30E+02
1977	1.44E+02	4.72E+02	1.43E+03	3.80E+02	1.17E+03	3.50E+03	6.28E+01	1.95E+02	5.54E+02	5.03E+01	1.53E+02	4.33E+02
1978	1.54E+02	4.39E+02	1.34E+03	3.60E+02	1.02E+03	3.01E+03	6.09E+01	1.82E+02	5.44E+02	4.82E+01	1.39E+02	4.16E+02
1979	1.45E+02	4.29E+02	1.36E+03	3.02E+02	8.75E+02	2.69E+03	6.00E+01	1.83E+02	5.35E+02	4.62E+01	1.33E+02	3.99E+02
1980	1.33E+02	4.22E+02	1.29E+03	2.88E+02	8.59E+02	2.50E+03	5.85E+01	1.74E+02	5.36E+02	4.56E+01	1.32E+02	4.01E+02
1981	1.23E+02	3.66E+02	1.12E+03	2.42E+02	7.35E+02	2.31E+03	5.35E+01	1.75E+02	4.95E+02	4.39E+01	1.31E+02	3.84E+02
1982	9.42E+01	2.88E+02	8.46E+02	1.10E+02	3.31E+02	9.50E+02	4.99E+01	1.46E+02	4.38E+02	4.29E+01	1.32E+02	3.79E+02
1983	9.24E+01	2.67E+02	8.65E+02	1.07E+02	2.96E+02	9.05E+02	5.03E+01	1.48E+02	4.50E+02	4.28E+01	1.24E+02	3.68E+02
1984	8.72E+01	2.66E+02	8.09E+02	2.43E+02	7.86E+02	2.20E+03	4.33E+01	1.32E+02	4.03E+02	4.19E+01	1.17E+02	3.58E+02
1985	8.99E+01	2.54E+02	7.85E+02	2.61E+02	7.84E+02	2.28E+03	4.11E+01	1.23E+02	3.78E+02	3.90E+01	1.17E+02	3.56E+02
1986	8.67E+01	2.62E+02	7.94E+02	2.51E+02	7.61E+02	2.31E+03	3.81E+01	1.19E+02	3.52E+02	3.91E+01	1.14E+02	3.43E+02
1987	8.62E+01	2.63E+02	7.66E+02	2.36E+02	7.03E+02	2.32E+03	3.75E+01	1.10E+02	3.40E+02	3.73E+01	1.09E+02	3.40E+02
1988	8.30E+01	2.50E+02	7.25E+02	2.47E+02	7.35E+02	2.23E+03	3.49E+01	1.04E+02	3.26E+02	3.81E+01	1.10E+02	3.20E+02
1989	7.59E+01	2.44E+02	6.92E+02	2.29E+02	6.92E+02	2.22E+03	3.56E+01	1.01E+02	3.23E+02	3.43E+01	9.91E+01	2.87E+02
1990	7.99E+01	2.23E+02	7.24E+02	2.20E+02	6.29E+02	1.90E+03	3.42E+01	1.06E+02	3.28E+02	2.92E+01	8.93E+01	2.71E+02
1991	7.41E+01	2.34E+02	6.96E+02	2.14E+02	6.42E+02	1.80E+03	3.39E+01	1.00E+02	2.88E+02	2.61E+01	8.00E+01	2.49E+02

Table 6C.2 Annual average concentrations of ^{90}Sr in shoreline sediment (Bq kg^{-1}) used in the assessment, with uncertainties and adjustments.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	4.24E-01	2.17E+00	9.91E+00	4.38E-02	2.50E-01	1.50E+00	1.37E-01	5.40E-01	2.22E+00	1.48E-01	5.93E-01	2.60E+00
1945	1.62E+00	8.19E+00	3.96E+01	8.23E-01	4.14E+00	1.93E+01	8.41E-01	3.48E+00	1.58E+01	9.61E-01	4.41E+00	2.39E+01
1946	2.00E+00	1.09E+01	5.14E+01	5.18E-01	2.81E+00	1.41E+01	1.94E+00	9.42E+00	4.13E+01	2.32E+00	9.86E+00	4.33E+01
1947	2.36E+00	1.30E+01	6.25E+01	6.02E-01	2.67E+00	1.08E+01	2.34E+00	1.30E+01	5.58E+01	2.33E+00	1.11E+01	5.38E+01
1948	1.12E+00	4.76E+00	1.93E+01	9.46E-01	4.09E+00	1.78E+01	2.05E+00	9.36E+00	3.80E+01	3.11E+00	1.41E+01	6.06E+01
1949	8.02E-01	2.96E+00	1.13E+01	1.65E+00	6.06E+00	1.89E+01	2.56E+00	9.81E+00	3.95E+01	5.34E+00	2.08E+01	7.34E+01
1950	3.09E+00	9.60E+00	2.89E+01	3.84E+00	1.19E+01	3.82E+01	4.27E+00	1.32E+01	4.27E+01	5.59E+00	1.70E+01	5.39E+01
1951	1.51E+00	4.62E+00	1.54E+01	1.59E+00	4.96E+00	1.45E+01	2.37E+00	7.78E+00	2.47E+01	3.01E+00	9.34E+00	2.94E+01
1952	1.13E+00	3.39E+00	1.06E+01	1.37E+00	4.30E+00	1.30E+01	1.93E+00	5.68E+00	1.82E+01	2.81E+00	9.07E+00	2.66E+01
1953	2.45E+00	7.52E+00	2.16E+01	3.17E+00	9.80E+00	2.80E+01	5.61E+00	1.65E+01	5.03E+01	6.77E+00	2.06E+01	5.82E+01
1954	3.24E+00	9.73E+00	2.93E+01	4.33E+00	1.30E+01	3.82E+01	8.64E+00	2.59E+01	8.01E+01	1.09E+01	3.26E+01	1.02E+02
1955	3.16E+00	9.78E+00	2.83E+01	4.99E+00	1.54E+01	4.65E+01	1.17E+01	3.58E+01	1.01E+02	1.27E+01	3.94E+01	1.15E+02
1956	2.03E+00	6.15E+00	1.82E+01	2.35E+00	7.21E+00	2.08E+01	5.92E+00	1.75E+01	5.20E+01	6.90E+00	2.09E+01	6.07E+01
1957	1.14E+00	3.25E+00	1.03E+01	3.22E+00	9.38E+00	2.91E+01	5.25E+00	1.51E+01	4.67E+01	5.28E+00	1.71E+01	5.17E+01
1958	3.36E+00	1.01E+01	2.86E+01	5.87E+00	1.85E+01	5.44E+01	5.93E+00	1.75E+01	4.91E+01	6.99E+00	2.02E+01	6.17E+01
1959	4.34E+00	1.29E+01	4.00E+01	8.00E+00	2.42E+01	7.23E+01	8.73E+00	2.52E+01	6.93E+01	8.42E+00	2.66E+01	7.98E+01
1960	2.04E+00	6.15E+00	1.93E+01	9.35E-01	2.71E+00	8.32E+00	6.12E+00	1.81E+01	5.55E+01	5.31E+00	1.66E+01	5.05E+01
1961	6.84E-01	2.10E+00	6.35E+00	8.64E-01	2.49E+00	7.44E+00	5.09E+00	1.59E+01	4.79E+01	5.02E+00	1.52E+01	4.56E+01
1962	6.42E-01	1.95E+00	5.96E+00	9.14E-01	2.65E+00	8.00E+00	2.51E+00	7.21E+00	2.16E+01	2.42E+00	7.24E+00	2.06E+01
1963	1.01E+00	2.99E+00	8.99E+00	4.18E+00	1.17E+01	3.59E+01	7.20E-01	2.13E+00	6.45E+00	1.18E+00	3.55E+00	1.00E+01
1964	9.00E-01	2.74E+00	8.21E+00	2.55E+00	7.86E+00	2.35E+01	6.13E-01	1.83E+00	5.36E+00	9.46E-01	2.84E+00	8.59E+00
1965	8.30E-01	2.47E+00	7.29E+00	3.69E+00	1.14E+01	3.35E+01	5.57E-01	1.61E+00	4.63E+00	7.74E-01	2.31E+00	6.99E+00
1966	8.45E-01	2.43E+00	7.32E+00	2.44E+00	7.04E+00	2.12E+01	4.57E-01	1.35E+00	4.03E+00	6.77E-01	1.97E+00	5.78E+00
1967	7.88E-01	2.27E+00	6.61E+00	2.88E+00	8.01E+00	2.27E+01	4.19E-01	1.19E+00	3.43E+00	5.78E-01	1.72E+00	4.99E+00
1968	7.00E-01	2.03E+00	5.66E+00	2.11E+00	6.20E+00	1.81E+01	2.73E-01	8.24E-01	2.37E+00	2.61E-01	7.67E-01	2.33E+00
1969	5.74E-01	1.69E+00	5.07E+00	1.57E+00	4.75E+00	1.38E+01	4.14E-01	1.17E+00	3.32E+00	3.11E-01	8.82E-01	2.61E+00
1970	5.40E-01	1.49E+00	4.67E+00	3.28E+00	9.77E+00	2.93E+01	4.17E-01	1.22E+00	3.64E+00	2.53E-01	7.47E-01	2.07E+00
1971	4.94E-01	1.47E+00	4.52E+00	2.60E+00	7.63E+00	2.42E+01	3.98E-01	1.11E+00	3.21E+00	1.97E-01	5.54E-01	1.60E+00
1972	5.05E-01	1.45E+00	4.54E+00	1.52E+00	4.50E+00	1.32E+01	3.76E-01	1.10E+00	3.12E+00	7.68E-02	2.19E-01	6.55E-01
1973	4.81E-01	1.36E+00	4.47E+00	2.90E+00	8.58E+00	2.52E+01	3.98E-01	1.13E+00	3.26E+00	3.33E-01	9.43E-01	2.76E+00
1974	4.70E-01	1.43E+00	4.03E+00	5.19E+00	1.61E+01	4.91E+01	3.29E-01	9.41E-01	2.81E+00	3.51E-01	1.01E+00	2.96E+00
1975	4.86E-01	1.38E+00	4.02E+00	5.10E+00	1.60E+01	4.52E+01	7.14E-01	2.04E+00	5.93E+00	3.31E-01	9.53E-01	2.79E+00
1976	4.51E-01	1.32E+00	4.14E+00	3.31E+00	1.01E+01	3.01E+01	4.77E-01	1.36E+00	3.96E+00	3.12E-01	9.27E-01	2.69E+00
1977	4.50E-01	1.28E+00	3.67E+00	3.98E+00	1.15E+01	3.27E+01	4.06E-01	1.14E+00	3.45E+00	2.65E-01	7.95E-01	2.25E+00
1978	4.30E-01	1.25E+00	3.86E+00	2.56E+00	7.81E+00	2.36E+01	3.95E-01	1.14E+00	3.40E+00	2.42E-01	6.95E-01	2.01E+00
1979	4.24E-01	1.26E+00	3.78E+00	1.03E+00	2.94E+00	9.14E+00	3.83E-01	1.06E+00	3.16E+00	2.42E-01	7.13E-01	1.98E+00
1980	4.10E-01	1.23E+00	3.54E+00	9.38E-01	2.74E+00	8.46E+00	3.32E-01	9.82E-01	2.79E+00	2.36E-01	6.68E-01	1.97E+00
1981	5.18E-01	1.45E+00	4.42E+00	7.28E-01	2.08E+00	6.22E+00	3.06E-01	8.91E-01	2.56E+00	2.30E-01	6.66E-01	1.98E+00
1982	6.84E-01	2.04E+00	5.78E+00	7.13E-01	2.05E+00	6.33E+00	1.31E-01	3.67E-01	1.03E+00	2.22E-01	6.30E-01	1.76E+00
1983	6.53E-01	1.96E+00	5.44E+00	6.51E-01	1.87E+00	5.93E+00	8.97E-02	2.61E-01	7.54E-01	2.14E-01	6.14E-01	1.86E+00
1984	6.37E-01	1.93E+00	5.38E+00	5.03E+00	1.49E+01	4.70E+01	2.72E-01	7.79E-01	2.20E+00	2.59E-01	7.54E-01	2.12E+00
1985	6.41E-01	1.89E+00	5.33E+00	5.06E+00	1.56E+01	4.82E+01	2.75E-01	7.58E-01	2.28E+00	2.66E-01	7.75E-01	2.24E+00
1986	6.08E-01	1.81E+00	5.28E+00	5.01E+00	1.50E+01	4.45E+01	2.30E-01	6.59E-01	1.95E+00	2.64E-01	7.92E-01	2.26E+00
1987	6.03E-01	1.71E+00	5.09E+00	4.90E+00	1.42E+01	4.15E+01	1.88E-01	5.55E-01	1.62E+00	2.67E-01	7.30E-01	2.17E+00
1988	5.91E-01	1.69E+00	4.72E+00	4.55E+00	1.33E+01	4.15E+01	1.51E-01	4.24E-01	1.24E+00	2.54E-01	7.30E-01	2.15E+00
1989	5.38E-01	1.58E+00	4.63E+00	3.90E+00	1.19E+01	3.57E+01	1.73E-01	5.03E-01	1.56E+00	2.51E-01	7.14E-01	2.03E+00
1990	5.05E-01	1.54E+00	4.53E+00	3.15E+00	9.06E+00	3.12E+01	2.03E-01	5.96E-01	1.81E+00	2.44E-01	7.18E-01	1.99E+00
1991	5.00E-01	1.45E+00	4.41E+00	2.45E+00	7.42E+00	2.27E+01	2.08E-01	5.86E-01	1.73E+00	1.78E-01	5.12E-01	1.50E+00

Table 6C.3 Annual average concentrations of ^{106}Ru in shoreline sediment (Bq kg^{-1}) used in the assessment, with uncertainties and adjustments.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	6.80E-01	3.46E+00	1.42E+01	9.47E-02	4.09E-01	1.75E+00	2.82E-01	1.23E+00	5.57E+00	2.59E-01	1.34E+00	5.79E+00
1945	1.99E+00	1.09E+01	4.94E+01	1.54E+00	7.13E+00	3.27E+01	1.12E+00	5.33E+00	2.79E+01	1.39E+00	6.42E+00	3.52E+01
1946	2.56E+00	1.19E+01	5.95E+01	1.21E+00	6.62E+00	3.18E+01	2.36E+00	1.39E+01	6.48E+01	3.60E+00	1.51E+01	6.69E+01
1947	2.56E+00	1.13E+01	6.03E+01	1.20E+00	4.92E+00	2.24E+01	3.73E+00	1.82E+01	8.19E+01	2.91E+00	1.26E+01	5.55E+01
1948	9.19E-01	3.99E+00	2.11E+01	8.87E-01	4.67E+00	1.92E+01	1.58E+00	7.84E+00	3.44E+01	2.76E+00	1.14E+01	5.44E+01
1949	1.05E+00	3.76E+00	1.33E+01	3.11E+00	1.07E+01	3.36E+01	3.23E+00	1.09E+01	3.41E+01	5.90E+00	2.16E+01	6.77E+01
1950	3.74E+00	1.22E+01	3.74E+01	5.81E+00	1.80E+01	6.13E+01	5.97E+00	1.82E+01	5.91E+01	7.69E+00	2.39E+01	7.00E+01
1951	1.41E+00	4.40E+00	1.37E+01	2.44E+00	7.11E+00	2.36E+01	2.47E+00	7.35E+00	2.15E+01	3.29E+00	1.01E+01	3.19E+01
1952	9.45E-01	2.86E+00	8.71E+00	1.39E+00	4.10E+00	1.31E+01	1.66E+00	5.32E+00	1.68E+01	2.40E+00	7.49E+00	2.17E+01
1953	1.29E+00	3.88E+00	1.15E+01	1.93E+00	5.57E+00	1.68E+01	3.39E+00	9.84E+00	3.12E+01	4.13E+00	1.22E+01	3.73E+01
1954	1.41E+00	4.28E+00	1.30E+01	1.61E+00	4.89E+00	1.48E+01	3.06E+00	8.71E+00	2.58E+01	3.76E+00	1.16E+01	3.33E+01
1955	1.42E+00	4.22E+00	1.22E+01	2.19E+00	6.51E+00	2.03E+01	3.41E+00	9.74E+00	2.91E+01	4.12E+00	1.29E+01	3.86E+01
1956	1.45E+00	4.39E+00	1.33E+01	2.30E+00	6.90E+00	2.05E+01	3.73E+00	1.12E+01	3.43E+01	4.96E+00	1.49E+01	4.60E+01
1957	1.03E+00	3.14E+00	9.75E+00	3.12E+00	9.53E+00	2.81E+01	4.28E+00	1.24E+01	3.71E+01	4.72E+00	1.44E+01	4.67E+01
1958	3.04E+00	9.70E+00	2.87E+01	6.61E+00	1.92E+01	6.20E+01	6.14E+00	1.85E+01	5.51E+01	6.32E+00	2.05E+01	6.33E+01
1959	5.81E+00	1.74E+01	5.28E+01	3.83E+01	1.11E+02	3.43E+02	3.22E+01	9.92E+01	3.16E+02	3.00E+01	9.16E+01	2.80E+02
1960	4.12E+00	1.24E+01	3.80E+01	8.30E+01	2.41E+02	7.77E+02	1.42E+02	4.08E+02	1.28E+03	1.39E+02	4.13E+02	1.24E+03
1961	1.78E+01	5.27E+01	1.64E+02	1.58E+02	4.89E+02	1.46E+03	2.25E+02	6.69E+02	1.98E+03	2.12E+02	6.17E+02	1.83E+03
1962	8.94E+00	2.83E+01	8.50E+01	1.30E+02	3.84E+02	1.14E+03	2.03E+02	5.56E+02	1.64E+03	2.12E+02	6.21E+02	1.83E+03
1963	5.55E+01	1.56E+02	4.37E+02	6.49E+01	1.93E+02	5.61E+02	1.39E+02	4.00E+02	1.15E+03	1.39E+02	4.04E+02	1.16E+03
1964	3.77E+01	1.06E+02	3.24E+02	1.93E+01	5.57E+01	1.62E+02	7.04E+01	1.96E+02	5.67E+02	7.79E+01	2.21E+02	6.52E+02
1965	2.49E+01	7.20E+01	2.01E+02	3.52E+01	1.01E+02	2.87E+02	3.57E+01	1.01E+02	2.90E+02	4.26E+01	1.21E+02	3.47E+02
1966	1.52E+01	4.45E+01	1.30E+02	1.83E+01	5.13E+01	1.57E+02	1.85E+01	5.48E+01	1.55E+02	2.13E+01	6.00E+01	1.68E+02
1967	8.18E+00	2.28E+01	6.45E+01	9.17E+00	2.71E+01	7.46E+01	8.87E+00	2.56E+01	7.52E+01	9.91E+00	3.06E+01	8.24E+01
1968	3.78E+00	1.09E+01	3.19E+01	4.93E+00	1.43E+01	4.10E+01	4.03E+00	1.17E+01	3.45E+01	3.24E+00	9.14E+00	2.68E+01
1969	1.88E+00	5.30E+00	1.59E+01	2.22E+00	6.18E+00	1.84E+01	1.87E+00	5.44E+00	1.57E+01	1.24E+00	3.53E+00	1.05E+01
1970	9.06E-01	2.58E+00	7.51E+00	1.49E+00	4.30E+00	1.24E+01	9.93E-01	2.88E+00	8.46E+00	6.02E-01	1.66E+00	4.83E+00
1971	4.52E-01	1.25E+00	3.68E+00	6.78E-01	2.00E+00	5.76E+00	4.83E-01	1.43E+00	4.21E+00	2.44E-01	6.55E-01	1.91E+00
1972	2.27E-01	6.49E-01	1.93E+00	2.69E-01	8.01E-01	2.19E+00	2.25E-01	6.69E-01	1.92E+00	4.57E-02	1.28E-01	3.81E-01
1973	1.17E-01	3.36E-01	9.31E-01	1.78E-01	5.06E-01	1.54E+00	1.10E-01	3.30E-01	9.53E-01	9.14E-02	2.59E-01	7.56E-01
1974	5.76E-02	1.67E-01	4.79E-01	3.10E-02	8.90E-02	2.70E-01	6.23E-02	1.79E-01	5.49E-01	4.75E-02	1.50E-01	4.55E-01
1975	3.11E-02	9.34E-02	2.75E-01	0.00E+00	0.00E+00	0.00E+00	4.43E-02	1.29E-01	3.67E-01	2.76E-02	7.78E-02	2.17E-01
1976	1.41E-02	4.10E-02	1.17E-01	0.00E+00	0.00E+00	0.00E+00	1.82E-02	5.40E-02	1.80E-01	1.43E-02	4.13E-02	1.14E-01
1977	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1978	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1979	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1980	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1981	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1982	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1983	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1984	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1985	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1986	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1987	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1988	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1989	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1990	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1991	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 6C.4 Annual average concentrations of ^{60}Co in shoreline sediment (Bq kg^{-1}) used in the assessment, with uncertainties and adjustments.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1945	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1946	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1947	8.67E-01	6.82E+00	5.88E+01	1.67E-01	1.32E+00	1.09E+01	4.78E-01	3.42E+00	3.54E+01	1.33E+00	1.13E+01	9.84E+01
1948	1.92E+00	1.58E+01	1.15E+02	9.25E-01	1.11E+01	1.02E+02	1.57E+00	1.58E+01	1.18E+02	2.56E+00	2.21E+01	2.32E+02
1949	1.98E+00	1.89E+01	1.23E+02	4.30E+00	3.71E+01	2.63E+02	4.96E+00	3.83E+01	3.37E+02	1.11E+01	7.02E+01	6.99E+02
1950	8.73E+00	7.12E+01	6.13E+02	1.20E+01	8.40E+01	7.46E+02	1.06E+01	7.61E+01	6.06E+02	1.40E+01	1.05E+02	9.48E+02
1951	4.34E+00	3.72E+01	2.79E+02	4.55E+00	3.91E+01	2.84E+02	6.18E+00	5.07E+01	4.19E+02	9.26E+00	6.65E+01	6.44E+02
1952	3.18E+00	2.13E+01	1.70E+02	2.36E+00	1.97E+01	1.36E+02	2.61E+00	2.13E+01	2.27E+02	4.57E+00	3.35E+01	2.18E+02
1953	3.26E+00	2.99E+01	2.17E+02	3.93E+00	3.19E+01	2.65E+02	7.83E+00	4.88E+01	3.70E+02	7.80E+00	5.94E+01	3.90E+02
1954	4.02E+00	4.43E+01	3.47E+02	5.23E+00	4.71E+01	3.51E+02	1.02E+01	7.39E+01	6.72E+02	9.91E+00	1.02E+02	6.97E+02
1955	7.22E+00	3.15E+01	2.16E+02	9.36E+00	5.05E+01	3.11E+02	1.22E+01	9.59E+01	5.23E+02	1.55E+01	1.01E+02	5.93E+02
1956	1.35E+01	4.28E+01	1.28E+02	2.05E+01	6.16E+01	2.08E+02	3.06E+01	9.57E+01	2.96E+02	4.04E+01	1.23E+02	3.81E+02
1957	1.50E+01	5.07E+01	1.56E+02	3.87E+01	1.18E+02	3.47E+02	4.03E+01	1.20E+02	3.57E+02	4.77E+01	1.47E+02	4.73E+02
1958	1.95E+01	5.74E+01	1.82E+02	2.76E+01	8.57E+01	2.58E+02	2.14E+01	6.74E+01	1.97E+02	2.55E+01	7.62E+01	2.33E+02
1959	2.08E+01	6.52E+01	1.99E+02	6.70E+01	1.93E+02	5.67E+02	6.07E+01	1.86E+02	5.84E+02	6.16E+01	1.82E+02	5.33E+02
1960	1.62E+01	4.98E+01	1.55E+02	6.01E+01	1.70E+02	5.39E+02	1.37E+02	4.05E+02	1.26E+03	1.45E+02	4.33E+02	1.23E+03
1961	1.87E+01	5.99E+01	1.72E+02	7.53E+01	2.37E+02	6.93E+02	1.75E+02	5.26E+02	1.56E+03	1.63E+02	5.21E+02	1.44E+03
1962	1.73E+01	5.11E+01	1.53E+02	7.85E+01	2.37E+02	6.88E+02	1.12E+02	3.40E+02	1.03E+03	1.19E+02	3.47E+02	1.05E+03
1963	4.17E+01	1.23E+02	3.70E+02	1.35E+02	3.87E+02	1.20E+03	4.88E+01	1.40E+02	4.29E+02	7.23E+01	2.11E+02	6.08E+02
1964	3.02E+01	9.01E+01	2.69E+02	7.85E+01	2.27E+02	7.06E+02	4.05E+01	1.23E+02	3.72E+02	5.76E+01	1.68E+02	4.82E+02
1965	2.30E+01	6.84E+01	1.88E+02	1.05E+02	2.93E+02	9.18E+02	4.01E+01	1.18E+02	3.35E+02	5.35E+01	1.53E+02	4.35E+02
1966	2.12E+01	6.32E+01	1.82E+02	7.59E+01	2.20E+02	7.02E+02	3.51E+01	1.07E+02	2.90E+02	4.81E+01	1.37E+02	3.99E+02
1967	1.68E+01	4.92E+01	1.40E+02	6.83E+01	2.06E+02	6.17E+02	3.08E+01	9.00E+01	2.62E+02	3.96E+01	1.22E+02	3.42E+02
1968	1.32E+01	3.74E+01	1.09E+02	5.87E+01	1.64E+02	4.94E+02	2.16E+01	6.19E+01	1.76E+02	2.01E+01	5.75E+01	1.67E+02
1969	8.74E+00	2.47E+01	7.23E+01	4.24E+01	1.24E+02	3.66E+02	2.45E+01	7.11E+01	2.09E+02	1.77E+01	5.28E+01	1.52E+02
1970	7.28E+00	2.02E+01	6.04E+01	5.69E+01	1.69E+02	4.96E+02	2.22E+01	6.61E+01	1.90E+02	1.39E+01	4.05E+01	1.14E+02
1971	5.84E+00	1.72E+01	5.21E+01	4.46E+01	1.30E+02	3.73E+02	1.84E+01	5.40E+01	1.57E+02	9.15E+00	2.67E+01	7.72E+01
1972	5.23E+00	1.53E+01	4.66E+01	2.65E+01	8.20E+01	2.41E+02	1.57E+01	4.50E+01	1.29E+02	2.92E+00	9.00E+00	2.54E+01
1973	4.62E+00	1.35E+01	3.81E+01	3.67E+01	1.04E+02	3.22E+02	1.37E+01	3.92E+01	1.12E+02	1.16E+01	3.39E+01	1.00E+02
1974	4.02E+00	1.17E+01	3.49E+01	1.98E+01	5.80E+01	1.73E+02	1.08E+01	2.99E+01	8.91E+01	1.10E+01	3.16E+01	9.16E+01
1975	3.53E+00	1.04E+01	3.05E+01	9.78E+00	3.00E+01	8.38E+01	1.65E+01	4.71E+01	1.36E+02	9.35E+00	2.83E+01	8.04E+01
1976	3.05E+00	9.06E+00	2.71E+01	6.47E+00	1.88E+01	5.88E+01	9.81E+00	2.75E+01	8.05E+01	8.61E+00	2.51E+01	7.12E+01
1977	2.78E+00	7.81E+00	2.21E+01	5.87E+00	1.80E+01	5.42E+01	7.28E+00	2.09E+01	6.16E+01	6.43E+00	1.81E+01	5.39E+01
1978	2.44E+00	6.77E+00	2.01E+01	4.47E+00	1.32E+01	3.92E+01	6.36E+00	1.93E+01	5.41E+01	5.33E+00	1.44E+01	4.36E+01
1979	2.06E+00	6.04E+00	1.77E+01	2.56E+00	7.35E+00	2.34E+01	5.53E+00	1.56E+01	4.66E+01	4.51E+00	1.34E+01	3.66E+01
1980	1.83E+00	5.29E+00	1.61E+01	2.22E+00	6.41E+00	1.95E+01	4.53E+00	1.34E+01	3.96E+01	4.01E+00	1.15E+01	3.33E+01
1981	2.04E+00	6.21E+00	1.72E+01	1.64E+00	5.11E+00	1.51E+01	3.86E+00	1.11E+01	3.34E+01	3.49E+00	1.00E+01	2.93E+01
1982	2.66E+00	7.74E+00	2.18E+01	9.29E-01	2.66E+00	8.13E+00	2.05E+00	6.02E+00	1.75E+01	3.05E+00	8.66E+00	2.48E+01
1983	2.31E+00	6.82E+00	2.01E+01	6.64E-01	2.12E+00	6.14E+00	1.47E+00	4.43E+00	1.24E+01	2.62E+00	7.74E+00	2.19E+01
1984	2.08E+00	5.97E+00	1.74E+01	1.21E+00	3.91E+00	1.24E+01	2.62E+00	7.53E+00	2.15E+01	2.69E+00	7.64E+00	2.21E+01
1985	1.76E+00	5.23E+00	1.44E+01	1.12E+00	3.54E+00	1.12E+01	2.37E+00	6.96E+00	2.01E+01	2.46E+00	7.13E+00	2.10E+01
1986	1.55E+00	4.54E+00	1.28E+01	9.57E-01	3.09E+00	9.45E+00	1.88E+00	5.62E+00	1.63E+01	2.11E+00	6.40E+00	1.73E+01
1987	1.37E+00	3.96E+00	1.13E+01	8.37E-01	2.73E+00	9.04E+00	1.45E+00	4.13E+00	1.22E+01	1.92E+00	5.49E+00	1.53E+01
1988	1.18E+00	3.48E+00	9.57E+00	7.61E-01	2.43E+00	7.32E+00	1.16E+00	3.50E+00	9.89E+00	1.63E+00	4.78E+00	1.36E+01
1989	1.03E+00	2.87E+00	8.51E+00	6.88E-01	2.17E+00	6.48E+00	1.26E+00	3.66E+00	1.01E+01	1.56E+00	4.56E+00	1.35E+01
1990	8.63E-01	2.58E+00	7.19E+00	5.74E-01	1.83E+00	5.97E+00	1.31E+00	3.69E+00	1.06E+01	1.47E+00	4.20E+00	1.20E+01
1991	7.74E-01	2.29E+00	6.68E+00	4.85E-01	1.67E+00	4.66E+00	1.20E+00	3.46E+00	1.01E+01	1.06E+00	3.12E+00	8.74E+00

Table 6C.5 Annual average concentrations of ^{144}Ce in shoreline sediment (Bq kg^{-1}) used in the assessment, with uncertainties and adjustments.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	3.53E+00	3.98E+01	4.76E+02	3.49E-01	2.82E+00	2.50E+01	8.44E-01	4.98E+00	3.45E+01	7.39E-01	4.94E+00	2.52E+01
1945	1.04E+01	1.07E+02	1.02E+03	4.85E+00	3.63E+01	2.79E+02	4.16E+00	2.84E+01	1.76E+02	4.26E+00	3.82E+01	2.09E+02
1946	1.13E+01	1.68E+02	1.96E+03	4.30E+00	2.11E+01	9.55E+01	1.06E+01	7.49E+01	6.27E+02	1.11E+01	8.10E+01	5.69E+02
1947	1.33E+01	1.93E+02	2.82E+03	4.78E+00	2.06E+01	1.03E+02	1.18E+01	1.03E+02	9.06E+02	8.97E+00	7.32E+01	7.67E+02
1948	3.99E+00	5.04E+01	3.97E+02	3.66E+00	2.57E+01	1.53E+02	5.24E+00	4.00E+01	3.51E+02	6.57E+00	6.62E+01	5.83E+02
1949	4.04E+00	2.44E+01	1.54E+02	8.76E+00	3.38E+01	1.28E+02	7.75E+00	3.68E+01	2.00E+02	1.40E+01	7.70E+01	4.32E+02
1950	1.15E+01	5.04E+01	2.31E+02	1.27E+01	4.57E+01	1.58E+02	1.28E+01	4.30E+01	1.42E+02	1.48E+01	5.65E+01	1.98E+02
1951	4.29E+00	1.45E+01	5.05E+01	4.69E+00	1.46E+01	4.61E+01	4.84E+00	1.65E+01	5.54E+01	5.81E+00	2.03E+01	7.55E+01
1952	3.65E+00	1.30E+01	4.78E+01	9.74E+00	2.90E+01	8.59E+01	9.45E+00	2.69E+01	7.62E+01	1.35E+01	3.77E+01	1.11E+02
1953	7.08E+00	2.76E+01	8.56E+01	8.58E+00	2.67E+01	8.17E+01	1.28E+01	3.67E+01	1.02E+02	1.51E+01	4.24E+01	1.22E+02
1954	1.19E+01	3.77E+01	1.22E+02	1.60E+01	4.58E+01	1.51E+02	1.50E+01	4.41E+01	1.25E+02	1.92E+01	5.70E+01	1.80E+02
1955	4.29E+01	1.25E+02	4.35E+02	4.70E+01	1.36E+02	4.33E+02	4.34E+01	1.20E+02	3.51E+02	5.78E+01	1.70E+02	4.99E+02
1956	4.36E+01	1.42E+02	4.90E+02	4.75E+01	1.38E+02	4.02E+02	5.62E+01	1.68E+02	4.67E+02	7.11E+01	2.13E+02	6.39E+02
1957	2.31E+01	7.59E+01	2.60E+02	4.39E+01	1.37E+02	4.51E+02	4.36E+01	1.30E+02	3.66E+02	4.73E+01	1.49E+02	4.38E+02
1958	2.76E+01	8.60E+01	2.85E+02	4.72E+01	1.41E+02	4.47E+02	3.11E+01	9.05E+01	2.67E+02	3.83E+01	1.07E+02	3.27E+02
1959	3.56E+01	1.13E+02	3.63E+02	7.21E+01	2.25E+02	6.82E+02	4.85E+01	1.37E+02	4.09E+02	4.80E+01	1.45E+02	4.24E+02
1960	1.45E+01	4.51E+01	1.28E+02	3.41E+01	9.78E+01	2.77E+02	4.51E+01	1.36E+02	4.14E+02	4.55E+01	1.41E+02	4.18E+02
1961	7.33E+00	2.07E+01	5.77E+01	2.36E+01	6.46E+01	1.90E+02	3.36E+01	1.05E+02	3.29E+02	3.61E+01	1.12E+02	3.70E+02
1962	2.98E+00	8.43E+00	2.38E+01	1.11E+01	3.37E+01	9.52E+01	1.31E+01	4.73E+01	1.43E+02	1.56E+01	4.52E+01	1.42E+02
1963	3.89E+00	1.43E+01	4.92E+01	7.89E+00	2.42E+01	7.30E+01	3.50E+00	1.00E+01	3.21E+01	4.31E+00	1.48E+01	4.56E+01
1964	1.92E+00	6.82E+00	2.17E+01	3.10E+00	8.76E+00	2.61E+01	1.60E+00	4.95E+00	1.44E+01	2.19E+00	6.78E+00	2.19E+01
1965	7.85E-01	2.47E+00	8.10E+00	1.55E+00	4.65E+00	1.57E+01	9.07E-01	2.58E+00	7.77E+00	1.12E+00	3.38E+00	1.14E+01
1966	4.06E-01	1.31E+00	4.13E+00	5.68E-01	1.61E+00	4.53E+00	3.79E-01	1.14E+00	3.34E+00	4.81E-01	1.54E+00	4.57E+00
1967	1.89E-01	5.72E-01	1.80E+00	2.76E-01	7.95E-01	2.37E+00	1.71E-01	5.10E-01	1.51E+00	2.37E-01	7.97E-01	2.61E+00
1968	9.95E-02	3.15E-01	1.01E+00	1.70E-01	5.27E-01	1.92E+00	6.69E-02	1.90E-01	5.36E-01	9.90E-02	2.97E-01	9.34E-01
1969	2.60E-02	7.56E-02	2.56E-01	5.88E-02	1.67E-01	5.06E-01	6.18E-02	1.94E-01	5.77E-01	4.60E-02	1.59E-01	5.92E-01
1970	5.84E-03	1.63E-02	4.69E-02	5.16E-02	2.56E-01	1.19E+00	3.75E-02	1.16E-01	3.63E-01	1.90E-02	6.81E-02	2.52E-01
1971	2.36E-03	6.80E-03	1.92E-02	2.22E-02	1.13E-01	4.97E-01	1.94E-02	6.19E-02	1.93E-01	1.02E-02	3.42E-02	1.12E-01
1972	9.87E-04	2.78E-03	7.99E-03	1.02E-02	4.33E-02	1.60E-01	2.05E-02	6.86E-02	2.22E-01	4.62E-03	1.39E-02	4.31E-02
1973	4.01E-04	1.12E-03	3.22E-03	2.00E-02	1.20E-01	7.26E-01	1.60E-02	5.24E-02	2.03E-01	2.01E-02	5.85E-02	1.67E-01
1974	1.66E-04	4.58E-04	1.30E-03	3.81E-03	2.19E-02	1.21E-01	8.28E-03	3.02E-02	1.21E-01	9.96E-03	2.84E-02	7.97E-02
1975	6.75E-05	1.92E-04	5.40E-04	2.52E-03	1.51E-02	8.47E-02	1.13E-02	4.95E-02	2.08E-01	4.06E-03	1.16E-02	3.29E-02
1976	2.84E-05	7.82E-05	2.32E-04	1.36E-03	6.95E-03	5.01E-02	4.47E-03	1.62E-02	5.53E-02	1.65E-03	4.62E-03	1.32E-02
1977	1.15E-05	3.27E-05	9.29E-05	5.90E-04	3.89E-03	2.94E-02	9.93E-04	3.79E-03	1.21E-02	7.49E-04	2.17E-03	6.06E-03
1978	4.78E-06	1.34E-05	3.83E-05	1.58E-04	1.32E-03	9.00E-03	4.73E-04	1.64E-03	6.07E-03	3.09E-04	9.36E-04	2.76E-03
1979	1.95E-06	5.54E-06	1.58E-05	2.45E-05	9.99E-05	3.85E-04	1.88E-04	6.47E-04	2.29E-03	1.26E-04	3.68E-04	1.12E-03
1980	8.14E-07	2.30E-06	6.66E-06	8.93E-06	3.55E-05	1.31E-04	7.85E-05	2.44E-04	8.14E-04	5.26E-05	1.51E-04	4.47E-04
1981	1.41E-06	5.01E-06	2.03E-05	2.58E-06	7.45E-06	2.12E-05	2.75E-05	9.31E-05	2.87E-04	2.09E-05	6.40E-05	1.94E-04
1982	1.42E-06	6.83E-06	3.35E-05	7.91E-07	2.48E-06	7.71E-06	6.68E-06	1.89E-05	5.36E-05	8.81E-06	2.48E-05	7.82E-05
1983	6.14E-07	2.98E-06	1.30E-05	2.76E-07	8.34E-07	2.49E-06	1.47E-06	4.24E-06	1.17E-05	3.54E-06	1.05E-05	3.34E-05
1984	2.80E-07	1.13E-06	5.09E-06	9.21E-08	6.25E-07	4.47E-06	1.13E-06	3.89E-06	1.35E-05	1.73E-06	5.75E-06	1.97E-05
1985	1.01E-07	5.01E-07	2.18E-06	4.11E-08	2.90E-07	2.39E-06	5.46E-07	1.89E-06	6.12E-06	7.72E-07	2.83E-06	1.07E-05
1986	4.55E-08	2.01E-07	9.67E-07	1.90E-08	1.27E-07	8.67E-07	2.05E-07	7.14E-07	2.10E-06	3.46E-07	1.19E-06	3.91E-06
1987	1.85E-08	8.03E-08	3.71E-07	6.20E-09	4.94E-08	3.37E-07	7.34E-08	2.30E-07	7.32E-07	1.39E-07	4.86E-07	1.68E-06
1988	7.13E-09	3.36E-08	1.54E-07	2.83E-09	2.04E-08	1.20E-07	2.84E-08	7.89E-08	2.29E-07	5.55E-08	1.91E-07	6.78E-07
1989	3.03E-09	1.25E-08	5.79E-08	1.11E-09	7.33E-09	5.06E-08	1.02E-08	3.04E-08	9.02E-08	2.06E-08	6.94E-08	2.53E-07
1990	1.28E-09	5.08E-09	2.19E-08	3.29E-10	2.38E-09	1.52E-08	4.33E-09	1.41E-08	4.75E-08	5.89E-09	2.37E-08	8.41E-08
1991	7.06E-10	2.82E-09	1.08E-08	1.42E-10	9.63E-10	5.84E-09	2.27E-09	6.82E-09	2.24E-08	2.62E-09	7.82E-09	2.62E-08

Table 6C.6 Annual average concentrations of ^{95}Nb in shoreline sediment (Bq kg^{-1}) used in the assessment, with uncertainties and adjustments.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	7.31E-02	2.07E+00	6.47E+01	8.38E-03	2.15E-01	5.07E+00	8.66E-03	2.19E-01	8.25E+00	8.40E-03	2.57E-01	7.10E+00
1945	2.23E-01	3.75E+00	9.76E+01	6.73E-02	2.24E+00	5.88E+01	4.66E-02	9.33E-01	3.41E+01	4.67E-02	1.43E+00	3.02E+01
1946	1.81E-01	4.80E+00	1.02E+02	2.91E-02	9.00E-01	2.56E+01	2.31E-01	6.14E+00	1.67E+02	2.57E-01	8.34E+00	2.24E+02
1947	9.83E-02	2.77E+00	6.63E+01	1.86E-02	6.02E-01	1.72E+01	2.56E-01	7.16E+00	2.06E+02	6.86E-02	1.74E+00	6.09E+01
1948	6.17E-02	1.48E+00	3.85E+01	3.86E-02	1.01E+00	3.05E+01	2.17E-02	5.02E-01	9.11E+00	3.28E-02	8.99E-01	1.98E+01
1949	4.82E-02	3.72E-01	3.54E+00	1.80E-01	1.89E+00	2.39E+01	1.31E-01	7.49E-01	4.53E+00	1.86E-01	1.38E+00	8.67E+00
1950	1.47E-01	5.46E-01	2.09E+00	2.29E-01	1.05E+00	4.00E+00	3.29E-01	1.43E+00	6.34E+00	5.82E-01	2.65E+00	1.09E+01
1951	3.13E-02	1.45E-01	6.45E-01	2.22E-01	1.14E+00	6.13E+00	9.66E-02	4.34E-01	2.08E+00	1.43E-01	7.28E-01	3.05E+00
1952	6.43E-02	2.55E-01	1.14E+00	1.78E-01	7.84E-01	3.06E+00	2.88E-01	1.25E+00	6.31E+00	2.11E-01	8.85E-01	3.95E+00
1953	4.62E-02	1.65E-01	7.41E-01	5.42E-02	2.20E-01	8.95E-01	5.91E-02	2.39E-01	1.03E+00	8.36E-02	3.50E-01	1.35E+00
1954	5.84E-02	2.34E-01	8.55E-01	1.15E-01	4.82E-01	2.36E+00	6.81E-02	2.60E-01	9.92E-01	9.54E-02	3.65E-01	1.35E+00
1955	7.01E-02	3.06E-01	1.24E+00	1.31E-01	5.35E-01	2.21E+00	6.85E-02	2.75E-01	1.24E+00	1.12E-01	4.52E-01	1.74E+00
1956	1.10E-01	4.56E-01	1.61E+00	1.99E-01	8.84E-01	3.35E+00	2.08E-01	9.41E-01	4.22E+00	3.14E-01	1.39E+00	5.84E+00
1957	5.93E-02	2.32E-01	9.21E-01	1.65E-01	8.20E-01	3.67E+00	1.21E-01	4.90E-01	2.02E+00	1.11E-01	4.40E-01	2.03E+00
1958	6.86E-02	2.37E-01	9.33E-01	1.81E-01	8.01E-01	3.53E+00	1.30E-01	6.27E-01	2.67E+00	1.20E-01	5.78E-01	2.47E+00
1959	3.07E-02	1.16E-01	4.77E-01	4.26E-01	1.98E+00	8.25E+00	1.91E-01	9.13E-01	3.30E+00	2.22E-01	1.03E+00	4.75E+00
1960	5.47E-03	2.41E-02	1.14E-01	6.31E-01	3.02E+00	1.26E+01	2.99E-01	1.33E+00	5.52E+00	2.90E-01	1.29E+00	5.07E+00
1961	2.26E-02	1.13E-01	6.72E-01	8.83E-01	3.85E+00	1.50E+01	3.89E-01	1.49E+00	5.60E+00	4.75E-01	1.85E+00	6.51E+00
1962	9.40E-04	3.23E-03	1.24E-02	1.86E-01	7.98E-01	2.90E+00	2.95E-01	1.36E+00	5.25E+00	4.57E-01	1.86E+00	7.08E+00
1963	1.60E-02	5.67E-02	1.98E-01	2.62E-02	9.59E-02	4.01E-01	4.71E-02	2.29E-01	9.12E-01	2.41E-02	1.15E-01	4.99E-01
1964	2.95E-04	8.87E-04	2.91E-03	3.38E-04	1.25E-03	4.81E-03	6.43E-04	2.44E-03	8.78E-03	8.58E-04	3.91E-03	1.49E-02
1965	6.06E-04	2.00E-03	6.32E-03	2.59E-04	7.85E-04	2.68E-03	1.50E-04	5.95E-04	2.50E-03	2.31E-04	1.05E-03	5.45E-03
1966	5.82E-04	1.91E-03	6.28E-03	1.89E-04	6.93E-04	2.42E-03	3.22E-04	1.34E-03	5.14E-03	7.79E-04	3.79E-03	1.55E-02
1967	6.60E-04	2.01E-03	6.68E-03	3.27E-04	1.10E-03	4.11E-03	5.27E-04	2.01E-03	8.31E-03	1.97E-03	8.39E-03	3.95E-02
1968	4.85E-04	1.59E-03	4.85E-03	5.67E-04	1.91E-03	6.30E-03	3.56E-04	1.57E-03	5.55E-03	1.06E-03	5.16E-03	2.11E-02
1969	2.41E-04	7.20E-04	2.26E-03	3.74E-05	1.46E-04	6.02E-04	2.22E-04	8.49E-04	3.03E-03	1.75E-04	6.19E-04	2.18E-03
1970	2.70E-06	9.47E-06	3.49E-05	5.33E-05	1.85E-04	7.21E-04	8.43E-05	2.90E-04	9.34E-04	1.39E-05	4.74E-05	1.62E-04
1971	0.00E+00	0.00E+00	0.00E+00	4.44E-06	1.52E-05	5.30E-05	5.89E-06	2.31E-05	9.22E-05	1.74E-05	6.98E-05	2.88E-04
1972	0.00E+00	0.00E+00	0.00E+00	6.12E-06	2.20E-05	7.61E-05	4.55E-05	2.13E-04	9.59E-04	3.63E-05	1.91E-04	9.39E-04
1973	0.00E+00	0.00E+00	0.00E+00	2.64E-05	9.17E-05	3.47E-04	2.59E-05	8.92E-05	3.42E-04	1.82E-05	6.75E-05	2.59E-04
1974	0.00E+00	0.00E+00	0.00E+00	1.72E-06	6.23E-06	2.51E-05	7.54E-06	3.28E-05	1.38E-04	0.00E+00	0.00E+00	0.00E+00
1975	0.00E+00	0.00E+00	0.00E+00	2.44E-05	2.02E-04	1.97E-03	1.01E-04	7.44E-04	5.01E-03	0.00E+00	0.00E+00	0.00E+00
1976	0.00E+00	0.00E+00	0.00E+00	1.16E-06	1.20E-05	1.18E-04	5.50E-06	3.69E-05	2.99E-04	0.00E+00	0.00E+00	0.00E+00
1977	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1978	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1979	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1980	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1981	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1982	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1983	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1984	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1985	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1986	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1987	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1988	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1989	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1990	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1991	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 6C.7 Annual average concentrations of ^{95}Zr in shoreline sediment (Bq kg^{-1}) used in the assessment, with uncertainties and adjustments.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	2.02E+00	2.42E+01	3.81E+02	1.63E-01	1.76E+00	1.52E+01	3.91E-01	2.51E+00	1.85E+01	2.89E-01	2.27E+00	1.65E+01
1945	3.10E+00	5.12E+01	4.86E+02	2.02E+00	1.78E+01	1.43E+02	1.38E+00	1.02E+01	9.64E+01	1.05E+00	1.10E+01	1.00E+02
1946	4.69E+00	5.87E+01	8.27E+02	8.15E-01	6.36E+00	4.77E+01	4.74E+00	4.01E+01	3.00E+02	4.66E+00	3.98E+01	2.88E+02
1947	3.04E+00	4.97E+01	6.30E+02	6.94E-01	3.99E+00	2.02E+01	6.14E+00	4.97E+01	5.31E+02	2.06E+00	1.68E+01	1.39E+02
1948	1.30E+00	1.00E+01	6.53E+01	1.04E+00	5.98E+00	4.70E+01	6.40E-01	6.45E+00	5.51E+01	1.07E+00	1.13E+01	9.08E+01
1949	1.93E+00	1.16E+01	7.36E+01	5.76E+00	3.13E+01	1.47E+02	5.17E+00	2.44E+01	1.32E+02	6.13E+00	3.68E+01	2.31E+02
1950	1.77E+00	1.45E+01	9.46E+01	3.60E+00	1.76E+01	1.10E+02	4.17E+00	2.00E+01	9.15E+01	6.43E+00	3.12E+01	2.07E+02
1951	1.74E-01	1.08E+00	5.79E+00	6.65E-01	3.44E+00	1.41E+01	4.73E-01	1.96E+00	1.09E+01	6.15E-01	3.02E+00	1.61E+01
1952	3.80E-01	2.04E+00	1.08E+01	1.20E+00	4.84E+00	1.99E+01	1.32E+00	4.48E+00	1.75E+01	1.34E+00	5.25E+00	2.77E+01
1953	4.20E-01	2.15E+00	1.08E+01	6.41E-01	3.07E+00	1.20E+01	7.45E-01	3.33E+00	1.36E+01	1.00E+00	4.31E+00	1.86E+01
1954	4.82E-01	2.22E+00	1.07E+01	9.22E-01	4.23E+00	2.04E+01	8.04E-01	3.48E+00	1.59E+01	1.04E+00	4.74E+00	2.09E+01
1955	3.71E-01	1.61E+00	8.14E+00	8.19E-01	3.65E+00	1.81E+01	6.06E-01	2.81E+00	1.29E+01	8.39E-01	4.14E+00	2.13E+01
1956	4.82E-01	2.20E+00	1.01E+01	7.79E-01	3.38E+00	1.63E+01	1.09E+00	3.34E+00	1.37E+01	1.20E+00	4.71E+00	1.87E+01
1957	6.48E-01	2.83E+00	1.45E+01	1.40E+00	6.40E+00	3.16E+01	1.23E+00	4.93E+00	2.11E+01	1.08E+00	5.10E+00	2.25E+01
1958	1.11E+00	4.70E+00	2.25E+01	1.96E+00	7.79E+00	3.62E+01	1.51E+00	6.00E+00	2.85E+01	1.24E+00	4.69E+00	2.18E+01
1959	1.01E-01	5.22E-01	2.24E+00	2.61E+00	1.06E+01	5.05E+01	1.40E+00	6.28E+00	2.84E+01	1.11E+00	5.27E+00	2.44E+01
1960	1.28E-02	6.85E-02	2.90E-01	2.82E+00	9.86E+00	3.99E+01	1.97E+00	9.73E+00	4.41E+01	1.45E+00	8.38E+00	5.13E+01
1961	2.51E-02	1.18E-01	4.60E-01	2.04E+00	8.13E+00	3.00E+01	1.24E+00	5.07E+00	2.45E+01	1.15E+00	5.67E+00	3.19E+01
1962	1.28E-02	5.89E-02	2.87E-01	4.77E-01	1.97E+00	7.93E+00	5.16E-01	2.85E+00	1.12E+01	6.09E-01	2.71E+00	1.48E+01
1963	6.00E-02	3.05E-01	1.37E+00	6.43E-02	2.78E-01	1.21E+00	1.46E-01	6.02E-01	2.40E+00	5.54E-02	2.85E-01	1.35E+00
1964	4.89E-03	1.91E-02	7.27E-02	4.06E-03	1.49E-02	7.19E-02	5.57E-03	3.10E-02	1.32E-01	6.20E-03	2.88E-02	1.35E-01
1965	4.67E-03	1.90E-02	6.78E-02	2.89E-03	1.19E-02	5.38E-02	3.48E-03	1.45E-02	6.11E-02	2.90E-03	1.32E-02	5.95E-02
1966	8.51E-03	2.90E-02	1.09E-01	1.58E-03	5.91E-03	2.23E-02	3.51E-03	1.47E-02	6.96E-02	3.84E-03	1.74E-02	8.34E-02
1967	6.32E-03	2.46E-02	9.57E-02	3.94E-03	1.77E-02	6.28E-02	6.61E-03	2.91E-02	1.24E-01	1.13E-02	5.57E-02	2.87E-01
1968	5.86E-03	2.58E-02	1.28E-01	1.74E-03	6.74E-03	3.38E-02	7.34E-03	2.95E-02	1.29E-01	7.11E-03	3.35E-02	1.84E-01
1969	1.56E-03	5.91E-03	2.41E-02	9.15E-04	2.97E-03	1.05E-02	3.52E-03	1.42E-02	6.04E-02	9.18E-04	4.52E-03	2.12E-02
1970	1.87E-05	5.90E-05	1.86E-04	2.12E-03	8.97E-03	4.63E-02	1.48E-03	5.48E-03	2.36E-02	1.09E-05	4.78E-05	1.96E-04
1971	0.00E+00	0.00E+00	0.00E+00	2.88E-04	1.36E-03	5.16E-03	3.54E-04	2.05E-03	9.88E-03	0.00E+00	0.00E+00	0.00E+00
1972	0.00E+00	0.00E+00	0.00E+00	7.62E-05	3.45E-04	1.78E-03	4.16E-04	1.97E-03	9.04E-03	0.00E+00	0.00E+00	0.00E+00
1973	0.00E+00	0.00E+00	0.00E+00	3.94E-04	2.93E-03	1.81E-02	2.81E-04	1.68E-03	7.61E-03	0.00E+00	0.00E+00	0.00E+00
1974	0.00E+00	0.00E+00	0.00E+00	2.06E-05	1.75E-04	1.38E-03	1.92E-04	1.17E-03	7.47E-03	0.00E+00	0.00E+00	0.00E+00
1975	0.00E+00	0.00E+00	0.00E+00	2.44E-05	1.98E-04	2.32E-03	8.52E-05	7.80E-04	6.05E-03	0.00E+00	0.00E+00	0.00E+00
1976	0.00E+00	0.00E+00	0.00E+00	1.18E-06	1.23E-05	9.54E-05	4.05E-06	4.12E-05	3.43E-04	0.00E+00	0.00E+00	0.00E+00
1977	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1978	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1979	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1980	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1981	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1982	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1983	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1984	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1985	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1986	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1987	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1988	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1989	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1990	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1991	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

APPENDIX 7A

WATER FILTRATION AND WATER QUALITY

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Appendix 7A: Water Filtration and Water Quality

Appendix 7A describes the water filtration processes of treatment plants in the lower Clinch River, the water quality of the potable water drawn from the Clinch River, and the backflow phenomenon that occurs at the confluence of the Tennessee and the Clinch Rivers. The treatment processes for water drawn from the Clinch River are described because these processes can remove radioactive materials from the water. For example, radionuclides attached to sediments (partically reactive radionuclides) are removed in the settling and filtering stages of water treatment. This reduction in the sediments and radionuclides in the Araw@ water will ultimately reduce the amount of radioactive material consumed by humans via water ingestion. The water treatment processes are summarized in Table 7.2 as the fraction of radioactive materials (partically reactive, anions, and cations) remaining in the water after processing. Each treatment facility drawing water from the Clinch River (K-25 water intake, Kingston Steam Plant water intake, and Kingston water intake) is described.

Overall, water quality is important in determining the amount of radioactive substances in potable water obtained from a municipal supply. Water quality is measured in terms of how Aclear@ (clarity) and how Aclean@ (free from physical, chemical, biological, or radiological substances) the water is. In this assessment, the contaminants of interest were radiological in nature. Water clarity is determined through the use of a turbidimeter (device used to determine the amount of suspended solids in the water) and is expressed in NTUs (Nephlometric Turbidity Units). Water contaminants are measured through radiochemical analysis and are expressed in ppm (parts per million). No correlation between NTU and ppm exists; measurements for each of these are made independent of the other.

Since turbidity represents the fraction of suspended solids (sediments) in water and turbidity data were available for all three treatment facilities, this information was used to estimate the amount of partically reactive radioactive substances remaining in the water after treatment. However, very few radiochemical analysis data were available at any facility. Therefore, other sources of information were used to estimate the amount of nonpartically reactive anions and cations remaining in the water after treatment (see Table 7.2).

Backflow (reversal of the normal flow of the river) is important for the Kingston water intake, which is located on the Tennessee River. If backflow did not occur, the Kingston Municipal Water Treatment Facility would be free from waterborne radioactive substances released from the Oak Ridge Reservation via the Clinch River because water would be drawn only from the Tennessee River, upstream from the radioactive effluent released from the reservation. Since backflow is expected to occur some fraction of the time, a factor accounting for this phenomenon is included. The estimated fraction of water reaching the Kingston intakes from the Clinch River is given in Table 7.2. Section 7A.3.3. describes this phenomenon and provides the justification for this parameter in detail.

7A.1 K-25 Water Intake

7A.1.1 Filtered Water

The water used by the K-25 water treatment facility is drawn from the Clinch River. The water is then treated with aluminum sulfate (alum), a cationic coagulant (Bowman, personal communication with C. Lewis, 1997). Once in the water, the aluminum sulfate adsorbs onto the negatively charged particles in the water, thereby neutralizing their negative charge. Neutralization occurs because the trivalent metal ion of aluminum (Al^{+3}) is strongly attracted to all negatively charged surfaces. In addition to being a coagulant, alum is considered a chemical treatment that kills germs, improves taste and reduces odor, and helps settle other solids in the water. The alum attaches to particle surfaces and causes the particles to stick together. The larger particles are known as floc (Bowman, personal communication with C. Lewis, 1997). After mixing, the water and the floc flow together into a settling basin, where the floc settles to the bottom, effectively removing it from the water column. From the settling basin, the water flows through the filters. The filters, made of anthracite coal, sand, and granite, are used to remove any remaining particles in the water. The water is then sent to the storage tanks, where it awaits distribution. When the water leaves the treatment facility at K-25, the water is as clean as or cleaner than required by the State of Tennessee (Bowman, personal communication with C. Lewis, 1997).

7A.1.2 Water Quality

Water clarity is important for treatment facilities drawing water from surface water bodies such as the Clinch River. These treatment plants commonly rely on coagulation, settling, and filtration to ensure an acceptable product. Water quality is measured by turbidity at the K-25 water treatment facility (Bowman, personal communication with C. Lewis, 1997). Turbidity, an expression of the optical property that causes light to be scattered and absorbed rather than transmitted in straight lines, is defined as the muddiness or cloudiness of water caused by the total suspended and dissolved solids carried in the water column (Watson and Der, 1986). Attempts to correlate turbidity with the weight concentration of suspended matter are impractical because the size, shape, and refractive index of the particulate matter do not have a direct relationship to the concentration and specific gravity of the suspended matter (McKay, personal communication with C. Lewis, 1997).

For the State of Tennessee, water quality guidelines are based on turbidity. The water clarity (turbidity) must be no greater than 5 NTU to be acceptable (Bowman, personal communication with C. Lewis, 1997; Sexton, personal communication with C. Lewis, 1997). Water quality is measured at the K-25 facility with turbidimeters, which consist of a nephelometer, a light source for illuminating the sample, and photoelectric detectors to indicate the intensity of light scattered at 90^{o} to the path of the incident light (Bowman, personal communication with C. Lewis, 1997). In addition to State requirements, K-25 imposes water quality regulations as well. The K-25 regulations require that 95% of the finished water samples must be less than 0.5 NTU (Bowman, personal communication with C. Lewis, 1997). The average sample is less than 0.1 NTU (Bowman, personal communication with C. Lewis, 1997).

7A.2 Kingston Steam Plant Water Intake

7A.2.1 Filtered Water

From 1954, when the water treatment system was installed at the Kingston Steam Plant until December 1989, the potable water supply was obtained from the Clinch River (Sexton, personal communication with C. Lewis, 1997). After the pretreatment phases, the treatment process for domestic water is a two-phase process involving a settling basin and four filters. The water drawn in from the Clinch is treated with liquid aluminum sulfate (alum) prior to reaching the settling basin. Once the water is in the settling basin, the floc settles out, and the water moves to the filtering stage. The majority (95%) of the particulates is removed in the 4- to 5-hour transit time through the settling basin (Sexton, personal communication with C. Lewis, 1997). Originally, the water was filtered through sand supported by carborundum block (Sexton, personal communication with C. Lewis, 1997). In the early 1980s, these sand filters were replaced with multi-media filters (Sexton, personal communication with C. Lewis, 1997). The four new filters were composed of quartz, sand, and anthracite coal of varying densities (Sexton, personal communication with C. Lewis, 1997). After leaving the settling basin, the water passes through the filters, which serve as a Awater polisher@ (Sexton, personal communication with C. Lewis, 1997).

7A.2.2 Water Quality

Water quality at the Kingston Steam Plant is also measured in turbidity units (Sexton, personal communication with C. Lewis, 1997). The State limits are 5 NTU for the Kingston Steam Plant: however, the finished water at the facility is routinely less than 0.1 NTU (Sexton, personal communication with C. Lewis, 1997). Even though the facility has purchased its drinking water from Midtown Utilities since December 1989, the Kingston Steam Plant continually tests its finished water to ensure compliance with the State guidelines (Sexton, personal communication with C. Lewis, 1997).

7A.3 Kingston Water Intake

7A.3.1 Filtered Water

The water treatment processes employed at the Kingston Water Treatment Plant are similar to those processes utilized at K-25 and the Kingston Steam Plant. The water comes from an intake on the Tennessee River or an underground spring. The water is initially treated with chlorine and Ultrion 8156, which is a cationic polymer and flocculent (Ladd, personal communication with C. Lewis, 1997). After addition of the two chemicals, the water is gently mixed so that the floc settles out as the water passes through the facility to the settling zone (Ladd, personal communication with C. Lewis, 1997). The majority of the floc is removed from the water in the settling zone (Ladd, personal communication with C. Lewis, 1997). Once the water leaves the settling zone, the water is filtered. The filters consist of anthracite, sand,

and gravel of various grain size (Ladd, personal communication with C. Lewis, 1997). The water is filtered at 4 gallons per minute per square foot (Ladd, personal communication with C. Lewis, 1997). After filtering, the water is transferred to a clear well, where the water is treated with chlorine, phosphate, and fluoride before being distributed to the public (Ladd, personal communication with C. Lewis, 1997).

7A.3.2 Water Quality

The Kingston Municipal water supply system operates under the Tennessee State guidelines for safe drinking water. All primary water standards are met and maintained at the facility (Ladd, personal communication with C. Lewis, 1997). A limited number of secondary water standards are met as well (Ladd, personal communication with C. Lewis, 1997). The secondary water standards are only recommendations at present and are conformed to voluntarily by the facility. Water quality is measured in NTUs at the Kingston Municipal Water Treatment Facility.

In November and December 1985, the Oak Ridge National Laboratory (ORNL) accidentally released an estimated 7.6×10^{10} Bq[1] of ^{90}Sr to the Clinch River via the White Oak Creek embayment during an excavation project (Lemming, personal communication with C. Lewis, 1997). The release was first detected on November 29, 1985 (Lemming, personal communication with C. Lewis, 1997). During this time period, the water intakes below White Oak Creek were notified of the release. As a safety precaution, the State of Tennessee notified the Kingston Municipal Water Treatment Facility about the accident and began regulation of the facility=s operating schedule (Ladd, personal communication with C. Lewis, 1997). During the regulated operating hours, the water treatment facility was allowed to obtain water from the Tennessee River. At other times, the municipality was required to obtain its water from the spring (Ladd, personal communication with C. Lewis, 1997). The State of Tennessee, Department of Conservation, and Water Supply Division prior to and after the release (Lemming, personal communication with C. Lewis, 1997) monitored the water at the intake. The measurements consisted of alpha readings only (Harris, personal communication with C. Lewis, 1997), which would not detect ^{90}Sr. Beta measurements were not made by the State unless the alpha readings were greater than 5 picocuries per liter (pCi L^{-1}) or 1.85×10^{-1} Bq L^{-1} (Harris, personal communication with C. Lewis, 1997). The gross alpha measurements available for 1984, 1987, 1991, and 1995, respectively, were 7.4×10^{-3} Bq L^{-1}, below detection limits, 2.6×10^{-2} Bq L^{-1}, and 2.2×10^{-2} Bq L^{-1} (Harris, personal communication with C. Lewis, 1997).

7A.3.3 Backflow of the Clinch River into the Tennessee

Backflow is a hydrologic phenomenon in which the water flow is upstream instead of downstream. The phenomenon of backflow is dependent on the flow of the water bodies contributing to the flow. In the case of the Clinch River, the water bodies of concern are the Tennessee River, the Clinch River, Watts Bar Reservoir, and Melton Hill Reservoir.

[1]Value calculated using 1.45×10^{-2} g A 141 Ci g^{-1} (Shleien and Terpilak, 1984) and a unit conversion of 2.7×10^{-11} Ci Bq^{-1}.

Primarily Melton Hill Dam, a peaking hydroelectric power unit, determines the flow of the Clinch River. When the dam is generating power and forcing water through the turbines, the flow of the Clinch River is greater than when the unit is not producing power. When the unit is not producing power, the streams, creeks, and river that empty into the Clinch determine the river flow: White Oak Creek, Poplar Creek, and the Emory River.

Primarily Fort Loudoun Dam, Watts Bar Reservoir, and the Clinch River control the Tennessee River in the area of the confluence of the Clinch and the Tennessee Rivers. When Fort Loudoun is producing electricity, the flow of the Tennessee is much greater, increasing the flow at the confluence of the Clinch and the Tennessee Rivers. The water then flows down past the confluence until it reaches Watts Bar Reservoir, which backs up the water unless the floodgates on the Watts Bar Dam are open or the dam is generating power. When the flowing water from the Clinch and the Tennessee interacts with the stationary water in the reservoir, the resulting flow can be upstream, instead of downstream. The stationary water acting as a wall to the flowing water causes this reversal. When the flowing water hits the wall, a wave of water returns upstream. This reversal of water flow forces Clinch River water upstream toward the Kingston water intakes, which are located on the Tennessee River at Tennessee River Mile (TRM) 568.4, approximately 0.7 miles above the confluence of the Clinch and Tennessee Rivers.

Figure 7A.1 graphically describes the flow of Melton Hill Reservoir releases, the flow at the Tennessee River/Clinch River confluence, the flow at the Kingston Water Treatment Plant, the flow of Watts Bar releases, and the flow of Fort Loudoun releases (TVA, 1997). The positive flows represent the release of water from a reservoir or the normal flow of the river. The negative flows represent the backflow of water upstream toward the Kingston water intakes (Hauser, personal communication with C. Lewis, 1997). TVA modeling efforts indicate that the phenomenon of backflow occurs daily (Hauser, personal communication with C. Lewis, 1997).

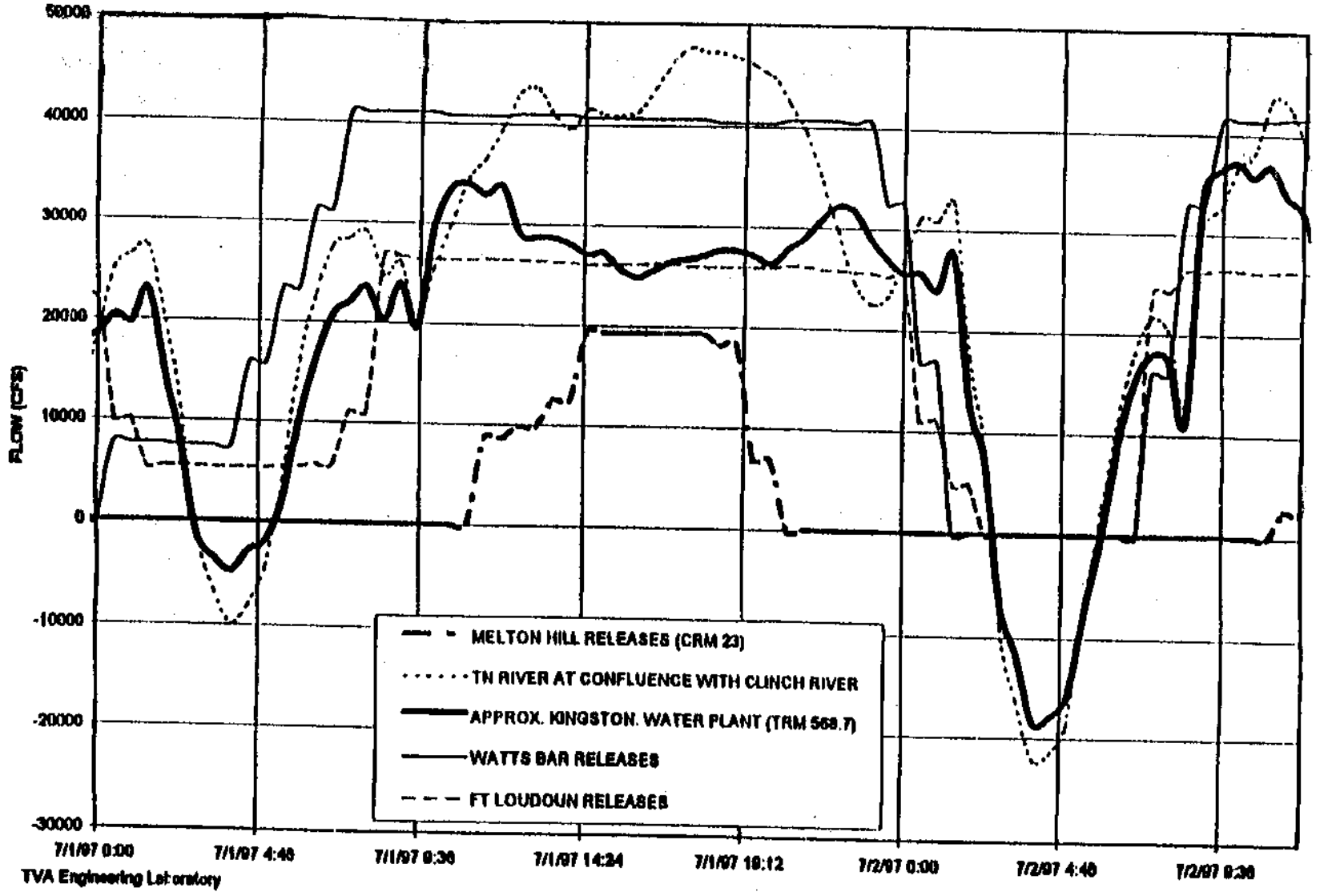

Figure 7A.1: Simulation of the flow reversal episode on the Tennessee River near the Kingston Water Intakes (TVA, 1997).

The extent of mixing of the Clinch and the Tennessee water and the travel upstream caused by backflow are not easily determined, but can be simulated (TVA, 1997). Since this phenomenon occurs when power is generated at the Melton Hill Dam and not at Fort Loudoun Dam, the likelihood of the backflowing water reaching the Kingston water intakes is reduced, because power is generated at Melton Hill Dam for only a couple of hours each day (TVA, 1997). Since the intakes are approximately 0.7 miles upstream from the confluence of the two rivers, the likelihood that water from the Clinch River would reach the Kingston intakes is small, unless large quantities of electricity are being generated at the facilities. According to a 1992 ORNL report, the sediment on the Clinch River banks near the City of Kingston was relatively free of contaminants (EG&G, 1993). The data obtained from aerial scans in this area indicate that the exposed sediment did not contain a large amount of man-made gamma-emitting radionuclides, such as ^{137}Cs and ^{60}Co (EG&G, 1993). The result appears to be a reduced quantity of partically reactive radionuclides being deposited in or reaching the Kingston reach of the Clinch River. This suggests that a reduced amount of partically reactive radionuclides is entering the Kingston Municipal water intakes.

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APPENDIX 7B

FOOD PROCESSING RETENTION FACTORS

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Table 7B.1 Food processing retention factors[a] for the isotopes of strontium, cesium, iodine, and ruthenium and food processing efficiencies for meat (IAEA, 1992).

Raw Material	Method of Processing	Sr		Cs		I	Ru	Processing Efficiency
Meat of mammals (cow, pig, sheep, deer, and rabbit)	Boiling meat	**0.5**[b]	0.4-0.9	**0.4**[b]	0.2-0.7	0.6	0.3	0.7
	Boiling bone		0.999		0.2-0.3	0.98	0.7	1.0
	Frying, roasting, or grilling meat		0.8		0.5-0.8			0.4-0.7
	Mincing meat				0.4			
	Microwave baking				0.4-0.5			0.4-0.7
	Pickling (wet)				0.1-0.7			0.9
	Pickling (dry)				0.8			
	Marinating				0.1-0.6			
	Sausage production				0.4-1.0			
Birds	Boiling meat		0.5					
	Baking meat				0.7-0.8			
Fish	Boiling meat		0.9	**0.7**[b]	0.2-0.9			0.5-0.9
	Frying meat				0.8-0.9			0.7-0.8

[a] The retention factor is the fraction of radionuclide remaining in the food after processing or cooking.
[b] Denotes the best estimate for the process retention factor.

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APPENDIX 8A

SUMMARY OF REPORTED MEASUREMENTS OF RADIONUCLIDES IN THE FLESH OF EDIBLE SPECIES OF CLINCH RIVER FISH CAUGHT BETWEEN CRM 0 AND CRM 20.8 DURING 1944-1991

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Table 8A.1 Summary of reported measurements of radionuclides in the flesh of edible species of Clinch River fish in October, 1948 (Knobf, 1951)[a].

Location	Fish species	Description	Concentration (Bq kg^{-1} wet weight)			
			^{137}Cs		^{90}Sr	
			mean	maximum[b]	mean	maximum[b]
CRM 13.3	carp	8 fish	160	320	5.3	11
	crappie	12 fish	480	3200	16	110
CRM 18-19	crappie	14 fish	1500	4400	48	140
	sucker	5 fish	970	2600	32	85
	drum	1 fish	650		21	

[a] Measurements were reported as cpm g^{-1} (see Section 8.1.1).
[b] Individual fish.

Table 8A.2 Summary of reported measurements of radionuclides in the flesh of edible species of Clinch River fish in 1960 (USPHS, 1960; Morton, 1961; 1962).

Date and location	Fish species	Description	Mean concentration (Bq kg^{-1} wet weight)			
			^{137}Cs	^{90}Sr	^{106}Ru	^{60}Co
February						
CRM 2.2	sauger, smallmouth bass, buffalo, carp, carpsucker	5 fish		15 (2.6 - 38) [a]		
CRM 4.6	smallmouth bass	1 sample or 1 fish?	22		16	2.2
	carp	1 sample or 1 fish?	17		16	
CRM 14.5	white bass, sauger, carp	3 fish		9.3 (4.3 - 13) [a]		
CRM 14.6	sauger	1 sample or 1 fish?	28			
May						
CRM 4.5	bottom-feeders[b]	7 fish	16	1.5	4.6	3.0
CRM 14.6	bottom-feeders	8 fish	41	3.3	5.6	8.3
CRM 19.6	bottom-feeders	6 fish	78	13	7.4	6.1
September						
CRM 4.5	bottom-feeders	3 fish	18	56	2.4	3.5
CRM 14.6	bottom-feeders	9 fish	21	74	2.2	4.1
CRM 19.6	bottom-feeders	4 fish	21	52	0.19	3.0

[a] Range of individual fish.

[b] Includes carp, suckers, buffalo, redhorse, carpsuckers, quillback, channel catfish, and flathead catfish.

Table 8A.3 Summary of reported measurements of radionuclides in the flesh of edible species of Clinch River fish from 1960-1963 (Morton, 1965; Cowser and Snyder, 1966)[a].

Date, location, and fish Species	Concentration (Bq kg^{-1} wet weight)							
	^{137}Cs		^{90}Sr		^{106}Ru		^{60}Co	
	n [b]	mean (SE[c])	n [b]	mean (SE[c])	n [b]	mean (SE[c])	n [b]	mean (SE[c])
January 1960 - June 1962								
CRM 4.5-19.1								
Carp	71	19 (2.1)	17	19 (5.2)	69	6.3 (0.67)	67	2.4 (0.23)
Carpsucker	122	44 (17)	18	20 (7.0)	22	4.4 (1.1)	22	4.4 (0.70)
Buffalo	5	18 (3.5)	3	8.9 (3.3)	5	4.1 (1.2)	5	2.9 (0.78)
sight-feeders[d]	126	25 (4.4)	109	6.7 (3.1)	127	4.4 (1.2)	127	0.81 (0.41)
CRM 19.6								
Carpsucker			4[e]	19				
May 1963								
CRM 4.5-19.1								
Carp	20	12 (4.1)	20	3.4 (0.81)				
Carpsucker	20	17 (3.0)	20	0.81 (0.16)				
Buffalo	21	21 (3.1)	20	1.6 (0.52)				

[a] This summary includes the fish listed in Table 8A-2.
[b] Number of fish measured.
[c] Standard error of the mean.
[d] Includes white crappie, bluegill, white bass, largemouth bass, sauger, drum, and catfish.
[e] Composite sample.

Table 8A.4 Summary of reported measurements of ^{137}Cs in the flesh of white crappie from CRM 10 (Nelson and Griffith, 1966)[a].

Date	Description	Concentration (Bq kg^{-1} wet weight)	
		mean	standard error of the mean
May 1962	6 fish	23.5	12.7
June 1962	10 fish	22.1	5.80
July 1962	7 fish	10.2	3.82
August 1962	10 fish	22.3	3.02
September 1962	9 fish	20.3	1.08
October 1962	10 fish	11.3	4.88
November 1962	10 fish	19.4	1.83
December 1962	10 fish	18.4	2.35
January 1963	10 fish	10.1	3.27
February 1963	10 fish	14.9	2.35
March 1963	10 fish	17.3	2.33
April 1963	10 fish	20.1	6.50
Total	112 fish	17.65	14.1

[a] Measurements were reported as disintegrations min^{-1} g^{-1} (see Section 8.1.1).

Table 8A.5 Summary of reported measurements of radionuclides in the flesh of edible species of Clinch River fish 965-1985.

Date and location	Fish species	Description	Concentration (Bq kg^{-1} wet weight)			
			^{137}Cs	^{90}Sr	^{106}Ru	^{60}Co
1965 (ORNL, 1968; 1969)						
not given	white crappie	1 composite sample	7.4	0.52	11	
not given	smallmouth buffalo	1 composite sample	7.2	1.2	240	
1966 (ORNL, 1968; 1969)						
not given	white crappie	1 composite sample	3.2	0.35	14	
not given	smallmouth buffalo	1 composite sample	48	3.5	6.9	
not given	carp	1 composite sample	15	2.3	not detected	
1967 (ORNL, 1968; 1969)						
not given	white crappie	1 composite sample	14	1.0	not detected	
not given	smallmouth buffalo	1 composite sample	15	1.0	4.5	
1968 (ORNL, 1969)						
not given	white crappie	1 composite sample	12	0.27	not detected	
not given	smallmouth buffalo	1 composite sample	4.9	0.59	not detected	
1971 (UCC, 1972)						
not given	white crappie	1 composite sample	13	5.0	< 6.7	
not given	smallmouth buffalo	1 composite sample	12	4.0	< 12	
1972 (ORNL, 1973; UCC, 1973)						
not given	white crappie	1 composite sample	6.9	2.3		
not given	carp	1 composite sample	1.6	1.3		
1973 (UCC, 1974)						
not given	white crappie	1 composite sample	56	2.2		
not given	carp	1 composite sample	20	5.2		

Table 8A.5 (continued)

Date and location	Fish species	Description	Concentration (Bq kg^{-1} wet weight)			
			^{137}Cs	^{90}Sr	^{106}Ru	^{60}Co
1974 (UCC, 1975)						
not given	White crappie	1 composite sample	6.9	1.6		
not given	Carp	1 composite sample	1.0	1.9		
1975 (UCC, 1976)						
CRM 14.5	White crappie	1 composite sample	1.1	8.1	8.5	1.7
	Carp	1 composite sample	0.63	0.48	0.96	0.52
1976 (ORNL, 1977)						
CRM 20	White crappie	1 composite sample	130	41		2.5
	Bass	1 composite sample	190	16		2.9
1977 (ORNL, 1978)						
CRM 12	Bass	1 composite sample	≤ 0.37	1.6		≤ 0.37
CRM 20.8	Crappie	1 composite sample	54	5.6		≤ 1.4
	Bluegill	1 composite sample	52	30		≤ 2.7
	Carp	1 composite sample	11	2.6		≤ 0.74
	Bass	1 composite sample	200	12		≤ 2.0
1978 (ORNL, 1979)						
CRM 4	Bass	1 composite sample	4.5	0.067		0.19
	Bluegill	1 composite sample	23	0.29		0.40
	Carp	1 composite sample	2.8	0.17		0.0037
CRM 5	Bass	1 composite sample	5.0	0.063		0.015
	Bluegill	1 composite sample	4.5	0.12		0.44
	Carp	1 composite sample	13	0.17		0.015

Table 8A.5 (continued)

Date and location	Fish species	Description	Concentration (Bq kg^{-1} wet weight)			
			^{137}Cs	^{90}Sr	^{106}Ru	^{60}Co
CRM 12	Bass	1 composite sample	6.1	0.022		0.14
	Bluegill	1 composite sample	3.5	0.18		0.23
	Carp	1 composite sample	2.6	0.11		0.11
	Crappie	1 composite sample	0.44	0.44		0.75
CRM 20.8	Bass	4 composite samples	380	1.6		1.0
	Bluegill	4 composite samples	120	4.7		2.9
	Carp	4 composite samples	16	1.2		0.47
	Crappie	4 composite samples	120	1.5		0.61
1979 (ORNL, 1980)						
CRM 5	Bass	1 composite sample	5.6	0.078		0.23
	Bluegill	1 composite sample	2.9	0.23		0.14
	Carp	1 composite sample	2.2	0.18		0.11
	Crappie	1 composite sample	2.1	0.18		0.14
CRM 12	Bass	1 composite sample	61	0.33		0.47
	Bluegill	1 composite sample	4.4	0.78		0.54
	Carp	1 composite sample	15	0.65		0.59
	Crappie	1 composite sample	25	0.51		0.50
CRM 20.8	Bass	4 composite samples	50	0.39		0.35
	Bluegill	4 composite samples	150	9.5		3.4
	Carp	4 composite samples	19	2.1		0.61
	Crappie	4 composite samples	15	0.52		0.40

Table 8A.5 (continued)

Date and location	Fish species	Description	Concentration (Bq kg^{-1} wet weight)			
			^{137}Cs	^{90}Sr	^{106}Ru	^{60}Co
1980 (ORNL, 1981)						
CRM 5	Bass	1 composite sample	4.5	0.081		0.056
	Bluegill	1 composite sample	2.4	0.19		0.052
	Carp	1 composite sample	2.5	0.71		0.089
	Crappie	1 composite sample	2.9	0.51		0.21
CRM 12	Bass	1 composite sample	12	0.33		0.29
	Bluegill	1 composite sample	1.3	0.53		0.20
	Carp	1 composite sample	1.0	0.16		0.10
	Crappie	1 composite sample	2.9	0.40		0.12
CRM 20.8	Bass	4 composite samples	5.0	0.53		0.25
	Bluegill	4 composite samples	48	14		2.2
	Carp	4 composite samples	8.6	1.8		0.57
	Crappie	4 composite samples	1.7	0.48		0.19
1981 (ORNL, 1982)						
CRM 5	Bass	1 composite sample	3.6	0.14		0.14
	Bluegill	1 composite sample	2.7	0.24		0.15
	Carp	1 composite sample	2.9	0.68		0.14
	Crappie	1 composite sample	3.6	0.30		0.13
CRM 10	Bass	1 composite sample	3.9	0.14		0.056
	Bluegill	1 composite sample	2.1	0.33		0.12
	Carp	1 composite sample	2.3	0.99		0.13
	Crappie	1 composite sample	2.6	0.14		0.078

Table 8A.5 (continued)

Date and location	Fish species	Description	Concentration (Bq kg^{-1} wet weight)			
			^{137}Cs	^{90}Sr	^{106}Ru	^{60}Co
CRM 12	Bass	1 composite sample	8.0	0.17		0.084
	Bluegill	1 composite sample	2.7	0.26		0.30
	Carp	1 composite sample	0.96	0.17		0.078
	Crappie	1 composite sample	3.6	0.17		0.065
CRM 20.8	Bass	4 composite samples	33	1.0		5.2
	Bluegill	4 composite samples	51	6.4		1.9
	Carp	4 composite samples	10	1.9		1.0
	Crappie	4 composite samples	29	1.3		0.35
1982 (UCC, 1983)						
CRM 5	Bass	1 composite sample	1.2	0.70		0.026
	Bluegill	1 composite sample	2.2	0.34		0.070
	Carp	1 composite sample	2.3	0.44		0.026
	Crappie	1 composite sample	2.7	0.17		0.037
CRM 10	Bass	1 composite sample	12	0.052		0.16
	Bluegill	1 composite sample	2.6	0.59		0.21
	Carp	1 composite sample	2.0	0.74		0.089
	Crappie	1 composite sample	3.1	0.26		0.067
CRM 12	Bass	1 composite sample	2.9	0.17		0.093
	Bluegill	1 composite sample	0.67	0.096		0.085
	Carp	1 composite sample	1.7	0.59		0.052
	Crappie	1 composite sample	3.2	0.096		0.056
CRM 20.8	Bass	4 composite samples	37	0.48		0.70
	Bluegill	4 composite samples	41	2.6		1.5
	Carp	4 composite samples	15	0.93		1.1
	Crappie	3 composite samples	13	0.48		0.28

Table 8A.5 (continued)

Date and location	Fish species	Description	Concentration (Bq kg^{-1} wet weight)			
			^{137}Cs	^{90}Sr	^{106}Ru	^{60}Co
1983 (MMES, 1984)						
CRM 5	Bass	1 composite sample	6.7	0.48		< 0.30
	Bluegill	1 composite sample	1.7	0.85		< 0.17
	Carp	1 composite sample	0.48	0.41		< 0.13
CRM 10	Bass	1 composite sample	7.4	0.52		< 0.26
	Bluegill	1 composite sample	3.7	0.44		0.15
	Carp	1 composite sample	1.5	0.56		< 0.13
	Crappie	1 composite sample	3.0	0.20		< 0.11
CRM 12	Bass	1 composite sample	3.0	0.11		< 0.14
	Bluegill	1 composite sample	1.1	0.20		< 0.15
	Carp	1 composite sample	17	1.0		0.33
	Crappie	1 composite sample	1.5	0.070		< 0.14
CRM 20.8	Bass	4 composite samples	25	2.7		0.41
	Bluegill	4 composite samples	24	4.4		1.0
	Carp	4 composite samples	48	5.9		1.8
1984 (ORNL, 1985b)						
CRM 2	Bass	1 composite sample	1.6	0.044		< 0.056
	Bluegill	1 composite sample	1.9	0.37		0.24
	Carp	1 composite sample	1.5	0.12		< 0.059
	Crappie	1 composite sample	4.4	0.15		< 0.25
CRM 5	Bass	1 composite sample	3.0	0.078		< 0.16
	Bluegill	1 composite sample	2.3	0.85		< 0.16
	Carp	1 composite sample	1.8	0.28		< 0.16
	Catfish	1 composite sample	2.9	0.074		< 0.13
	Crappie	1 composite sample	1.6	0.23		< 0.21

Table 8A.5 (continued)

Date and location	Fish species	Description	Concentration (Bq kg^{-1} wet weight)			
			^{137}Cs	^{90}Sr	^{106}Ru	^{60}Co
CRM 10	Bass	1 composite sample	3.4	0.056		< 0.089
	Bluegill	1 composite sample	2.6	0.48		0.44
	Carp	1 composite sample	2.0	0.48		< 0.14
CRM 12	Bass	4 composite samples	5.2	0.18		0.10
	Bluegill	4 composite samples	41	2.6		0.37
	Carp	4 composite samples	1.8	0.33		0.13
	Catfish	4 composite samples	2.3	0.37		< 0.085
	Crappie	4 composite samples	2.6	0.21		< 0.16
CRM 20.8	Bass	4 composite samples	48	1.2		0.52
	Bluegill	4 composite samples	29	2.1		0.74
	Carp	4 composite samples	20	1.6		0.59
	Catfish	4 composite samples	3.3	0.81		0.89
	Crappie	4 composite samples	1.6	1.0		0.74
1985 (MMES, 1986)						
CRM 2	Bass	1 composite sample	1.5	0.011		0.074
	Bluegill	1 composite sample	1.1	1.1		0.19
	Carp	1 composite sample	2.2	0.093		0.074
CRM 5	Bass	1 composite sample	3.7	0.15		0.056
	Bluegill	1 composite sample	1.5	0.89		0.19
	Carp	1 composite sample	1.9	1.0		0.074
CRM 10	Bass	1 composite sample	4.8	0.19		0.11
	Bluegill	1 composite sample	2.6	0.33		0.30
	Carp	1 composite sample	0.74	0.78		0.074
CRM 12	Bass	1 composite sample?	3.7	0.19		0.11
	Bluegill	1 composite sample?	1.1	0.67		0.24
	Carp	1 composite sample?	1.1	0.44		0.11
CRM 20.8	Bass	4 composite samples?	44	1.7		0.22
	Bluegill	4 composite samples?	24	4.4		0.52
	Carp	4 composite samples?	8.1	1.7		0.37

Table 8A-6. Summary of reported measurements of radionuclides in the flesh of Clinch River bluegill from 1986-1991.

Date and location	Fish species	Description	Concentration (Bq kg^{-1} wet weight)		
			^{137}Cs	^{90}Sr[a]	^{60}Co
1986 (MMES, 1987)					
CRM 5	Bluegill	5 composite samples	2.9 (2.5 - 3.2)[b]	0.59 (0.29 - 0.85)	< 0.30 (< 0.22 - 0.35)
CRM 20.8	Bluegill	4 composite samples	15 (6.3 – 25)	1.1 (0.78 - 1.4)	< 0.74 (< 0.30 - 0.78)
1987 (MMES, 1988b)					
CRM 5	Bluegill	6 composite samples	2.0 (1.5 - 2.6)	< 0.96 (< 0.063 - 4.4)	< 0.12 (< 0.10 - < 0.15)
CRM 20.8	Bluegill	6 composite samples	5.6 (3.5 – 11)	0.70 (0.17 - 1.5)	< 0.14 (< 0.036 - < 0.17)
1988 (MMES, 1989b)					
CRM 5	bluegill	6 composite samples	1.8 (1.6 - 2.0)	0.093 (0.031 - 0.20)	0.12 (-0.013 - 0.21)
CRM 20.8	bluegill	6 composite samples	4.5 (1.5 - 8.3)	0.31 (0.097 - 0.56)	0.065 (-0.065 - 0.11)
1989 (MMES, 1990b)					
CRM 5	bluegill	6 composite samples	3.7 (1.7 - 5.6)	0.16 (0.012 - 0.34)	0.10 (-0.031 - 0.23)
CRM 20.8	bluegill	6 composite samples	4.8 (1.5 - 6.7)	0.63 (0.22 - 0.81)	0.093 (-0.015 - 0.17)
1990 (MMES, 1991b)					
CRM 5	bluegill	6 composite samples	1.7 (0.63 – 2.9)	0.56 (-0.012 - 2.4)	0.041 (-0.048 - 0.19)
CRM 20.8	bluegill	6 composite samples	8.1 (3.2 – 17)	0.85 (0.44 - 2.1)	0.085 (-0.013 - 0.29)
1991 (MMES, 1992)					
CRM 5	bluegill	6 composite samples	2.7 (2.2 - 3.2)	0.19 (0.013 - 0.44)	0.012 (-0.11 - 0.070)
CRM 20.8	bluegill	6 composite samples	6.3 (2.9 - 9.3)	0.96 (0.11 - 2.1)	0.081 (-0.048 - 0.14)

[a] For 1987-1991, the reported measurements were for $^{89}Sr + ^{90}Sr$. Most of the activity is expected to be ^{90}Sr.
[b] Range of sample measurements.

APPENDIX 8B

SUMMARY OF PREDICTED ANNUAL AVERAGE CONCENTRATIONS OF RADIONUCLIDES IN THE FLESH OF CLINCH RIVER FISH

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Table 8B.1 Predicted annual average concentrations of ^{137}Cs in the flesh of Clinch River fish (Bq kg^{-1}) at four locations.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	3.49E+02	3.18E+03	4.28E+04	7.68E+01	5.90E+02	4.89E+03	4.37E+01	4.33E+02	2.95E+03	5.09E+01	3.64E+02	3.70E+03
1945	2.55E+02	3.06E+03	3.88E+04	6.11E+01	5.00E+02	4.92E+03	3.38E+01	3.21E+02	2.20E+03	4.33E+01	2.97E+02	2.31E+03
1946	4.11E+02	5.07E+03	5.54E+04	1.09E+02	8.63E+02	6.37E+03	8.40E+01	5.83E+02	4.52E+03	6.67E+01	6.17E+02	4.64E+03
1947	1.27E+02	1.32E+03	1.94E+04	3.10E+01	2.64E+02	2.03E+03	2.05E+01	1.89E+02	1.50E+03	1.77E+01	1.78E+02	1.28E+03
1948	2.34E+02	2.54E+03	2.43E+04	6.07E+01	4.90E+02	3.78E+03	3.76E+01	2.77E+02	2.35E+03	3.56E+01	3.03E+02	2.04E+03
1949	2.23E+02	1.94E+03	1.43E+04	7.82E+01	3.39E+02	1.55E+03	5.23E+01	2.26E+02	1.01E+03	4.71E+01	2.29E+02	1.03E+03
1950	6.24E+01	5.23E+02	3.54E+03	1.87E+01	9.03E+01	4.43E+02	1.44E+01	6.64E+01	2.93E+02	1.55E+01	6.58E+01	3.21E+02
1951	4.55E+01	4.37E+02	2.88E+03	1.73E+01	7.67E+01	3.40E+02	1.12E+01	5.13E+01	2.19E+02	1.22E+01	5.30E+01	2.36E+02
1952	3.04E+01	2.67E+02	2.01E+03	1.03E+01	4.75E+01	2.16E+02	6.98E+00	3.29E+01	1.39E+02	6.95E+00	3.14E+01	1.38E+02
1953	2.25E+01	1.80E+02	1.30E+03	6.98E+00	3.11E+01	1.41E+02	4.59E+00	1.94E+01	8.74E+01	4.40E+00	1.95E+01	9.47E+01
1954	1.02E+02	8.39E+02	5.71E+03	3.20E+01	1.46E+02	6.95E+02	1.79E+01	7.86E+01	3.58E+02	1.71E+01	7.63E+01	3.39E+02
1955	2.04E+02	1.70E+03	1.32E+04	7.19E+01	2.94E+02	1.35E+03	4.35E+01	1.95E+02	7.85E+02	4.55E+01	1.81E+02	7.90E+02
1956	5.07E+02	4.85E+03	3.07E+04	1.97E+02	8.17E+02	3.67E+03	1.09E+02	5.10E+02	2.16E+03	1.13E+02	4.99E+02	2.22E+03
1957	2.41E+02	2.31E+03	1.64E+04	8.84E+01	4.14E+02	1.91E+03	6.03E+01	2.75E+02	1.29E+03	5.56E+01	2.62E+02	1.25E+03
1958	1.44E+02	1.32E+03	8.91E+03	4.83E+01	2.36E+02	1.08E+03	3.50E+01	1.52E+02	6.80E+02	3.50E+01	1.42E+02	6.82E+02
1959	3.44E+02	2.97E+03	2.12E+04	1.19E+02	5.15E+02	2.37E+03	6.26E+01	2.78E+02	1.26E+03	6.02E+01	2.80E+02	1.22E+03
1960	4.38E+01	3.03E+02	2.51E+03	1.20E+01	5.62E+01	2.40E+02	1.23E+01	5.35E+01	2.08E+02	9.93E+00	4.70E+01	2.46E+02
1961	9.52E+00	6.58E+01	5.46E+02	2.60E+00	1.22E+01	5.22E+01	2.67E+00	1.16E+01	4.53E+01	2.16E+00	1.02E+01	5.35E+01
1962	1.33E+01	9.21E+01	7.65E+02	3.65E+00	1.71E+01	7.31E+01	3.73E+00	1.63E+01	6.34E+01	3.02E+00	1.43E+01	7.49E+01
1963	4.38E+01	3.03E+02	2.51E+03	1.20E+01	5.62E+01	2.40E+02	1.23E+01	5.35E+01	2.08E+02	9.93E+00	4.70E+01	2.46E+02
1964	6.28E+01	4.34E+02	3.61E+03	1.72E+01	8.07E+01	3.45E+02	1.76E+01	7.68E+01	2.99E+02	1.43E+01	6.74E+01	3.53E+02
1965	3.24E+01	2.24E+02	1.86E+03	8.85E+00	4.16E+01	1.78E+02	9.07E+00	3.96E+01	1.54E+02	7.34E+00	3.47E+01	1.82E+02
1966	3.05E+01	2.11E+02	1.75E+03	8.33E+00	3.91E+01	1.67E+02	8.54E+00	3.72E+01	1.45E+02	6.91E+00	3.27E+01	1.71E+02
1967	2.86E+01	1.97E+02	1.64E+03	7.81E+00	3.67E+01	1.57E+02	8.00E+00	3.49E+01	1.36E+02	6.48E+00	3.07E+01	1.60E+02
1968	2.67E+01	1.84E+02	1.53E+03	7.29E+00	3.42E+01	1.46E+02	7.47E+00	3.26E+01	1.27E+02	6.05E+00	2.86E+01	1.50E+02
1969	3.62E+01	2.50E+02	2.08E+03	9.89E+00	4.64E+01	1.99E+02	1.01E+01	4.42E+01	1.72E+02	8.21E+00	3.88E+01	2.03E+02
1970	3.62E+01	2.50E+02	2.08E+03	9.89E+00	4.64E+01	1.99E+02	1.01E+01	4.42E+01	1.72E+02	8.21E+00	3.88E+01	2.03E+02
1971	2.44E+01	1.59E+02	1.10E+03	8.73E+00	2.74E+01	1.05E+02	4.80E+00	2.09E+01	8.15E+01	3.89E+00	1.84E+01	9.63E+01
1972	1.32E+01	8.58E+01	5.90E+02	4.70E+00	1.48E+01	5.66E+01	2.67E+00	1.16E+01	4.53E+01	2.16E+00	1.02E+01	5.35E+01
1973	9.39E+00	6.13E+01	4.21E+02	3.36E+00	1.06E+01	4.04E+01	2.13E+00	9.31E+00	3.62E+01	1.73E+00	8.17E+00	4.28E+01
1974	9.39E-01	6.13E+00	4.21E+01	3.36E-01	1.06E+00	4.04E+00	4.27E-01	1.86E+00	7.25E+00	3.46E-01	1.63E+00	8.56E+00
1975	1.32E+00	8.58E+00	5.90E+01	4.70E-01	1.48E+00	5.66E+00	2.67E-01	1.16E+00	4.53E+00	2.16E-01	1.02E+00	5.35E+00
1976	5.63E-01	3.68E+00	2.53E+01	2.02E-01	6.33E-01	2.43E+00	1.07E-01	4.65E-01	1.81E+00	8.64E-02	4.09E-01	2.14E+00
1977	5.63E-01	3.68E+00	2.53E+01	2.02E-01	6.33E-01	2.43E+00	2.67E+00	1.16E+01	4.53E+01	2.16E+00	1.02E+01	5.35E+01
1978	2.20E+01	1.43E+02	9.85E+02	7.86E+00	2.47E+01	9.46E+01	3.79E+00	1.65E+01	6.43E+01	3.07E+00	1.45E+01	7.59E+01
1979	3.76E-01	2.45E+00	1.68E+01	1.34E-01	4.22E-01	1.62E+00	1.07E-01	4.65E-01	1.81E+00	8.64E-02	4.09E-01	2.14E+00
1980	1.50E+00	9.80E+00	6.74E+01	5.37E-01	1.69E+00	6.47E+00	3.80E-01	1.64E+00	6.98E+00	3.31E-01	1.57E+00	8.14E+00
1981	2.16E+00	1.41E+01	9.69E+01	7.73E-01	2.43E+00	9.30E+00	5.46E-01	2.36E+00	1.00E+01	4.75E-01	2.25E+00	1.17E+01
1982	1.26E+01	8.21E+01	5.64E+02	4.50E+00	1.41E+01	5.42E+01	3.18E+00	1.38E+01	5.84E+01	2.77E+00	1.31E+01	6.82E+01
1983	5.26E+00	3.43E+01	2.36E+02	1.88E+00	5.91E+00	2.26E+01	1.33E+00	5.75E+00	2.44E+01	1.16E+00	5.48E+00	2.85E+01
1984	2.20E+00	1.92E+01	1.22E+02	7.55E-01	3.21E+00	1.46E+01	5.05E-01	2.14E+00	9.66E+00	5.12E-01	2.24E+00	9.62E+00
1985	3.19E+00	2.08E+01	1.43E+02	1.14E+00	3.59E+00	1.38E+01	8.08E-01	3.49E+00	1.48E+01	7.03E-01	3.33E+00	1.73E+01
1986	5.13E+00	4.45E+01	2.94E+02	1.80E+00	7.74E+00	3.65E+01	1.05E+00	4.46E+00	1.92E+01	9.68E-01	4.27E+00	2.02E+01
1987	2.27E+00	1.95E+01	1.24E+02	8.17E-01	3.48E+00	1.55E+01	6.08E-01	2.79E+00	1.20E+01	5.82E-01	2.56E+00	1.14E+01
1988	3.25E+00	2.92E+01	1.98E+02	1.07E+00	4.99E+00	2.18E+01	6.04E-01	2.85E+00	1.30E+01	6.61E-01	3.01E+00	1.29E+01
1989	9.20E+00	6.00E+01	4.13E+02	3.29E+00	1.03E+01	3.96E+01	2.33E+00	1.01E+01	4.27E+01	2.03E+00	9.60E+00	4.99E+01
1990	3.01E+00	1.96E+01	1.35E+02	1.08E+00	3.38E+00	1.29E+01	7.60E-01	3.29E+00	1.40E+01	6.61E-01	3.13E+00	1.63E+01
1991	8.44E+00	7.21E+01	4.80E+02	2.96E+00	1.29E+01	5.57E+01	1.77E+00	7.91E+00	3.49E+01	1.72E+00	7.87E+00	3.27E+01

Table 8B.2 Predicted annual average concentrations of ^{90}Sr in the flesh of Clinch River fish (Bq kg^{-1}) at four locations.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	3.62E+00	6.08E+01	6.59E+02	1.30E+00	1.06E+01	8.81E+01	1.07E+00	7.64E+00	6.28E+01	1.05E+00	7.00E+00	6.53E+01
1945	3.55E+00	5.21E+01	5.48E+02	1.00E+00	9.02E+00	7.49E+01	8.37E-01	6.41E+00	5.56E+01	8.08E-01	6.38E+00	5.64E+01
1946	6.13E+00	8.62E+01	1.20E+03	1.74E+00	1.61E+01	1.10E+02	1.54E+00	1.11E+01	1.05E+02	1.64E+00	1.10E+01	1.20E+02
1947	1.51E+00	2.27E+01	2.31E+02	4.51E-01	4.13E+00	3.06E+01	4.12E-01	2.92E+00	2.80E+01	3.90E-01	2.83E+00	2.86E+01
1948	3.64E+00	4.34E+01	4.10E+02	1.05E+00	7.81E+00	6.09E+01	7.85E-01	5.04E+00	3.80E+01	7.81E-01	4.87E+00	3.72E+01
1949	6.08E+00	7.24E+01	6.20E+02	1.83E+00	1.19E+01	7.68E+01	1.29E+00	9.11E+00	6.21E+01	1.42E+00	8.96E+00	6.80E+01
1950	1.18E+00	1.50E+01	1.38E+02	3.84E-01	2.58E+00	1.80E+01	2.77E-01	1.89E+00	1.21E+01	2.68E-01	1.76E+00	1.23E+01
1951	9.87E-01	1.22E+01	1.15E+02	3.25E-01	2.09E+00	1.41E+01	1.68E-01	1.41E+00	1.08E+01	2.10E-01	1.41E+00	9.68E+00
1952	3.61E+00	3.81E+01	3.13E+02	9.95E-01	6.72E+00	4.62E+01	9.20E-01	5.22E+00	3.59E+01	8.10E-01	5.32E+00	3.64E+01
1953	5.64E+00	7.29E+01	7.05E+02	1.76E+00	1.26E+01	8.94E+01	1.37E+00	9.72E+00	6.64E+01	1.41E+00	9.42E+00	6.50E+01
1954	1.06E+01	1.15E+02	9.58E+02	2.75E+00	2.03E+01	1.24E+02	1.74E+00	1.19E+01	8.55E+01	2.03E+00	1.25E+01	8.75E+01
1955	4.28E+00	5.11E+01	4.67E+02	1.28E+00	8.75E+00	6.36E+01	9.85E-01	6.60E+00	4.20E+01	9.87E-01	6.52E+00	4.30E+01
1956	5.16E+00	5.36E+01	4.83E+02	1.64E+00	9.44E+00	6.73E+01	9.12E-01	6.62E+00	5.07E+01	9.31E-01	6.66E+00	4.09E+01
1957	3.45E+00	3.84E+01	3.40E+02	1.08E+00	6.57E+00	4.46E+01	5.78E-01	4.54E+00	3.09E+01	6.86E-01	4.38E+00	2.94E+01
1958	6.22E+00	7.78E+01	7.30E+02	1.80E+00	1.32E+01	1.00E+02	1.73E+00	1.07E+01	6.96E+01	1.54E+00	1.06E+01	7.44E+01
1959	4.64E+00	5.09E+01	4.67E+02	1.36E+00	8.38E+00	5.89E+01	8.09E-01	5.42E+00	3.95E+01	7.29E-01	5.50E+00	3.51E+01
1960	1.99E+00	2.31E+01	2.54E+02	6.13E-01	3.94E+00	2.40E+01	5.91E-01	3.47E+00	2.12E+01	4.75E-01	3.39E+00	2.55E+01
1961	9.00E-01	1.04E+01	1.15E+02	2.78E-01	1.79E+00	1.09E+01	2.68E-01	1.57E+00	9.59E+00	2.15E-01	1.53E+00	1.16E+01
1962	7.12E-01	8.25E+00	9.09E+01	2.19E-01	1.41E+00	8.60E+00	2.12E-01	1.24E+00	7.58E+00	1.70E-01	1.21E+00	9.14E+00
1963	6.07E-01	7.04E+00	7.75E+01	1.87E-01	1.20E+00	7.33E+00	1.80E-01	1.06E+00	6.47E+00	1.45E-01	1.04E+00	7.80E+00
1964	5.86E-01	6.79E+00	7.49E+01	1.81E-01	1.16E+00	7.08E+00	1.74E-01	1.02E+00	6.24E+00	1.40E-01	9.99E-01	7.53E+00
1965	3.14E-01	3.64E+00	4.01E+01	9.68E-02	6.23E-01	3.79E+00	9.33E-02	5.47E-01	3.34E+00	7.51E-02	5.35E-01	4.03E+00
1966	4.40E-01	5.10E+00	5.62E+01	1.36E-01	8.72E-01	5.31E+00	1.31E-01	7.66E-01	4.68E+00	1.05E-01	7.49E-01	5.65E+00
1967	2.51E-01	2.91E+00	3.21E+01	7.75E-02	4.98E-01	3.03E+00	7.47E-02	4.38E-01	2.68E+00	6.01E-02	4.28E-01	3.23E+00
1968	3.14E-01	3.64E+00	4.01E+01	9.68E-02	6.23E-01	3.79E+00	9.33E-02	5.47E-01	3.34E+00	7.51E-02	5.35E-01	4.03E+00
1969	2.30E-01	2.67E+00	2.94E+01	7.10E-02	4.57E-01	2.78E+00	6.84E-02	4.01E-01	2.45E+00	5.50E-02	3.93E-01	2.96E+00
1970	2.30E-01	2.67E+00	2.94E+01	7.10E-02	4.57E-01	2.78E+00	6.84E-02	4.01E-01	2.45E+00	5.50E-02	3.93E-01	2.96E+00
1971	3.69E-01	3.93E+00	3.13E+01	1.08E-01	6.82E-01	4.17E+00	6.22E-02	3.65E-01	2.23E+00	5.00E-02	3.57E-01	2.69E+00
1972	3.08E-01	3.28E+00	2.61E+01	8.98E-02	5.68E-01	3.47E+00	6.84E-02	4.01E-01	2.45E+00	5.50E-02	3.93E-01	2.96E+00
1973	2.46E-01	2.62E+00	2.09E+01	7.18E-02	4.55E-01	2.78E+00	1.06E-01	6.20E-01	3.79E+00	8.51E-02	6.07E-01	4.57E+00
1974	1.19E-01	1.27E+00	1.01E+01	3.47E-02	2.20E-01	1.34E+00	2.80E-02	1.64E-01	1.00E+00	2.25E-02	1.61E-01	1.21E+00
1975	8.61E-02	9.18E-01	7.31E+00	2.51E-02	1.59E-01	9.73E-01	1.93E-02	1.13E-01	6.91E-01	1.55E-02	1.11E-01	8.33E-01
1976	5.33E-02	5.68E-01	4.52E+00	1.56E-02	9.85E-02	6.02E-01	1.49E-02	8.75E-02	5.35E-01	1.20E-02	8.56E-02	6.45E-01
1977	3.69E-02	3.93E-01	3.13E+00	1.08E-02	6.82E-02	4.17E-01	1.68E-02	9.85E-02	6.02E-01	1.35E-02	9.63E-02	7.26E-01
1978	2.26E-02	2.40E-01	1.91E+00	6.59E-03	4.17E-02	2.55E-01	6.22E-03	3.65E-02	2.23E-01	5.00E-03	3.57E-02	2.69E-01
1979	8.20E-02	8.74E-01	6.96E+00	2.40E-02	1.52E-01	9.26E-01	2.05E-02	1.20E-01	7.36E-01	1.65E-02	1.18E-01	8.87E-01
1980	1.54E-01	1.64E+00	1.31E+01	4.49E-02	2.84E-01	1.74E+00	3.64E-02	2.52E-01	1.90E+00	3.19E-02	2.47E-01	1.72E+00
1981	2.95E-01	3.15E+00	2.50E+01	8.62E-02	5.45E-01	3.33E+00	6.99E-02	4.84E-01	3.64E+00	6.13E-02	4.75E-01	3.30E+00
1982	3.69E-01	3.93E+00	3.13E+01	1.08E-01	6.82E-01	4.17E+00	8.74E-02	6.05E-01	4.55E+00	7.67E-02	5.94E-01	4.13E+00
1983	4.10E-01	4.37E+00	3.48E+01	1.20E-01	7.58E-01	4.63E+00	9.71E-02	6.73E-01	5.05E+00	8.52E-02	6.60E-01	4.59E+00
1984	2.26E-01	2.40E+00	1.91E+01	6.59E-02	4.17E-01	2.55E+00	5.34E-02	3.70E-01	2.78E+00	4.68E-02	3.63E-01	2.52E+00
1985	3.90E-01	4.15E+00	3.31E+01	1.14E-01	7.20E-01	4.40E+00	9.22E-02	6.39E-01	4.80E+00	8.09E-02	6.27E-01	4.36E+00
1986	3.90E-01	4.15E+00	3.31E+01	1.14E-01	7.20E-01	4.40E+00	9.22E-02	6.39E-01	4.80E+00	8.09E-02	6.27E-01	4.36E+00
1987	6.77E-01	7.21E+00	5.74E+01	1.98E-01	1.25E+00	7.64E+00	1.60E-01	1.11E+00	8.34E+00	1.41E-01	1.09E+00	7.57E+00
1988	3.90E-01	4.15E+00	3.31E+01	1.14E-01	7.20E-01	4.40E+00	9.22E-02	6.39E-01	4.80E+00	8.09E-02	6.27E-01	4.36E+00
1989	4.51E-01	4.81E+00	3.83E+01	1.32E-01	8.33E-01	5.10E+00	1.07E-01	7.40E-01	5.56E+00	9.37E-02	7.26E-01	5.05E+00
1990	1.74E-01	1.86E+00	1.48E+01	5.09E-02	3.22E-01	1.97E+00	4.13E-02	2.86E-01	2.15E+00	3.62E-02	2.80E-01	1.95E+00
1991	1.84E-01	2.24E+00	1.90E+01	5.68E-02	3.94E-01	2.45E+00	3.31E-02	2.41E-01	1.60E+00	3.76E-02	2.44E-01	1.60E+00

Table 8B.3 Predicted annual average concentrations of ^{106}Ru in the flesh of Clinch River fish (Bq kg^{-1}) at four locations.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	2.22E-01	2.91E+00	4.51E+01	6.08E-02	4.98E-01	5.12E+00	4.27E-02	4.09E-01	3.09E+00	4.04E-02	3.90E-01	3.36E+00
1945	2.05E-01	2.74E+00	3.94E+01	5.65E-02	4.45E-01	4.42E+00	3.55E-02	3.27E-01	3.02E+00	3.27E-02	3.47E-01	2.93E+00
1946	2.92E-01	4.47E+00	6.77E+01	8.24E-02	7.84E-01	7.10E+00	6.51E-02	5.59E-01	6.55E+00	6.52E-02	5.66E-01	5.39E+00
1947	9.41E-02	1.09E+00	1.43E+01	2.44E-02	1.87E-01	1.79E+00	1.84E-02	1.46E-01	1.27E+00	1.56E-02	1.42E-01	1.45E+00
1948	1.91E-01	2.18E+00	2.55E+01	4.51E-02	3.73E-01	3.33E+00	3.27E-02	2.55E-01	1.77E+00	2.91E-02	2.43E-01	1.90E+00
1949	4.48E-01	5.29E+00	5.35E+01	1.15E-01	9.02E-01	5.86E+00	8.71E-02	6.25E-01	4.54E+00	8.24E-02	6.22E-01	4.58E+00
1950	8.03E-02	9.53E-01	9.64E+00	2.13E-02	1.59E-01	1.05E+00	1.40E-02	1.08E-01	8.00E-01	1.35E-02	1.05E-01	7.63E-01
1951	5.92E-02	7.45E-01	8.44E+00	1.71E-02	1.27E-01	8.86E-01	1.22E-02	8.57E-02	6.55E-01	1.34E-02	8.23E-02	6.84E-01
1952	7.43E-02	8.38E-01	8.59E+00	2.02E-02	1.43E-01	9.00E-01	1.39E-02	1.05E-01	7.65E-01	1.53E-02	1.03E-01	7.24E-01
1953	1.32E-01	1.47E+00	1.54E+01	3.37E-02	2.44E-01	1.81E+00	2.69E-02	1.85E-01	1.31E+00	2.41E-02	1.76E-01	1.33E+00
1954	8.78E-02	9.14E-01	8.72E+00	2.08E-02	1.60E-01	1.11E+00	1.39E-02	9.44E-02	6.96E-01	1.32E-02	9.58E-02	6.39E-01
1955	1.81E-01	1.65E+00	1.88E+01	4.14E-02	2.76E-01	1.99E+00	3.02E-02	2.12E-01	1.41E+00	2.81E-02	2.03E-01	1.46E+00
1956	1.55E-01	1.57E+00	1.48E+01	3.90E-02	2.69E-01	1.97E+00	2.42E-02	1.79E-01	1.27E+00	2.57E-02	1.74E-01	1.25E+00
1957	2.62E-01	2.67E+00	2.86E+01	5.96E-02	4.66E-01	3.28E+00	4.21E-02	2.98E-01	2.10E+00	4.36E-02	3.09E-01	2.21E+00
1958	2.03E-01	2.21E+00	2.21E+01	4.98E-02	3.68E-01	2.87E+00	4.19E-02	2.97E-01	2.04E+00	3.98E-02	2.88E-01	1.88E+00
1959	3.58E+00	4.27E+01	4.50E+02	1.10E+00	7.24E+00	4.95E+01	6.27E-01	4.61E+00	3.03E+01	6.57E-01	4.64E+00	3.22E+01
1960	6.95E+00	8.39E+01	9.34E+02	1.95E+00	1.44E+01	1.10E+02	2.29E+00	1.34E+01	8.85E+01	1.98E+00	1.43E+01	9.95E+01
1961	5.33E+00	6.44E+01	7.17E+02	1.50E+00	1.11E+01	8.44E+01	1.76E+00	1.03E+01	6.79E+01	1.52E+00	1.09E+01	7.63E+01
1962	3.05E+00	3.68E+01	4.10E+02	8.54E-01	6.33E+00	4.82E+01	1.01E+00	5.86E+00	3.88E+01	8.66E-01	6.25E+00	4.36E+01
1963	1.58E+00	1.91E+01	2.12E+02	4.43E-01	3.28E+00	2.50E+01	5.21E-01	3.04E+00	2.01E+01	4.49E-01	3.24E+00	2.26E+01
1964	8.57E-01	1.03E+01	1.15E+02	2.40E-01	1.78E+00	1.36E+01	2.83E-01	1.65E+00	1.09E+01	2.44E-01	1.76E+00	1.23E+01
1965	2.29E-01	2.76E+00	3.07E+01	6.41E-02	4.75E-01	3.62E+00	7.54E-02	4.40E-01	2.91E+00	6.50E-02	4.69E-01	3.27E+00
1966	7.43E-02	8.96E-01	9.98E+00	2.08E-02	1.54E-01	1.18E+00	2.45E-02	1.43E-01	9.46E-01	2.11E-02	1.52E-01	1.06E+00
1967	1.14E-02	1.38E-01	1.54E+00	3.20E-03	2.37E-02	1.81E-01	3.77E-03	2.20E-02	1.46E-01	3.25E-03	2.35E-02	1.64E-01
1968	1.33E-02	1.61E-01	1.79E+00	3.74E-03	2.77E-02	2.11E-01	4.40E-03	2.56E-02	1.70E-01	3.79E-03	2.74E-02	1.91E-01
1969	2.67E-02	3.22E-01	3.58E+00	7.47E-03	5.54E-02	4.22E-01	8.80E-03	5.13E-02	3.40E-01	7.58E-03	5.47E-02	3.82E-01
1970	9.52E-03	1.15E-01	1.28E+00	2.67E-03	1.98E-02	1.51E-01	3.14E-03	1.83E-02	1.21E-01	2.71E-03	1.95E-02	1.36E-01
1971	5.96E-02	5.26E-01	4.53E+00	1.65E-02	1.01E-01	6.60E-01	1.26E-02	7.33E-02	4.85E-01	1.08E-02	7.82E-02	5.45E-01
1972	1.77E-02	1.56E-01	1.34E+00	4.88E-03	2.99E-02	1.96E-01	3.77E-03	2.20E-02	1.46E-01	3.25E-03	2.35E-02	1.64E-01
1973	1.10E-02	9.74E-02	8.39E-01	3.05E-03	1.87E-02	1.22E-01	3.14E-03	1.83E-02	1.21E-01	2.71E-03	1.95E-02	1.36E-01
1974	2.87E-03	2.53E-02	2.18E-01	7.94E-04	4.85E-03	3.18E-02	1.95E-03	1.14E-02	7.52E-02	1.68E-03	1.21E-02	8.45E-02
1975	2.87E-03	2.53E-02	2.18E-01	7.94E-04	4.85E-03	3.18E-02	1.19E-03	6.96E-03	4.61E-02	1.03E-03	7.42E-03	5.18E-02
1976	3.09E-03	2.73E-02	2.35E-01	8.55E-04	5.23E-03	3.42E-02	9.42E-04	5.49E-03	3.64E-02	8.12E-04	5.86E-03	4.09E-02
1977	3.31E-03	2.92E-02	2.52E-01	9.16E-04	5.60E-03	3.67E-02	1.19E-03	6.96E-03	4.61E-02	1.03E-03	7.42E-03	5.18E-02
1978	1.88E-02	1.66E-01	1.43E+00	5.19E-03	3.17E-02	2.08E-01	4.59E-03	2.67E-02	1.77E-01	3.95E-03	2.85E-02	1.99E-01
1979	1.77E-03	1.56E-02	1.34E-01	4.88E-04	2.99E-03	1.96E-02	6.91E-04	4.03E-03	2.67E-02	5.96E-04	4.30E-03	3.00E-02
1980	3.76E-03	3.31E-02	2.85E-01	1.04E-03	6.35E-03	4.16E-02	7.70E-04	5.79E-03	3.52E-02	6.83E-04	5.78E-03	4.15E-02
1981	8.10E-04	8.48E-03	8.45E-02	1.85E-04	1.38E-03	9.29E-03	1.45E-04	9.86E-04	6.61E-03	1.35E-04	9.66E-04	7.43E-03
1982	6.94E-04	7.92E-03	7.77E-02	1.72E-04	1.29E-03	9.31E-03	1.27E-04	9.32E-04	6.56E-03	1.33E-04	9.58E-04	6.74E-03
1983	9.88E-04	1.04E-02	1.02E-01	2.42E-04	1.74E-03	1.25E-02	1.75E-04	1.17E-03	8.65E-03	1.55E-04	1.19E-03	8.84E-03
1984	9.36E-04	9.45E-03	9.27E-02	2.28E-04	1.59E-03	1.07E-02	1.52E-04	1.11E-03	7.52E-03	1.56E-04	1.08E-03	7.16E-03
1985	4.18E-05	4.34E-04	4.42E-03	1.03E-05	7.20E-05	4.78E-04	1.01E-05	7.16E-05	4.80E-04	1.04E-05	7.21E-05	4.93E-04
1986	2.32E-12	2.39E-11	2.47E-10	5.68E-13	4.01E-12	2.86E-11	5.60E-13	3.94E-12	2.79E-11	5.55E-13	3.83E-12	2.65E-11
1987	2.24E-12	2.37E-11	2.45E-10	5.29E-13	3.91E-12	2.83E-11	5.51E-13	3.95E-12	2.66E-11	5.58E-13	3.94E-12	2.63E-11
1988	2.24E-12	2.35E-11	2.39E-10	5.40E-13	3.96E-12	2.73E-11	5.68E-13	3.94E-12	2.84E-11	5.35E-13	3.91E-12	2.71E-11
1989	2.29E-12	2.41E-11	2.41E-10	5.77E-13	3.93E-12	2.72E-11	5.69E-13	3.95E-12	2.58E-11	5.44E-13	3.91E-12	2.77E-11
1990	2.30E-12	2.40E-11	2.37E-10	5.72E-13	3.97E-12	2.68E-11	5.27E-13	3.97E-12	2.57E-11	5.40E-13	3.91E-12	2.82E-11
1991	2.23E-12	2.41E-11	2.49E-10	5.41E-13	3.88E-12	2.76E-11	5.23E-13	3.97E-12	2.86E-11	5.43E-13	3.99E-12	2.81E-11

Table 8B.4 Predicted annual average concentrations of ^{60}Co in the flesh of Clinch River fish (Bq kg^{-1}) at four locations.

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
1944	1.48E-10	1.27E-09	9.31E-09	4.11E-11	2.34E-10	1.00E-09	4.18E-11	2.27E-10	1.08E-09	4.25E-11	2.30E-10	1.03E-09
1945	1.50E-10	1.21E-09	1.13E-08	3.79E-11	2.14E-10	1.13E-09	4.24E-11	2.27E-10	1.04E-09	4.45E-11	2.18E-10	1.04E-09
1946	1.48E-10	1.21E-09	9.16E-09	4.90E-11	2.26E-10	1.20E-09	5.27E-11	2.05E-10	1.12E-09	4.15E-11	2.14E-10	1.10E-09
1947	6.96E-01	1.00E+01	1.49E+02	1.84E-01	2.01E+00	1.70E+01	1.08E-01	1.43E+00	1.35E+01	1.24E-01	1.30E+00	1.31E+01
1948	1.43E+00	2.20E+01	3.28E+02	4.25E-01	3.76E+00	2.92E+01	2.76E-01	2.37E+00	1.95E+01	2.10E-01	2.28E+00	1.98E+01
1949	2.91E+00	4.09E+01	7.35E+02	7.14E-01	7.01E+00	6.87E+01	5.58E-01	5.05E+00	4.66E+01	5.77E-01	4.85E+00	4.71E+01
1950	8.88E-01	9.75E+00	1.11E+02	1.92E-01	1.64E+00	1.54E+01	1.27E-01	1.20E+00	1.08E+01	1.07E-01	1.23E+00	1.08E+01
1951	3.23E-01	5.06E+00	5.57E+01	8.83E-02	1.00E+00	7.88E+00	6.72E-02	6.36E-01	5.99E+00	7.17E-02	6.69E-01	5.56E+00
1952	8.93E-01	1.35E+01	2.05E+02	2.28E-01	2.58E+00	2.32E+01	2.06E-01	1.67E+00	1.49E+01	1.98E-01	1.76E+00	1.59E+01
1953	1.47E+00	1.98E+01	2.44E+02	3.51E-01	3.79E+00	4.33E+01	2.41E-01	2.45E+00	2.33E+01	2.25E-01	2.40E+00	2.89E+01
1954	2.79E+00	3.76E+01	5.64E+02	6.67E-01	6.31E+00	6.76E+01	3.69E-01	4.02E+00	4.12E+01	4.16E-01	3.70E+00	3.57E+01
1955	1.36E+00	1.01E+01	7.67E+01	3.99E-01	1.86E+00	8.03E+00	2.88E-01	1.22E+00	5.39E+00	2.68E-01	1.22E+00	5.44E+00
1956	8.92E+00	6.53E+01	5.37E+02	2.58E+00	1.30E+01	4.85E+01	1.66E+00	7.63E+00	3.27E+01	1.66E+00	7.59E+00	3.22E+01
1957	8.66E-01	7.13E+00	6.07E+01	2.63E-01	1.32E+00	5.12E+00	1.95E-01	8.85E-01	3.77E+00	2.03E-01	8.96E-01	3.91E+00
1958	1.46E+00	1.19E+01	9.83E+01	4.45E-01	2.19E+00	9.63E+00	3.44E-01	1.62E+00	6.52E+00	3.29E-01	1.61E+00	6.45E+00
1959	2.12E+01	1.72E+02	1.35E+03	6.51E+00	3.19E+01	1.17E+02	4.05E+00	1.78E+01	7.53E+01	3.77E+00	1.75E+01	7.32E+01
1960	4.72E+00	3.69E+01	3.28E+02	1.53E+00	6.52E+00	2.88E+01	1.36E+00	5.92E+00	2.72E+01	1.10E+00	5.61E+00	2.98E+01
1961	3.48E+00	2.71E+01	2.41E+02	1.12E+00	4.80E+00	2.12E+01	1.00E+00	4.36E+00	2.00E+01	8.07E-01	4.13E+00	2.19E+01
1962	2.85E+00	2.23E+01	1.98E+02	9.22E-01	3.94E+00	1.74E+01	8.20E-01	3.57E+00	1.64E+01	6.63E-01	3.39E+00	1.80E+01
1963	4.19E+00	3.27E+01	2.91E+02	1.35E+00	5.79E+00	2.56E+01	1.21E+00	5.25E+00	2.41E+01	9.73E-01	4.98E+00	2.64E+01
1964	3.83E+00	2.99E+01	2.66E+02	1.24E+00	5.29E+00	2.34E+01	1.10E+00	4.80E+00	2.20E+01	8.90E-01	4.55E+00	2.42E+01
1965	2.05E+00	1.60E+01	1.42E+02	6.62E-01	2.83E+00	1.25E+01	5.90E-01	2.57E+00	1.18E+01	4.76E-01	2.44E+00	1.29E+01
1966	3.30E+00	2.58E+01	2.29E+02	1.07E+00	4.55E+00	2.01E+01	9.49E-01	4.13E+00	1.90E+01	7.66E-01	3.92E+00	2.08E+01
1967	1.07E+00	8.35E+00	7.42E+01	3.46E-01	1.48E+00	6.52E+00	3.08E-01	1.34E+00	6.15E+00	2.48E-01	1.27E+00	6.74E+00
1968	2.41E+00	1.88E+01	1.67E+02	7.78E-01	3.32E+00	1.47E+01	6.92E-01	3.02E+00	1.38E+01	5.59E-01	2.86E+00	1.52E+01
1969	3.12E+00	2.44E+01	2.16E+02	1.01E+00	4.31E+00	1.90E+01	8.97E-01	3.91E+00	1.79E+01	7.25E-01	3.71E+00	1.97E+01
1970	8.91E-01	6.96E+00	6.18E+01	2.88E-01	1.23E+00	5.44E+00	2.56E-01	1.12E+00	5.12E+00	2.07E-01	1.06E+00	5.62E+00
1971	5.66E-01	3.68E+00	2.36E+01	1.96E-01	6.82E-01	2.61E+00	2.05E-01	8.94E-01	4.10E+00	1.66E-01	8.47E-01	4.49E+00
1972	1.28E-01	9.51E-01	7.18E+00	3.64E-02	1.68E-01	6.83E-01	2.64E-02	1.29E-01	5.29E-01	2.62E-02	1.30E-01	5.07E-01
1973	1.26E-01	9.84E-01	7.70E+00	3.72E-02	1.76E-01	6.99E-01	2.62E-02	1.22E-01	4.84E-01	2.67E-02	1.21E-01	4.84E-01
1974	8.98E-02	7.15E-01	6.22E+00	2.76E-02	1.32E-01	5.70E-01	2.19E-02	1.05E-01	4.17E-01	2.17E-02	1.02E-01	4.06E-01
1975	6.35E-02	4.84E-01	3.99E+00	1.97E-02	8.63E-02	3.56E-01	1.33E-02	6.50E-02	2.61E-01	1.40E-02	6.33E-02	2.59E-01
1976	1.94E-01	1.52E+00	1.19E+01	5.60E-02	2.69E-01	1.11E+00	3.92E-02	1.86E-01	7.33E-01	3.76E-02	1.88E-01	7.63E-01
1977	6.14E-02	4.56E-01	3.70E+00	1.82E-02	8.50E-02	3.53E-01	1.30E-02	6.22E-02	2.60E-01	1.34E-02	6.36E-02	2.51E-01
1978	1.51E-01	9.82E-01	6.28E+00	5.22E-02	1.82E-01	6.96E-01	2.82E-02	1.23E-01	5.64E-01	2.28E-02	1.17E-01	6.18E-01
1979	4.72E-02	3.07E-01	1.96E+00	1.63E-02	5.68E-02	2.17E-01	1.03E-02	4.47E-02	2.05E-01	8.28E-03	4.24E-02	2.25E-01
1980	1.98E-01	1.29E+00	8.25E+00	6.85E-02	2.39E-01	9.13E-01	4.60E-02	2.09E-01	9.02E-01	4.21E-02	2.09E-01	9.49E-01
1981	8.97E-02	5.83E-01	3.73E+00	3.10E-02	1.08E-01	4.13E-01	2.08E-02	9.44E-02	4.08E-01	1.90E-02	9.47E-02	4.29E-01
1982	5.66E-01	3.68E+00	2.36E+01	1.96E-01	6.82E-01	2.61E+00	1.31E-01	5.96E-01	2.58E+00	1.20E-01	5.98E-01	2.71E+00
1983	1.51E-01	9.82E-01	6.28E+00	5.22E-02	1.82E-01	6.96E-01	3.50E-02	1.59E-01	6.87E-01	3.21E-02	1.60E-01	7.23E-01
1984	3.45E-02	2.78E-01	2.34E+00	1.07E-02	4.90E-02	2.09E-01	7.52E-03	3.35E-02	1.43E-01	7.13E-03	3.40E-02	1.45E-01
1985	1.32E-01	8.59E-01	5.50E+00	4.57E-02	1.59E-01	6.09E-01	3.06E-02	1.39E-01	6.02E-01	2.81E-02	1.40E-01	6.33E-01
1986	1.68E-01	1.26E+00	9.79E+00	4.98E-02	2.20E-01	9.25E-01	3.23E-02	1.47E-01	5.80E-01	3.22E-02	1.49E-01	5.79E-01
1987	2.57E-02	2.04E-01	1.64E+00	7.76E-03	3.62E-02	1.43E-01	6.62E-03	3.13E-02	1.26E-01	6.43E-03	3.07E-02	1.25E-01
1988	3.31E-02	2.52E-01	2.00E+00	9.91E-03	4.64E-02	1.81E-01	5.82E-03	2.72E-02	1.10E-01	6.09E-03	2.87E-02	1.08E-01
1989	2.93E-01	1.90E+00	1.22E+01	1.01E-01	3.52E-01	1.35E+00	6.78E-02	3.08E-01	1.33E+00	6.21E-02	3.09E-01	1.40E+00
1990	2.74E-01	1.78E+00	1.14E+01	9.46E-02	3.30E-01	1.26E+00	6.35E-02	2.88E-01	1.25E+00	5.81E-02	2.89E-01	1.31E+00
1991	3.31E-02	2.59E-01	2.11E+00	1.07E-02	4.77E-02	1.92E-01	6.50E-03	3.00E-02	1.16E-01	6.64E-03	2.95E-02	1.17E-01

APPENDIX 10A

NUCLEAR PROPERTIES

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Appendix 10A: Nuclear Properties

Appendix 10A contains selected information on the nuclear properties of the radionuclides of interest to both internal and external dosimetry. The properties provided in Appendix 10A include half-lives, types of radiation emitted, radiation energies, and yield. The radionuclides of interest are ^{137}Cs, ^{60}Co, ^{131}I, ^{106}Ru and ^{90}Sr for internal dosimetry and ^{137}Cs, ^{60}Co, ^{106}Ru, ^{95}Zr, ^{95}Nb, ^{144}Ce, and ^{90}Sr for external dosimetry. All the information presented here is extracted from ICRP Publication 38 (1983).

Internal dosimetry is conducted for exposure pathways that result in radioactive materials entering the human body. These pathways include ingestion, inhalation, and injection into the bloodstream. The only pathway necessary in the analyses of the effects of radionuclides released into the Clinch River is ingestion.

External dosimetry is conducted for exposure pathways that result in radioactive materials accumulating in the environment and externally irradiating the organs of the human body. These pathways include exposure to contaminated surfaces, submersion in water or air, and dermal contact. The only pathway applicable for the releases to the Clinch River is exposure to contaminated shoreline sediments.

10A.1 Nuclear Properties of Cesium-137

Cesium-137 is a beta emitter with a half-life of 30 years. The daughter of ^{137}Cs is ^{137m}Ba ($T_{1/2}$ = 2.55 min), which is produced 94.6% of the time and which emits one 661.6 KeV gamma radiation. The total amount of energy per nuclear transformation from beta radiation is 0.2521 MeV nt^{-1} (nuclear transformation) (0.187 MeV nt^{-1} from ^{137}Cs decay and 0.0651 MeV nt^{-1} from ^{137m}Ba decay). The total amount of energy per nuclear transformation from gamma radiation is 0.594 MeV nt^{-1} from ^{137m}Ba decay.

10A.2 Nuclear Properties of Cobalt-60

Cobalt-60 has a half-life of 5.27 years; it decays by emitting electrons (beta radiation), followed by two very energetic gamma rays (E_1 = 1.173 MeV and E_2 = 1.33 MeV). Its daughter, ^{60}Ni, is stable. The total energy per nuclear transformation is 2.5 MeV nt^{-1} from gamma radiation and 0.0965 MeV nt^{-1} from beta radiation.

10A.3 Nuclear Properties of Iodine-131

Iodine-131 has a half-life of 8.04 days. It decays by emitting various beta and gamma radiations. The total energy emitted by nonpenetrating radiation (beta, capture electrons, and Auger electrons) is 0.190 MeV nt^{-1}. The total energy emitted by penetrating radiation (x-rays and gammas) is 0.380 MeV nt^{-1}.

10A.4 Nuclear Properties of Ruthenium-106

Ruthenium-106 has a half-life of 368.2 days. It decays by emitting a weak electron (beta) (0.01 MeV). Its daughter, ^{106}Rh, has a 29.9-second half-life and decays to the stable^{106} Pd by emitting different electrons followed by gamma radiation. The total energy emitted by penetrating radiation (x-rays and gammas) is 0.20 MeV nt^{-1}, while the energy emitted by nonpenetrating radiation (beta, capture electrons, and Auger electrons) is 1.41 MeV nt^{-1}.

10A.5 Nuclear Properties of Strontium-90

Strontium-90, with a 29.12-year half-life, decays to ^{90}Y by beta decay. The average energy of this electron is 0.196 MeV. Yttrium-90, the radioactive daughter of ^{90}Sr, has a half-life of 64.0 hours. Yttrium-90 also decays by electron emission to ^{90}Zr, which is stable. When ^{90}Y decays to ^{90}Zr, there are multiple decay schemes possible (beta or gamma emission), but the most probable is the emission of a beta particle. The average energy for this electron is 0.935 MeV. The yield for all ^{90}Sr beta decays is approximately 100%, while the other transitions are negligible.

10A.6 Nuclear Properties of Cerium-144

Cerium-144 has a half-life of 284 days. The ^{144}Ce daughter, ^{144}Pr (Praseodymium), is formed by direct beta emission or by the emission of a beta followed by several gamma emissions. Praseodymium-144 decays (17-minute half-life) by beta emission to ^{144}Nd (Neodymium), which is stable. This transition can be the result of direct beta decay or of beta emission followed by gamma emission. The energy of emitted photons ranges from 0.033 MeV to 2.186 MeV.

10A.7 Nuclear Properties of Zirconium-95 and Niobium-95

Zirconium-95 has a half-life of approximately 64 days and decays by beta emission, followed by gamma emission to ^{95}Nb (Niobium). Niobium-95, which is also radioactive, has a half-life of 35 days and decays to stable ^{95}Mo (Molybdenum) by further beta and gamma emission. Zirconium-95 emits two photons with an energy of 0.72 MeV and 0.76 KeV, respectively. Niobium-95 emits one 0.75 MeV photon in every nuclear disintegration.

10A.8 References

International Commission on Radiological Protection (ICRP). 1983. Radionuclide Transformations Energy and Intensity of Emissions. Report No. 38. Pergamon Press, Oxford. pp. 187-198.

APPENDIX 10B

DATA ON CLINCH RIVER SHORELINES

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Appendix 10B: Data on Clinch River Shorelines

This appendix presents supporting data used in the estimation of the doses and health risks from external exposure to radionuclides deposited in the shoreline sediments of the Clinch River.

The shoreline width was estimated for the following locations of interest on the Clinch River: Jones Island (CRM 19.2), Grassy Creek/K-25 (CRM 14.5), Kingston Steam Plant (CRM 2.3), and the City of Kingston (CRM 0.0). Based on the available river bottom profiles, it was found that, in most cases, one shore on the river is very steep, while the opposite one is rather flat and accessible to people. For a given location, the difference between the daily predicted river width and the minimum predicted width as output by the HEC-6-R model (Section 6) was calculated. Then, using the slope of the less steep shore at that location, the width of the shoreline was estimated.

The shoreline width varies from one season to another during a given year. To express the uncertainty introduced by this variation the following procedure was used.

(a) The maximum and the average shoreline width in a given year were estimated (Figures 10B.1, 10B.2, 10B.3, and 10B.4).

(b) A minimum shoreline width of 2 meters was assumed for all years.

(c) The uncertainty in the width of the shoreline during a year was expressed as a triangular distribution with a minimum of 2 m, a mode equal to the estimated average shoreline width in each year and a maximum given by the estimated maximum shoreline width in the same year (Table 10B.1).

(d) The probability distributions for the shoreline width were sampled independently for each year and each location.

Based on the shoreline width, the dose-rate factors available for areas contaminated to an infinite extent are adjusted to the finite dimension of the Clinch River shorelines. A geometry adjustment factor was obtained using the relationship derived in Section 10.4.2 (Figure 10.4); linear interpolation was used to obtain intermediate points.

The result of this procedure is a set of probability distributions that describe the uncertainty introduced by the geometry of the Clinch River shoreline. There is one for each exposure year (48 years), for each radionuclide of interest (7 radionuclides), and for each location of interest (4 locations). These distributions are applied to the dose-rate factors for each specific organ. An example of the distribution for such geometry factors is presented in Figure 10.5. All of the derived geometry factors are presented in Tables 10B.2 to 10B.8).

Table 10.B.1 Estimated shoreline width (m) at locations of interest on the Clinch River.

	CRM 19.2			**CRM 14.5**			**CRM 2.3**			**CRM 0.0**		
	min	mode	max	min	mode	max	min	mode	max	min	mode	max
1944	2.0	8.2	12.4	2.0	6.0	10.7	2.0	14.7	25.3	2.0	14.7	25.3
1945	2.0	8.5	12.7	2.0	6.0	11.0	2.0	14.5	25.6	2.0	14.5	25.6
1946	2.0	10.7	15.9	2.0	5.7	11.3	2.0	13.9	26.3	2.0	13.9	26.2
1947	2.0	8.2	12.8	2.0	6.1	11.3	2.0	14.3	25.2	2.0	14.3	25.2
1948	2.0	17.0	22.5	2.0	9.2	14.7	2.0	17.5	29.3	2.0	17.4	29.2
1949	2.0	12.8	20.1	2.0	7.7	14.0	2.0	19.5	33.6	2.0	19.4	33.4
1950	2.0	13.6	21.7	2.0	8.3	15.0	2.0	21.0	35.2	2.0	20.9	35.0
1951	2.0	14.5	22.0	2.0	8.0	14.2	2.0	13.9	27.6	2.0	13.8	27.5
1952	2.0	9.7	16.6	2.0	6.6	12.2	2.0	15.0	26.6	2.0	14.9	26.4
1953	2.0	13.2	20.3	2.0	8.5	15.1	2.0	19.4	32.2	2.0	19.2	31.8
1954	2.0	12.0	19.6	2.0	7.0	14.0	2.0	13.5	26.6	2.0	13.3	26.2
1955	2.0	11.2	20.2	2.0	6.3	13.8	2.0	13.3	26.3	2.0	13.1	26.0
1956	2.0	8.5	17.7	2.0	5.1	11.9	2.0	8.8	21.6	2.0	8.6	21.2
1957	2.0	10.1	21.6	2.0	5.4	13.4	2.0	10.4	25.4	2.0	10.3	25.2
1958	2.0	16.1	28.6	2.0	10.8	19.3	2.0	22.7	36.9	2.0	22.4	36.4
1959	2.0	15.4	29.2	2.0	10.5	19.7	2.0	22.2	37.6	2.0	22.0	37.1
1960	2.0	11.5	23.8	2.0	8.2	17.1	2.0	16.3	30.7	2.0	16.1	30.4
1961	2.0	10.4	24.0	2.0	7.6	17.2	2.0	15.4	30.3	2.0	15.2	29.8
1962	2.0	9.6	26.9	2.0	7.7	17.4	2.0	16.4	31.6	2.0	16.0	31.0
1963	2.0	16.3	31.1	2.0	11.0	24.6	2.0	23.8	43.2	2.0	23.5	42.3
1964	2.0	11.8	24.0	2.0	8.8	17.9	2.0	20.2	35.8	2.0	19.9	35.4
1965	2.0	11.2	25.1	2.0	7.5	18.0	2.0	15.7	34.4	2.0	15.5	34.0
1966	2.0	12.8	23.8	2.0	9.3	17.8	2.0	21.6	36.8	2.0	21.3	36.4
1967	2.0	12.6	25.4	2.0	9.1	18.6	2.0	21.6	38.1	2.0	21.3	37.6
1968	2.0	9.4	21.1	2.0	7.3	16.3	2.0	16.1	32.7	2.0	15.9	32.1
1969	2.0	16.6	27.6	2.0	11.0	19.7	2.0	21.4	36.4	2.0	19.7	34.5
1970	2.0	13.4	25.4	2.0	9.5	18.6	2.0	23.0	38.8	2.0	22.6	38.3
1971	2.0	11.7	24.1	2.0	8.1	17.4	2.0	17.6	33.6	2.0	17.4	33.1
1972	2.0	11.5	25.4	2.0	7.7	18.1	2.0	17.6	34.7	2.0	17.3	34.1
1973	2.0	16.2	30.5	2.0	10.9	21.4	2.0	28.0	45.9	2.0	27.4	44.9
1974	2.0	9.5	22.3	2.0	5.0	13.6	2.0	12.9	30.0	2.0	12.7	29.5
1975	2.0	15.0	28.3	2.0	8.2	17.4	2.0	16.9	34.0	2.0	15.9	32.6
1976	2.0	9.7	21.5	2.0	6.6	15.0	2.0	16.4	32.6	2.0	16.2	32.2
1977	2.0	15.9	29.8	2.0	9.4	18.9	2.0	22.4	40.0	2.0	21.4	38.7
1978	2.0	9.1	21.0	2.0	6.2	14.3	2.0	15.1	30.2	2.0	14.9	29.8
1979	2.0	9.4	21.7	2.0	6.4	14.8	2.0	16.4	32.6	2.0	16.2	32.1
1980	2.0	12.0	23.3	2.0	7.2	15.0	2.0	13.8	29.0	2.0	12.9	28.0
1981	2.0	22.0	33.7	2.0	10.1	18.5	2.0	14.4	30.5	2.0	14.3	30.1
1982	2.0	7.1	18.8	2.0	5.1	12.8	2.0	12.9	28.4	2.0	12.8	28.1
1983	2.0	11.7	23.2	2.0	7.4	15.1	2.0	18.4	34.0	2.0	18.1	33.4
1984	2.0	18.9	30.3	2.0	11.5	19.4	2.0	33.1	48.6	2.0	32.4	47.7
1985	2.0	8.7	18.3	2.0	5.7	12.4	2.0	13.5	27.6	2.0	13.3	27.2
1986	2.0	7.9	16.9	2.0	5.3	11.4	2.0	12.3	24.5	2.0	12.2	24.2
1987	2.0	7.9	18.3	2.0	5.2	12.3	2.0	12.6	27.5	2.0	12.4	27.1
1988	2.0	8.8	19.9	2.0	5.3	13.1	2.0	13.3	29.5	2.0	13.1	29.2
1989	2.0	13.2	25.3	2.0	8.1	16.0	2.0	23.1	39.1	2.0	22.8	38.5
1990	2.0	15.5	27.3	2.0	9.3	16.9	2.0	22.8	38.3	2.0	20.5	35.7
1991*	2.0	15.5	27.3	2.0	9.3	16.9	2.0	22.8	38.3	2.0	20.5	35.7

* Data on the shoreline width for 1991 were not available. The 1990 shoreline width was used for 1991. This choice has a minimal effect on the final results because the amount of radioactivity released in 1991 was small compared to the total amount released.

Table 10.B.2 Estimated adjustment factor (G) for the finite geometry of Clinch River shorelines for ^{144}Ce.

	CRM 19.2			CRM 14.5			CRM 2.3			CRM 0.0		
Percentiles	2.5%	50.0%	97.5%	2.5%	50.0%	97.5%	2.5%	50.0%	97.5%	2.5%	50.0%	97.5%
1944	0.19	0.32	0.39	0.18	0.28	0.36	0.25	0.42	0.51	0.25	0.42	0.51
1945	0.19	0.32	0.39	0.18	0.28	0.36	0.24	0.42	0.51	0.24	0.42	0.51
1946	0.21	0.36	0.43	0.17	0.28	0.37	0.24	0.42	0.52	0.24	0.42	0.51
1947	0.19	0.32	0.39	0.18	0.29	0.37	0.24	0.42	0.51	0.24	0.42	0.51
1948	0.25	0.43	0.50	0.20	0.34	0.41	0.26	0.45	0.54	0.26	0.45	0.54
1949	0.23	0.39	0.47	0.19	0.32	0.40	0.27	0.48	0.56	0.27	0.47	0.56
1950	0.23	0.40	0.49	0.20	0.33	0.42	0.28	0.49	0.57	0.28	0.49	0.57
1951	0.24	0.41	0.49	0.19	0.32	0.41	0.25	0.43	0.52	0.25	0.43	0.52
1952	0.21	0.36	0.44	0.18	0.30	0.38	0.25	0.43	0.52	0.25	0.43	0.52
1953	0.23	0.40	0.47	0.20	0.33	0.42	0.27	0.47	0.56	0.27	0.47	0.55
1954	0.23	0.39	0.47	0.19	0.31	0.40	0.25	0.42	0.52	0.24	0.42	0.51
1955	0.22	0.38	0.47	0.18	0.30	0.40	0.24	0.42	0.52	0.24	0.42	0.51
1956	0.20	0.35	0.44	0.17	0.28	0.38	0.21	0.37	0.48	0.21	0.37	0.48
1957	0.22	0.38	0.48	0.18	0.29	0.39	0.23	0.40	0.51	0.23	0.40	0.51
1958	0.25	0.44	0.53	0.22	0.38	0.46	0.28	0.50	0.58	0.28	0.50	0.58
1959	0.25	0.44	0.53	0.22	0.38	0.47	0.28	0.50	0.58	0.28	0.50	0.58
1960	0.23	0.40	0.50	0.20	0.34	0.44	0.26	0.45	0.54	0.26	0.45	0.54
1961	0.23	0.39	0.50	0.20	0.34	0.44	0.26	0.44	0.54	0.26	0.44	0.54
1962	0.23	0.40	0.52	0.20	0.34	0.44	0.26	0.45	0.55	0.26	0.45	0.55
1963	0.26	0.45	0.55	0.23	0.40	0.50	0.29	0.51	0.61	0.29	0.51	0.60
1964	0.23	0.40	0.50	0.21	0.35	0.45	0.27	0.49	0.57	0.27	0.48	0.57
1965	0.23	0.40	0.51	0.20	0.34	0.45	0.26	0.46	0.57	0.26	0.46	0.56
1966	0.24	0.41	0.50	0.21	0.36	0.45	0.28	0.49	0.58	0.28	0.49	0.58
1967	0.24	0.41	0.51	0.21	0.36	0.45	0.28	0.50	0.58	0.28	0.49	0.58
1968	0.22	0.37	0.48	0.20	0.33	0.43	0.26	0.46	0.56	0.26	0.45	0.55
1969	0.25	0.44	0.53	0.22	0.38	0.47	0.28	0.49	0.58	0.27	0.48	0.57
1970	0.24	0.42	0.51	0.21	0.36	0.45	0.29	0.50	0.59	0.28	0.50	0.59
1971	0.23	0.40	0.50	0.20	0.34	0.44	0.27	0.47	0.56	0.27	0.46	0.56
1972	0.23	0.40	0.51	0.20	0.34	0.45	0.27	0.47	0.57	0.27	0.47	0.56
1973	0.26	0.45	0.54	0.22	0.39	0.48	0.30	0.53	0.62	0.30	0.53	0.62
1974	0.22	0.38	0.49	0.18	0.29	0.39	0.24	0.43	0.54	0.24	0.43	0.53
1975	0.25	0.44	0.53	0.20	0.34	0.44	0.26	0.46	0.56	0.26	0.45	0.56
1976	0.22	0.38	0.48	0.19	0.31	0.41	0.26	0.46	0.56	0.26	0.45	0.55
1977	0.26	0.45	0.54	0.21	0.37	0.46	0.29	0.50	0.59	0.28	0.50	0.59
1978	0.21	0.37	0.47	0.18	0.31	0.40	0.26	0.44	0.54	0.25	0.44	0.54
1979	0.22	0.38	0.48	0.19	0.31	0.41	0.26	0.46	0.56	0.26	0.45	0.55
1980	0.23	0.40	0.50	0.19	0.32	0.41	0.25	0.43	0.53	0.24	0.42	0.52
1981	0.28	0.49	0.57	0.22	0.37	0.45	0.26	0.44	0.54	0.25	0.44	0.54
1982	0.20	0.34	0.45	0.18	0.29	0.39	0.24	0.42	0.53	0.24	0.42	0.53
1983	0.23	0.40	0.49	0.19	0.32	0.42	0.27	0.47	0.57	0.27	0.47	0.56
1984	0.27	0.46	0.54	0.22	0.38	0.46	0.32	0.56	0.63	0.32	0.55	0.63
1985	0.20	0.35	0.45	0.18	0.29	0.38	0.24	0.43	0.52	0.24	0.42	0.52
1986	0.20	0.34	0.44	0.17	0.28	0.37	0.23	0.41	0.50	0.23	0.40	0.50
1987	0.20	0.35	0.45	0.17	0.28	0.38	0.24	0.42	0.52	0.24	0.42	0.52
1988	0.21	0.36	0.46	0.18	0.29	0.39	0.25	0.43	0.54	0.24	0.43	0.53
1989	0.24	0.41	0.51	0.20	0.33	0.43	0.28	0.50	0.59	0.28	0.50	0.59
1990	0.25	0.44	0.52	0.21	0.35	0.44	0.28	0.50	0.59	0.27	0.49	0.57
1991	0.25	0.44	0.52	0.21	0.35	0.44	0.28	0.50	0.59	0.27	0.49	0.57

Table 10.B.3 Estimated adjustment factor (G) for the finite geometry of Clinch River shorelines for ^{137}Cs.

	CRM 19.2			CRM 14.5			CRM 2.3			CRM 0.0		
Percentiles	2.5%	50.0%	97.5%	2.5%	50.0%	97.5%	2.5%	50.0%	97.5%	2.5%	50.0%	97.5%
1944	0.21	0.34	0.41	0.19	0.31	0.38	0.27	0.45	0.53	0.27	0.45	0.53
1945	0.21	0.34	0.41	0.19	0.31	0.39	0.26	0.45	0.53	0.26	0.45	0.53
1946	0.22	0.38	0.45	0.19	0.31	0.39	0.26	0.45	0.53	0.26	0.45	0.53
1947	0.21	0.34	0.41	0.19	0.31	0.39	0.26	0.45	0.53	0.26	0.45	0.53
1948	0.27	0.45	0.52	0.22	0.36	0.44	0.29	0.48	0.55	0.28	0.47	0.55
1949	0.25	0.42	0.49	0.21	0.34	0.43	0.30	0.50	0.58	0.29	0.50	0.58
1950	0.25	0.43	0.51	0.21	0.35	0.44	0.30	0.51	0.59	0.30	0.51	0.59
1951	0.26	0.43	0.51	0.21	0.35	0.43	0.27	0.45	0.54	0.27	0.45	0.54
1952	0.22	0.38	0.46	0.20	0.32	0.40	0.27	0.46	0.54	0.27	0.45	0.54
1953	0.25	0.42	0.49	0.22	0.36	0.44	0.29	0.49	0.57	0.29	0.49	0.57
1954	0.24	0.41	0.49	0.21	0.34	0.43	0.27	0.45	0.54	0.26	0.44	0.53
1955	0.24	0.41	0.49	0.20	0.33	0.42	0.26	0.44	0.53	0.26	0.44	0.53
1956	0.22	0.37	0.47	0.19	0.30	0.40	0.23	0.40	0.50	0.23	0.39	0.50
1957	0.24	0.40	0.50	0.19	0.32	0.42	0.25	0.42	0.53	0.25	0.42	0.53
1958	0.28	0.47	0.55	0.23	0.40	0.48	0.30	0.52	0.60	0.30	0.52	0.59
1959	0.28	0.47	0.55	0.23	0.40	0.49	0.30	0.52	0.60	0.30	0.52	0.60
1960	0.25	0.42	0.52	0.22	0.37	0.46	0.28	0.47	0.56	0.28	0.47	0.56
1961	0.24	0.41	0.52	0.21	0.36	0.46	0.28	0.47	0.56	0.28	0.47	0.56
1962	0.25	0.42	0.53	0.22	0.36	0.46	0.29	0.48	0.57	0.28	0.47	0.56
1963	0.28	0.47	0.56	0.25	0.42	0.52	0.31	0.53	0.62	0.31	0.53	0.62
1964	0.25	0.42	0.52	0.22	0.38	0.47	0.30	0.51	0.59	0.30	0.50	0.59
1965	0.25	0.42	0.53	0.22	0.36	0.47	0.29	0.48	0.58	0.28	0.48	0.58
1966	0.26	0.43	0.52	0.22	0.38	0.47	0.30	0.51	0.59	0.30	0.51	0.59
1967	0.26	0.43	0.53	0.23	0.38	0.48	0.30	0.52	0.60	0.30	0.51	0.60
1968	0.23	0.40	0.50	0.21	0.35	0.45	0.29	0.48	0.57	0.29	0.47	0.57
1969	0.28	0.47	0.54	0.24	0.40	0.49	0.30	0.51	0.59	0.29	0.50	0.58
1970	0.26	0.44	0.53	0.23	0.39	0.48	0.31	0.52	0.60	0.31	0.52	0.60
1971	0.25	0.42	0.52	0.22	0.37	0.46	0.29	0.49	0.58	0.29	0.48	0.58
1972	0.25	0.43	0.53	0.22	0.37	0.47	0.29	0.49	0.58	0.29	0.49	0.58
1973	0.28	0.47	0.56	0.24	0.41	0.50	0.33	0.55	0.63	0.32	0.55	0.63
1974	0.23	0.40	0.51	0.19	0.31	0.42	0.27	0.45	0.55	0.26	0.45	0.55
1975	0.27	0.46	0.55	0.22	0.37	0.47	0.29	0.48	0.58	0.28	0.48	0.57
1976	0.23	0.40	0.50	0.20	0.34	0.44	0.28	0.48	0.57	0.28	0.48	0.57
1977	0.28	0.47	0.56	0.23	0.39	0.48	0.31	0.52	0.61	0.31	0.52	0.60
1978	0.23	0.40	0.50	0.20	0.33	0.43	0.28	0.47	0.56	0.28	0.46	0.56
1979	0.23	0.40	0.50	0.20	0.33	0.43	0.29	0.48	0.57	0.28	0.48	0.57
1980	0.25	0.42	0.52	0.21	0.34	0.44	0.27	0.46	0.55	0.26	0.45	0.54
1981	0.30	0.51	0.58	0.23	0.39	0.48	0.28	0.46	0.56	0.28	0.46	0.56
1982	0.21	0.37	0.48	0.19	0.31	0.41	0.26	0.45	0.55	0.26	0.45	0.54
1983	0.25	0.42	0.51	0.21	0.35	0.44	0.29	0.49	0.58	0.29	0.49	0.58
1984	0.29	0.48	0.56	0.24	0.41	0.48	0.34	0.57	0.64	0.34	0.57	0.64
1985	0.22	0.38	0.47	0.19	0.31	0.40	0.26	0.45	0.54	0.26	0.45	0.54
1986	0.21	0.36	0.46	0.19	0.30	0.39	0.25	0.43	0.52	0.25	0.43	0.52
1987	0.22	0.37	0.47	0.19	0.31	0.40	0.26	0.44	0.54	0.26	0.44	0.54
1988	0.22	0.39	0.49	0.19	0.31	0.41	0.27	0.45	0.55	0.26	0.45	0.55
1989	0.26	0.44	0.53	0.21	0.36	0.45	0.31	0.52	0.60	0.31	0.52	0.60
1990	0.27	0.46	0.54	0.22	0.38	0.46	0.31	0.52	0.60	0.30	0.51	0.59
1991	0.27	0.46	0.54	0.22	0.38	0.46	0.31	0.52	0.60	0.30	0.51	0.59

Table 10.B.4 Estimated adjustment factor (G) for the finite geometry of Clinch River shorelines for ^{106}Ru.

	CRM 19.2			CRM 14.5			CRM 2.3			CRM 0.0		
Percentiles	2.5%	50.0%	97.5%	2.5%	50.0%	97.5%	2.5%	50.0%	97.5%	2.5%	50.0%	97.5%
1944	0.21	0.34	0.41	0.19	0.31	0.38	0.27	0.45	0.53	0.27	0.45	0.53
1945	0.21	0.34	0.41	0.19	0.31	0.39	0.26	0.45	0.53	0.26	0.45	0.53
1946	0.22	0.38	0.45	0.19	0.31	0.39	0.26	0.45	0.53	0.26	0.45	0.53
1947	0.21	0.34	0.41	0.19	0.31	0.39	0.26	0.45	0.53	0.26	0.45	0.53
1948	0.27	0.45	0.52	0.22	0.36	0.44	0.29	0.48	0.55	0.28	0.47	0.55
1949	0.25	0.42	0.49	0.21	0.34	0.43	0.30	0.50	0.58	0.29	0.50	0.58
1950	0.25	0.43	0.51	0.21	0.35	0.44	0.30	0.51	0.59	0.30	0.51	0.59
1951	0.26	0.43	0.51	0.21	0.35	0.43	0.27	0.45	0.54	0.27	0.45	0.54
1952	0.22	0.38	0.46	0.20	0.32	0.40	0.27	0.46	0.54	0.27	0.45	0.54
1953	0.25	0.42	0.49	0.22	0.36	0.44	0.29	0.49	0.57	0.29	0.49	0.57
1954	0.24	0.41	0.49	0.21	0.34	0.43	0.27	0.45	0.54	0.26	0.44	0.53
1955	0.24	0.41	0.49	0.20	0.33	0.42	0.26	0.44	0.53	0.26	0.44	0.53
1956	0.22	0.37	0.47	0.19	0.30	0.40	0.23	0.40	0.50	0.23	0.39	0.50
1957	0.24	0.40	0.50	0.19	0.32	0.42	0.25	0.42	0.53	0.25	0.42	0.53
1958	0.28	0.47	0.55	0.23	0.40	0.48	0.30	0.52	0.60	0.30	0.52	0.59
1959	0.28	0.47	0.55	0.23	0.40	0.49	0.30	0.52	0.60	0.30	0.52	0.60
1960	0.25	0.42	0.52	0.22	0.37	0.46	0.28	0.47	0.56	0.28	0.47	0.56
1961	0.24	0.41	0.52	0.21	0.36	0.46	0.28	0.47	0.56	0.28	0.47	0.56
1962	0.25	0.42	0.53	0.22	0.36	0.46	0.29	0.48	0.57	0.28	0.47	0.56
1963	0.28	0.47	0.56	0.25	0.42	0.52	0.31	0.53	0.62	0.31	0.53	0.62
1964	0.25	0.42	0.52	0.22	0.38	0.47	0.30	0.51	0.59	0.30	0.50	0.59
1965	0.25	0.42	0.53	0.22	0.36	0.47	0.29	0.48	0.58	0.28	0.48	0.58
1966	0.26	0.43	0.52	0.22	0.38	0.47	0.30	0.51	0.59	0.30	0.51	0.59
1967	0.26	0.43	0.53	0.23	0.38	0.48	0.30	0.52	0.60	0.30	0.51	0.60
1968	0.23	0.40	0.50	0.21	0.35	0.45	0.29	0.48	0.57	0.29	0.47	0.57
1969	0.28	0.47	0.54	0.24	0.40	0.49	0.30	0.51	0.59	0.29	0.50	0.58
1970	0.26	0.44	0.53	0.23	0.39	0.48	0.31	0.52	0.60	0.31	0.52	0.60
1971	0.25	0.42	0.52	0.22	0.37	0.46	0.29	0.49	0.58	0.29	0.48	0.58
1972	0.25	0.43	0.53	0.22	0.37	0.47	0.29	0.49	0.58	0.29	0.49	0.58
1973	0.28	0.47	0.56	0.24	0.41	0.50	0.33	0.55	0.63	0.32	0.55	0.63
1974	0.23	0.40	0.51	0.19	0.31	0.42	0.27	0.45	0.55	0.26	0.45	0.55
1975	0.27	0.46	0.55	0.22	0.37	0.47	0.29	0.48	0.58	0.28	0.48	0.57
1976	0.23	0.40	0.50	0.20	0.34	0.44	0.28	0.48	0.57	0.28	0.48	0.57
1977	0.28	0.47	0.56	0.23	0.39	0.48	0.31	0.52	0.61	0.31	0.52	0.60
1978	0.23	0.40	0.50	0.20	0.33	0.43	0.28	0.47	0.56	0.28	0.46	0.56
1979	0.23	0.40	0.50	0.20	0.33	0.43	0.29	0.48	0.57	0.28	0.48	0.57
1980	0.25	0.42	0.52	0.21	0.34	0.44	0.27	0.46	0.55	0.26	0.45	0.54
1981	0.30	0.51	0.58	0.23	0.39	0.48	0.28	0.46	0.56	0.28	0.46	0.56
1982	0.21	0.37	0.48	0.19	0.31	0.41	0.26	0.45	0.55	0.26	0.45	0.54
1983	0.25	0.42	0.51	0.21	0.35	0.44	0.29	0.49	0.58	0.29	0.49	0.58
1984	0.29	0.48	0.56	0.24	0.41	0.48	0.34	0.57	0.64	0.34	0.57	0.64
1985	0.22	0.38	0.47	0.19	0.31	0.40	0.26	0.45	0.54	0.26	0.45	0.54
1986	0.21	0.36	0.46	0.19	0.30	0.39	0.25	0.43	0.52	0.25	0.43	0.52
1987	0.22	0.37	0.47	0.19	0.31	0.40	0.26	0.44	0.54	0.26	0.44	0.54
1988	0.22	0.39	0.49	0.19	0.31	0.41	0.27	0.45	0.55	0.26	0.45	0.55
1989	0.26	0.44	0.53	0.21	0.36	0.45	0.31	0.52	0.60	0.31	0.52	0.60
1990	0.27	0.46	0.54	0.22	0.38	0.46	0.31	0.52	0.60	0.30	0.51	0.59
1991	0.27	0.46	0.54	0.22	0.38	0.46	0.31	0.52	0.60	0.30	0.51	0.59

Table 10.B.5 Estimated adjustment factor (G) for the finite geometry of Clinch River shorelines for ^{95}Zr.

	CRM 19.2			CRM 14.5			CRM 2.3			CRM 0.0		
Percentiles	2.5%	50.0%	97.5%	2.5%	50.0%	97.5%	2.5%	50.0%	97.5%	2.5%	50.0%	97.5%
1944	0.21	0.34	0.41	0.20	0.31	0.38	0.27	0.45	0.53	0.27	0.45	0.53
1945	0.21	0.34	0.41	0.20	0.31	0.39	0.27	0.45	0.53	0.27	0.45	0.53
1946	0.23	0.38	0.45	0.19	0.31	0.39	0.27	0.45	0.54	0.27	0.45	0.54
1947	0.21	0.34	0.41	0.20	0.31	0.39	0.27	0.45	0.53	0.27	0.45	0.53
1948	0.27	0.45	0.52	0.23	0.36	0.44	0.29	0.48	0.56	0.28	0.47	0.56
1949	0.26	0.42	0.49	0.21	0.34	0.43	0.30	0.50	0.59	0.29	0.50	0.58
1950	0.26	0.43	0.51	0.22	0.35	0.44	0.30	0.51	0.59	0.30	0.51	0.59
1951	0.26	0.43	0.51	0.22	0.35	0.43	0.27	0.45	0.54	0.27	0.45	0.54
1952	0.23	0.38	0.46	0.20	0.32	0.40	0.27	0.46	0.54	0.27	0.45	0.54
1953	0.26	0.42	0.49	0.22	0.36	0.44	0.29	0.49	0.58	0.29	0.49	0.57
1954	0.25	0.41	0.49	0.21	0.34	0.43	0.27	0.45	0.54	0.27	0.44	0.53
1955	0.25	0.41	0.49	0.21	0.33	0.42	0.27	0.44	0.54	0.27	0.44	0.53
1956	0.23	0.37	0.47	0.19	0.30	0.40	0.24	0.40	0.50	0.24	0.39	0.50
1957	0.25	0.40	0.50	0.20	0.32	0.42	0.26	0.42	0.53	0.26	0.42	0.53
1958	0.28	0.47	0.55	0.24	0.40	0.48	0.30	0.52	0.60	0.30	0.52	0.60
1959	0.28	0.47	0.56	0.24	0.40	0.49	0.30	0.52	0.60	0.30	0.52	0.60
1960	0.25	0.42	0.52	0.22	0.37	0.46	0.28	0.47	0.57	0.28	0.47	0.56
1961	0.25	0.41	0.52	0.22	0.36	0.46	0.28	0.47	0.56	0.28	0.47	0.56
1962	0.25	0.42	0.54	0.22	0.36	0.46	0.29	0.48	0.57	0.28	0.47	0.57
1963	0.28	0.47	0.57	0.26	0.42	0.52	0.31	0.53	0.62	0.31	0.53	0.62
1964	0.26	0.42	0.52	0.23	0.38	0.47	0.30	0.51	0.59	0.30	0.50	0.59
1965	0.26	0.42	0.53	0.22	0.36	0.47	0.29	0.48	0.59	0.28	0.48	0.59
1966	0.26	0.43	0.52	0.23	0.38	0.47	0.30	0.51	0.60	0.30	0.51	0.60
1967	0.26	0.43	0.53	0.23	0.38	0.48	0.30	0.52	0.60	0.30	0.51	0.60
1968	0.24	0.40	0.50	0.22	0.35	0.45	0.29	0.48	0.58	0.29	0.47	0.57
1969	0.28	0.47	0.55	0.25	0.40	0.49	0.30	0.51	0.60	0.29	0.50	0.59
1970	0.27	0.44	0.53	0.24	0.39	0.48	0.31	0.52	0.61	0.31	0.52	0.60
1971	0.26	0.42	0.52	0.22	0.37	0.46	0.29	0.49	0.58	0.29	0.48	0.58
1972	0.26	0.43	0.53	0.22	0.37	0.47	0.29	0.49	0.59	0.29	0.49	0.59
1973	0.28	0.47	0.56	0.25	0.41	0.50	0.33	0.55	0.63	0.32	0.55	0.63
1974	0.24	0.40	0.51	0.19	0.31	0.42	0.27	0.45	0.56	0.27	0.45	0.55
1975	0.27	0.46	0.55	0.23	0.37	0.47	0.29	0.48	0.59	0.28	0.48	0.58
1976	0.24	0.40	0.50	0.21	0.34	0.44	0.28	0.48	0.58	0.28	0.48	0.57
1977	0.28	0.47	0.56	0.24	0.39	0.48	0.31	0.52	0.61	0.31	0.52	0.60
1978	0.24	0.40	0.50	0.21	0.33	0.43	0.28	0.47	0.56	0.28	0.46	0.56
1979	0.24	0.40	0.50	0.21	0.33	0.43	0.29	0.48	0.58	0.28	0.48	0.57
1980	0.26	0.42	0.52	0.21	0.34	0.44	0.27	0.46	0.55	0.27	0.45	0.55
1981	0.30	0.51	0.59	0.24	0.39	0.48	0.28	0.46	0.56	0.28	0.46	0.56
1982	0.22	0.37	0.48	0.19	0.31	0.41	0.27	0.45	0.55	0.27	0.45	0.55
1983	0.26	0.42	0.51	0.21	0.35	0.44	0.29	0.49	0.59	0.29	0.49	0.58
1984	0.29	0.48	0.56	0.25	0.41	0.48	0.34	0.58	0.65	0.34	0.57	0.64
1985	0.23	0.38	0.47	0.20	0.31	0.40	0.27	0.45	0.54	0.27	0.45	0.54
1986	0.22	0.36	0.46	0.19	0.30	0.39	0.26	0.43	0.52	0.26	0.43	0.52
1987	0.23	0.37	0.47	0.19	0.31	0.40	0.27	0.44	0.54	0.26	0.44	0.54
1988	0.23	0.39	0.49	0.20	0.31	0.41	0.27	0.45	0.56	0.27	0.45	0.55
1989	0.26	0.44	0.53	0.22	0.36	0.45	0.31	0.52	0.61	0.31	0.52	0.60
1990	0.27	0.46	0.54	0.23	0.38	0.46	0.31	0.52	0.60	0.30	0.51	0.59
1991	0.27	0.46	0.54	0.23	0.38	0.46	0.31	0.52	0.60	0.30	0.51	0.59

Table 10.B.6 Estimated adjustment factor (G) for the finite geometry of Clinch River shorelines for ^{95}Nb.

	CRM 19.2			CRM 14.5			CRM 2.3			CRM 0.0		
Percentiles	2.5%	50.0%	97.5%	2.5%	50.0%	97.5%	2.5%	50.0%	97.5%	2.5%	50.0%	97.5%
1944	0.21	0.34	0.41	0.20	0.31	0.38	0.27	0.45	0.53	0.27	0.45	0.53
1945	0.21	0.34	0.41	0.20	0.31	0.39	0.27	0.45	0.53	0.27	0.45	0.53
1946	0.23	0.38	0.45	0.19	0.31	0.39	0.27	0.45	0.54	0.27	0.45	0.54
1947	0.21	0.34	0.41	0.20	0.31	0.39	0.27	0.45	0.53	0.27	0.45	0.53
1948	0.27	0.45	0.52	0.23	0.36	0.44	0.29	0.48	0.56	0.28	0.47	0.56
1949	0.26	0.42	0.49	0.21	0.34	0.43	0.30	0.50	0.59	0.29	0.50	0.58
1950	0.26	0.43	0.51	0.22	0.35	0.44	0.30	0.51	0.59	0.30	0.51	0.59
1951	0.26	0.43	0.51	0.22	0.35	0.43	0.27	0.45	0.54	0.27	0.45	0.54
1952	0.23	0.38	0.46	0.20	0.32	0.40	0.27	0.46	0.54	0.27	0.45	0.54
1953	0.26	0.42	0.49	0.22	0.36	0.44	0.29	0.49	0.58	0.29	0.49	0.57
1954	0.25	0.41	0.49	0.21	0.34	0.43	0.27	0.45	0.54	0.27	0.44	0.53
1955	0.25	0.41	0.49	0.21	0.33	0.42	0.27	0.44	0.54	0.27	0.44	0.53
1956	0.23	0.37	0.47	0.19	0.30	0.40	0.24	0.40	0.50	0.24	0.39	0.50
1957	0.25	0.40	0.50	0.20	0.32	0.42	0.26	0.42	0.53	0.26	0.42	0.53
1958	0.28	0.47	0.55	0.24	0.40	0.48	0.30	0.52	0.60	0.30	0.52	0.60
1959	0.28	0.47	0.56	0.24	0.40	0.49	0.30	0.52	0.60	0.30	0.52	0.60
1960	0.25	0.42	0.52	0.22	0.37	0.46	0.28	0.47	0.57	0.28	0.47	0.56
1961	0.25	0.41	0.52	0.22	0.36	0.46	0.28	0.47	0.56	0.28	0.47	0.56
1962	0.25	0.42	0.54	0.22	0.36	0.46	0.29	0.48	0.57	0.28	0.47	0.57
1963	0.28	0.47	0.57	0.26	0.42	0.52	0.31	0.53	0.62	0.31	0.53	0.62
1964	0.26	0.42	0.52	0.23	0.38	0.47	0.30	0.51	0.59	0.30	0.50	0.59
1965	0.26	0.42	0.53	0.22	0.36	0.47	0.29	0.48	0.59	0.28	0.48	0.59
1966	0.26	0.43	0.52	0.23	0.38	0.47	0.30	0.51	0.60	0.30	0.51	0.60
1967	0.26	0.43	0.53	0.23	0.38	0.48	0.30	0.52	0.60	0.30	0.51	0.60
1968	0.24	0.40	0.50	0.22	0.35	0.45	0.29	0.48	0.58	0.29	0.47	0.57
1969	0.28	0.47	0.55	0.25	0.40	0.49	0.30	0.51	0.60	0.29	0.50	0.59
1970	0.27	0.44	0.53	0.24	0.39	0.48	0.31	0.52	0.61	0.31	0.52	0.60
1971	0.26	0.42	0.52	0.22	0.37	0.46	0.29	0.49	0.58	0.29	0.48	0.58
1972	0.26	0.43	0.53	0.22	0.37	0.47	0.29	0.49	0.59	0.29	0.49	0.59
1973	0.28	0.47	0.56	0.25	0.41	0.50	0.33	0.55	0.63	0.32	0.55	0.63
1974	0.24	0.40	0.51	0.19	0.31	0.42	0.27	0.45	0.56	0.27	0.45	0.55
1975	0.27	0.46	0.55	0.23	0.37	0.47	0.29	0.48	0.59	0.28	0.48	0.58
1976	0.24	0.40	0.50	0.21	0.34	0.44	0.28	0.48	0.58	0.28	0.48	0.57
1977	0.28	0.47	0.56	0.24	0.39	0.48	0.31	0.52	0.61	0.31	0.52	0.60
1978	0.24	0.40	0.50	0.21	0.33	0.43	0.28	0.47	0.56	0.28	0.46	0.56
1979	0.24	0.40	0.50	0.21	0.33	0.43	0.29	0.48	0.58	0.28	0.48	0.57
1980	0.26	0.42	0.52	0.21	0.34	0.44	0.27	0.46	0.55	0.27	0.45	0.55
1981	0.30	0.51	0.59	0.24	0.39	0.48	0.28	0.46	0.56	0.28	0.46	0.56
1982	0.22	0.37	0.48	0.19	0.31	0.41	0.27	0.45	0.55	0.27	0.45	0.55
1983	0.26	0.42	0.51	0.21	0.35	0.44	0.29	0.49	0.59	0.29	0.49	0.58
1984	0.29	0.48	0.56	0.25	0.41	0.48	0.34	0.58	0.65	0.34	0.57	0.64
1985	0.23	0.38	0.47	0.20	0.31	0.40	0.27	0.45	0.54	0.27	0.45	0.54
1986	0.22	0.36	0.46	0.19	0.30	0.39	0.26	0.43	0.52	0.26	0.43	0.52
1987	0.23	0.37	0.47	0.19	0.31	0.40	0.27	0.44	0.54	0.26	0.44	0.54
1988	0.23	0.39	0.49	0.20	0.31	0.41	0.27	0.45	0.56	0.27	0.45	0.55
1989	0.26	0.44	0.53	0.22	0.36	0.45	0.31	0.52	0.61	0.31	0.52	0.60
1990	0.27	0.46	0.54	0.23	0.38	0.46	0.31	0.52	0.60	0.30	0.51	0.59
1991	0.27	0.46	0.54	0.23	0.38	0.46	0.31	0.52	0.60	0.30	0.51	0.59

Table 10.B.7 Estimated adjustment factor (G) for the finite geometry of Clinch River shorelines for ^{60}Co.

	CRM 19.2			CRM 14.5			CRM 2.3			CRM 0.0		
Percentiles	2.5%	50.0%	97.5%	2.5%	50.0%	97.5%	2.5%	50.0%	97.5%	2.5%	50.0%	97.5%
1944	0.21	0.35	0.42	0.20	0.32	0.39	0.28	0.46	0.54	0.28	0.46	0.54
1945	0.21	0.35	0.42	0.20	0.32	0.40	0.27	0.46	0.54	0.27	0.46	0.54
1946	0.23	0.39	0.46	0.19	0.32	0.40	0.27	0.46	0.54	0.27	0.46	0.54
1947	0.21	0.35	0.42	0.20	0.32	0.40	0.27	0.46	0.54	0.27	0.46	0.54
1948	0.28	0.46	0.53	0.23	0.37	0.45	0.30	0.49	0.56	0.29	0.48	0.56
1949	0.26	0.43	0.50	0.21	0.35	0.44	0.31	0.51	0.59	0.30	0.51	0.59
1950	0.26	0.44	0.52	0.22	0.36	0.45	0.31	0.52	0.60	0.31	0.52	0.60
1951	0.27	0.44	0.52	0.22	0.36	0.44	0.28	0.46	0.55	0.28	0.46	0.55
1952	0.23	0.39	0.47	0.20	0.33	0.41	0.28	0.47	0.55	0.28	0.46	0.55
1953	0.26	0.43	0.50	0.22	0.37	0.45	0.30	0.50	0.58	0.30	0.50	0.58
1954	0.25	0.42	0.50	0.21	0.35	0.44	0.28	0.46	0.55	0.27	0.45	0.54
1955	0.25	0.42	0.50	0.21	0.34	0.43	0.27	0.45	0.54	0.27	0.45	0.54
1956	0.23	0.38	0.48	0.19	0.31	0.41	0.24	0.41	0.51	0.24	0.40	0.51
1957	0.25	0.41	0.51	0.20	0.33	0.43	0.26	0.43	0.54	0.26	0.43	0.54
1958	0.29	0.48	0.56	0.24	0.41	0.49	0.31	0.53	0.61	0.31	0.53	0.60
1959	0.29	0.48	0.56	0.24	0.41	0.50	0.31	0.53	0.61	0.31	0.53	0.61
1960	0.26	0.43	0.53	0.22	0.38	0.47	0.29	0.48	0.57	0.29	0.48	0.57
1961	0.25	0.42	0.53	0.22	0.37	0.47	0.29	0.48	0.57	0.29	0.48	0.57
1962	0.26	0.43	0.54	0.22	0.37	0.47	0.30	0.49	0.58	0.29	0.48	0.57
1963	0.29	0.48	0.57	0.26	0.43	0.53	0.32	0.54	0.63	0.32	0.54	0.63
1964	0.26	0.43	0.53	0.23	0.39	0.48	0.31	0.52	0.60	0.31	0.51	0.60
1965	0.26	0.43	0.54	0.22	0.37	0.48	0.30	0.49	0.59	0.29	0.49	0.59
1966	0.27	0.44	0.53	0.23	0.39	0.48	0.31	0.52	0.60	0.31	0.52	0.60
1967	0.27	0.44	0.54	0.23	0.39	0.49	0.31	0.53	0.61	0.31	0.52	0.61
1968	0.24	0.41	0.51	0.22	0.36	0.46	0.30	0.49	0.58	0.30	0.48	0.58
1969	0.29	0.48	0.55	0.25	0.41	0.50	0.31	0.52	0.60	0.30	0.51	0.59
1970	0.27	0.45	0.54	0.24	0.40	0.49	0.32	0.53	0.61	0.32	0.53	0.61
1971	0.26	0.43	0.53	0.22	0.38	0.47	0.30	0.50	0.59	0.30	0.49	0.59
1972	0.26	0.44	0.54	0.22	0.38	0.48	0.30	0.50	0.59	0.30	0.50	0.59
1973	0.29	0.48	0.57	0.25	0.42	0.51	0.34	0.56	0.64	0.33	0.56	0.64
1974	0.24	0.41	0.52	0.19	0.32	0.43	0.28	0.46	0.56	0.27	0.46	0.56
1975	0.28	0.47	0.56	0.23	0.38	0.48	0.30	0.49	0.59	0.29	0.49	0.58
1976	0.24	0.41	0.51	0.21	0.35	0.45	0.29	0.49	0.58	0.29	0.49	0.58
1977	0.29	0.48	0.57	0.24	0.40	0.49	0.32	0.53	0.62	0.32	0.53	0.61
1978	0.24	0.41	0.51	0.21	0.34	0.44	0.29	0.48	0.57	0.29	0.47	0.57
1979	0.24	0.41	0.51	0.21	0.34	0.44	0.30	0.49	0.58	0.29	0.49	0.58
1980	0.26	0.43	0.53	0.21	0.35	0.45	0.28	0.47	0.56	0.27	0.46	0.55
1981	0.31	0.52	0.59	0.24	0.40	0.49	0.29	0.47	0.57	0.29	0.47	0.57
1982	0.22	0.38	0.49	0.19	0.32	0.42	0.27	0.46	0.56	0.27	0.46	0.55
1983	0.26	0.43	0.52	0.21	0.36	0.45	0.30	0.50	0.59	0.30	0.50	0.59
1984	0.30	0.49	0.57	0.25	0.42	0.49	0.35	0.58	0.65	0.35	0.58	0.65
1985	0.23	0.39	0.48	0.20	0.32	0.41	0.27	0.46	0.55	0.27	0.46	0.55
1986	0.22	0.37	0.47	0.19	0.31	0.40	0.26	0.44	0.53	0.26	0.44	0.53
1987	0.23	0.38	0.48	0.19	0.32	0.41	0.27	0.45	0.55	0.27	0.45	0.55
1988	0.23	0.40	0.50	0.20	0.32	0.42	0.28	0.46	0.56	0.27	0.46	0.56
1989	0.27	0.45	0.54	0.22	0.37	0.46	0.32	0.53	0.61	0.32	0.53	0.61
1990	0.28	0.47	0.55	0.23	0.39	0.47	0.32	0.53	0.61	0.31	0.52	0.60
1991	0.28	0.47	0.55	0.23	0.39	0.47	0.32	0.53	0.61	0.31	0.52	0.60

Table 10.B.8 Estimated adjustment factor (G) for the finite geometry of Clinch River shorelines for ^{90}Sr.

	CRM 19.2			CRM 14.5			CRM 2.3			CRM 0.0		
Percentiles	2.5%	50.0%	97.5%	2.5%	50.0%	97.5%	2.5%	50.0%	97.5%	2.5%	50.0%	97.5%
1944	0.21	0.34	0.41	0.19	0.31	0.38	0.27	0.45	0.53	0.27	0.45	0.53
1945	0.21	0.34	0.41	0.19	0.31	0.39	0.26	0.45	0.53	0.26	0.45	0.53
1946	0.22	0.38	0.45	0.19	0.31	0.39	0.26	0.45	0.53	0.26	0.45	0.53
1947	0.21	0.34	0.41	0.19	0.31	0.39	0.26	0.45	0.53	0.26	0.45	0.53
1948	0.27	0.45	0.52	0.22	0.36	0.44	0.29	0.48	0.55	0.28	0.47	0.55
1949	0.25	0.42	0.49	0.21	0.34	0.43	0.30	0.50	0.58	0.29	0.50	0.58
1950	0.25	0.43	0.51	0.21	0.35	0.44	0.30	0.51	0.59	0.30	0.51	0.59
1951	0.26	0.43	0.51	0.21	0.35	0.43	0.27	0.45	0.54	0.27	0.45	0.54
1952	0.22	0.38	0.46	0.20	0.32	0.40	0.27	0.46	0.54	0.27	0.45	0.54
1953	0.25	0.42	0.49	0.22	0.36	0.44	0.29	0.49	0.57	0.29	0.49	0.57
1954	0.24	0.41	0.49	0.21	0.34	0.43	0.27	0.45	0.54	0.26	0.44	0.53
1955	0.24	0.41	0.49	0.20	0.33	0.42	0.26	0.44	0.53	0.26	0.44	0.53
1956	0.22	0.37	0.47	0.19	0.30	0.40	0.23	0.40	0.50	0.23	0.39	0.50
1957	0.24	0.40	0.50	0.19	0.32	0.42	0.25	0.42	0.53	0.25	0.42	0.53
1958	0.28	0.47	0.55	0.23	0.40	0.48	0.30	0.52	0.60	0.30	0.52	0.59
1959	0.28	0.47	0.55	0.23	0.40	0.49	0.30	0.52	0.60	0.30	0.52	0.60
1960	0.25	0.42	0.52	0.22	0.37	0.46	0.28	0.47	0.56	0.28	0.47	0.56
1961	0.24	0.41	0.52	0.21	0.36	0.46	0.28	0.47	0.56	0.28	0.47	0.56
1962	0.25	0.42	0.53	0.22	0.36	0.46	0.29	0.48	0.57	0.28	0.47	0.56
1963	0.28	0.47	0.56	0.25	0.42	0.52	0.31	0.53	0.62	0.31	0.53	0.62
1964	0.25	0.42	0.52	0.22	0.38	0.47	0.30	0.51	0.59	0.30	0.50	0.59
1965	0.25	0.42	0.53	0.22	0.36	0.47	0.29	0.48	0.58	0.28	0.48	0.58
1966	0.26	0.43	0.52	0.22	0.38	0.47	0.30	0.51	0.59	0.30	0.51	0.59
1967	0.26	0.43	0.53	0.23	0.38	0.48	0.30	0.52	0.60	0.30	0.51	0.60
1968	0.23	0.40	0.50	0.21	0.35	0.45	0.29	0.48	0.57	0.29	0.47	0.57
1969	0.28	0.47	0.54	0.24	0.40	0.49	0.30	0.51	0.59	0.29	0.50	0.58
1970	0.26	0.44	0.53	0.23	0.39	0.48	0.31	0.52	0.60	0.31	0.52	0.60
1971	0.25	0.42	0.52	0.22	0.37	0.46	0.29	0.49	0.58	0.29	0.48	0.58
1972	0.25	0.43	0.53	0.22	0.37	0.47	0.29	0.49	0.58	0.29	0.49	0.58
1973	0.28	0.47	0.56	0.24	0.41	0.50	0.33	0.55	0.63	0.32	0.55	0.63
1974	0.23	0.40	0.51	0.19	0.31	0.42	0.27	0.45	0.55	0.26	0.45	0.55
1975	0.27	0.46	0.55	0.22	0.37	0.47	0.29	0.48	0.58	0.28	0.48	0.57
1976	0.23	0.40	0.50	0.20	0.34	0.44	0.28	0.48	0.57	0.28	0.48	0.57
1977	0.28	0.47	0.56	0.23	0.39	0.48	0.31	0.52	0.61	0.31	0.52	0.60
1978	0.23	0.40	0.50	0.20	0.33	0.43	0.28	0.47	0.56	0.28	0.46	0.56
1979	0.23	0.40	0.50	0.20	0.33	0.43	0.29	0.48	0.57	0.28	0.48	0.57
1980	0.25	0.42	0.52	0.21	0.34	0.44	0.27	0.46	0.55	0.26	0.45	0.54
1981	0.30	0.51	0.58	0.23	0.39	0.48	0.28	0.46	0.56	0.28	0.46	0.56
1982	0.21	0.37	0.48	0.19	0.31	0.41	0.26	0.45	0.55	0.26	0.45	0.54
1983	0.25	0.42	0.51	0.21	0.35	0.44	0.29	0.49	0.58	0.29	0.49	0.58
1984	0.29	0.48	0.56	0.24	0.41	0.48	0.34	0.57	0.64	0.34	0.57	0.64
1985	0.22	0.38	0.47	0.19	0.31	0.40	0.26	0.45	0.54	0.26	0.45	0.54
1986	0.21	0.36	0.46	0.19	0.30	0.39	0.25	0.43	0.52	0.25	0.43	0.52
1987	0.22	0.37	0.47	0.19	0.31	0.40	0.26	0.44	0.54	0.26	0.44	0.54
1988	0.22	0.39	0.49	0.19	0.31	0.41	0.27	0.45	0.55	0.26	0.45	0.55
1989	0.26	0.44	0.53	0.21	0.36	0.45	0.31	0.52	0.60	0.31	0.52	0.60
1990	0.27	0.46	0.54	0.22	0.38	0.46	0.31	0.52	0.60	0.30	0.51	0.59
1991	0.27	0.46	0.54	0.22	0.38	0.46	0.31	0.52	0.60	0.30	0.51	0.59

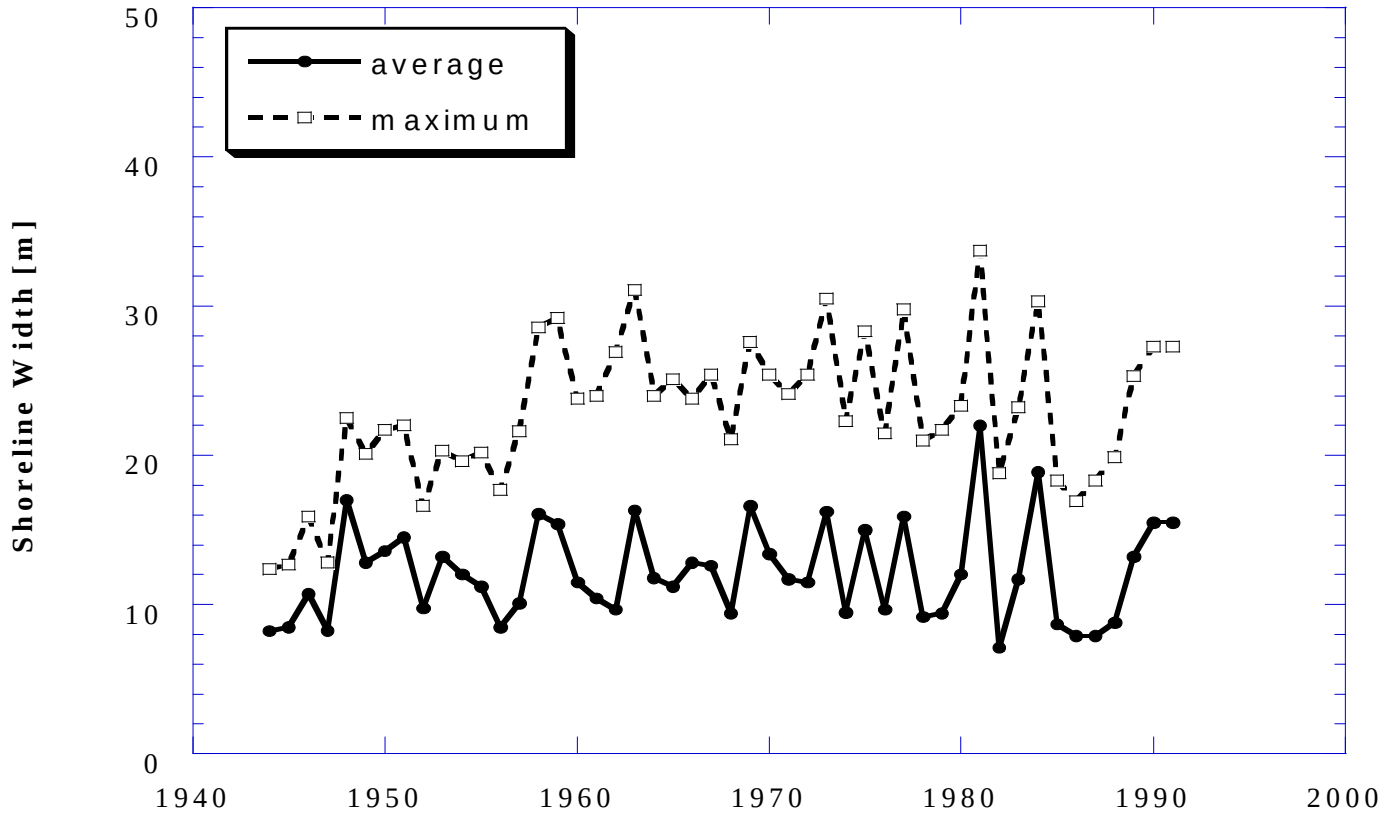

Figure 10B.1 Estimated shoreline width for the Jones Island area (CRM 19.2).

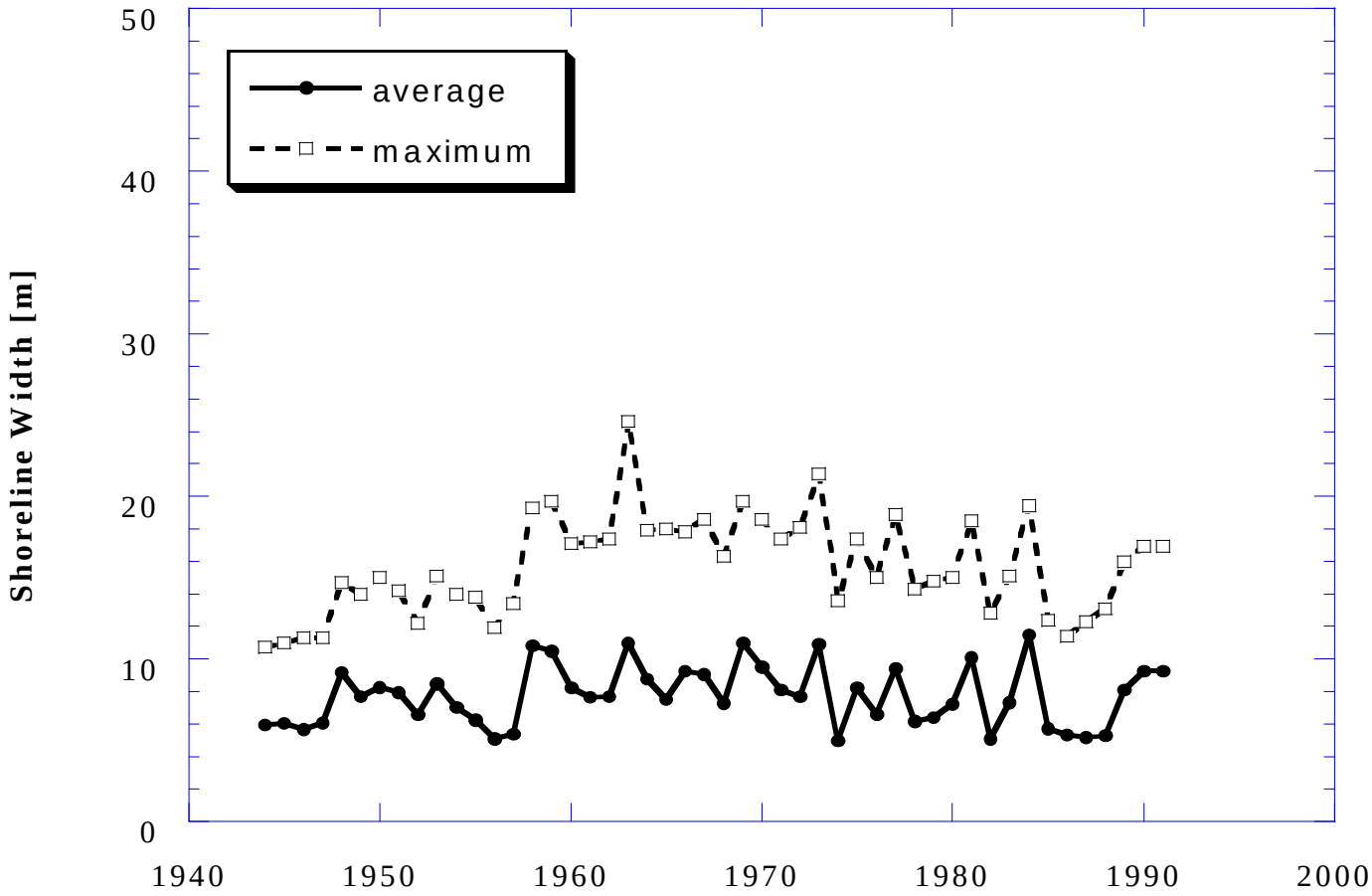

Figure 10B.2 Estimated shoreline width for the Grassy Creek/K-25 area (CRM 14.5)

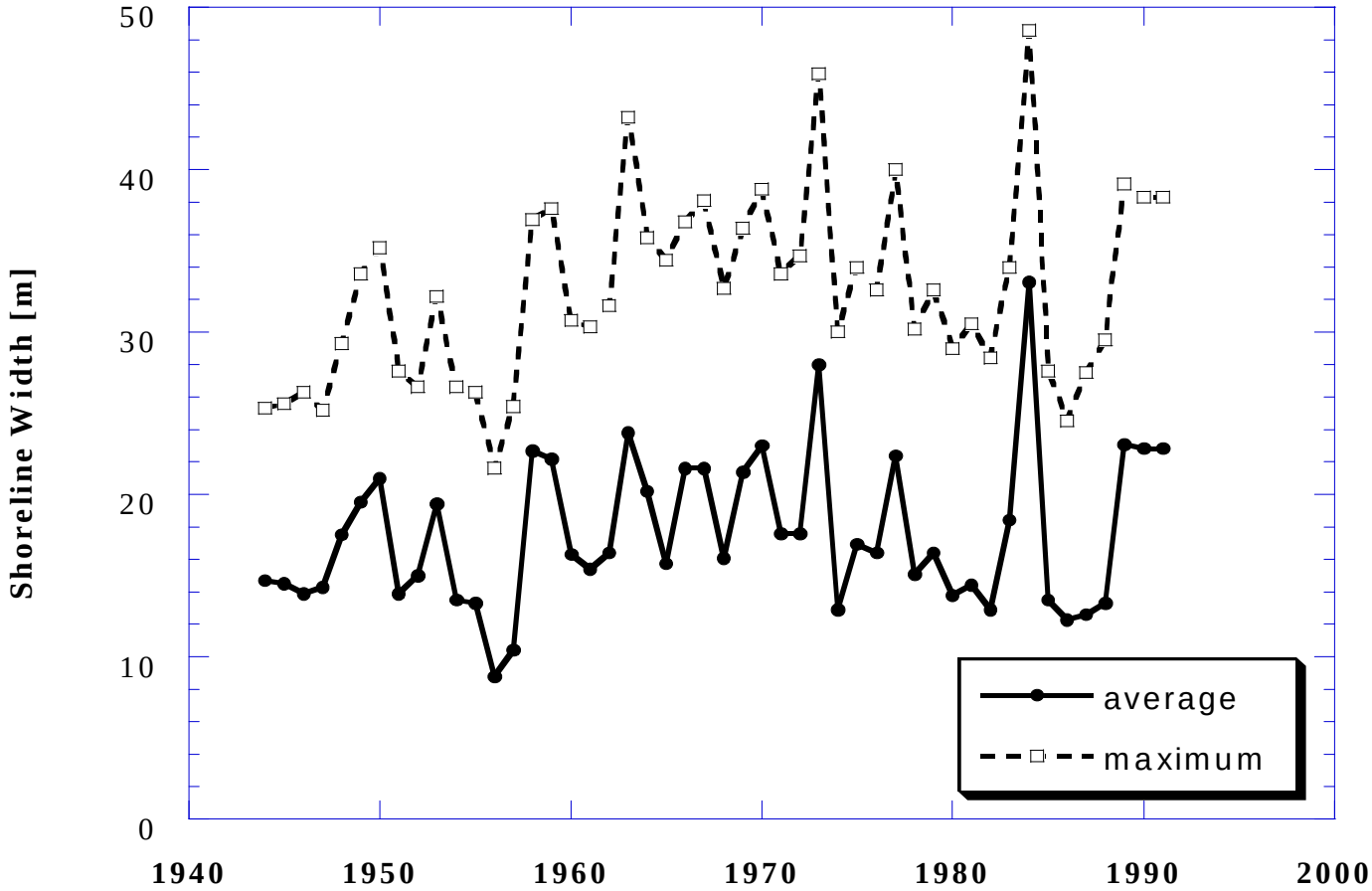

Figure 10B.3 Estimated shoreline width for the Kingston Steam Plant area (CRM 2.3)

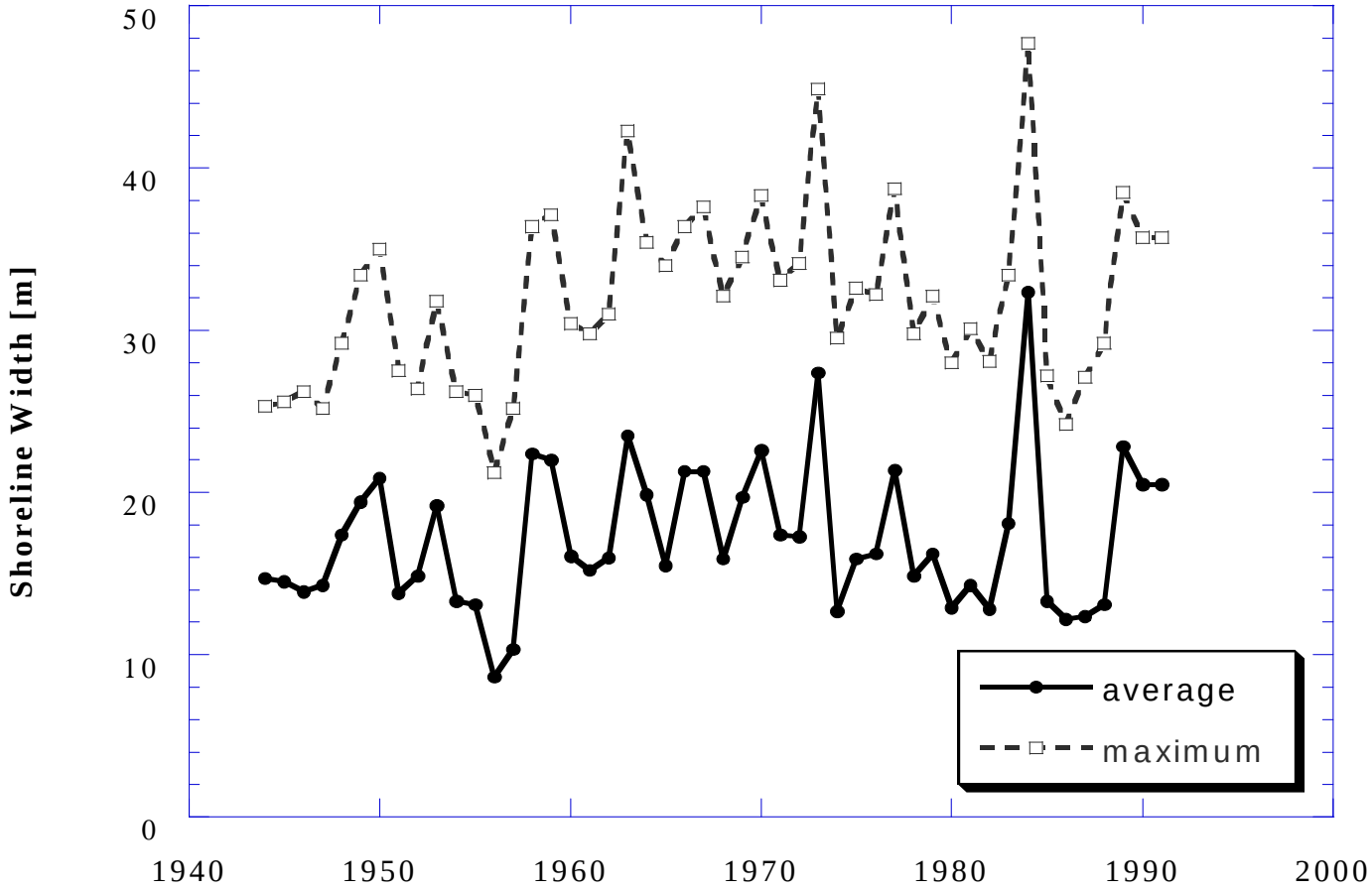

Figure 10B.4 Estimated shoreline width for the City of Kingston area (CRM 0.0)

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APPENDIX 12A

DERIVATION OF THE LIFETIME "BACKGROUND" RISK OF THYROID CANCER INCIDENCE[a]

[a]This section is based on information available at the time of the Task 4 analysis. For an updated version of this material, see the Task 1 Final Report (July 1999) of the Oak Ridge Dose Reconstruction. Use of the updated material is not expected to cause a significant difference in the Task 4 results.

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Appendix 12A:
Derivation of the Lifetime "Background" Risk of Thyroid Cancer Incidence

An individual of age "*i*" has a risk of thyroid cancer for the duration of his or her life. This natural risk is called "lifetime background risk," and it depends on the age "*i*," and on the life expectancy of the individual. In this study, the exposed individual is an average individual having an average lifetime of 70 years. Also, by definition, the individual has no thyroid cancer at age "*i*."

The lifetime background risk of thyroid cancer for an individual can be estimated as follows:

In the case of exposure to radiation at age "*i*"

Let $R_{o,\,k}$ be the incidence rate of thyroid cancer for a nonirradiated population of age k (new cases per 100,000 per year); this quantity is known as the background risk of thyroid cancer. Let $R_{1,\,k,\,i}$ be the excess incidence rate of thyroid cancer for a population of age k, which was exposed to a dose D at age i; that is, $R_{1,\,k,\,i}$ represents the excess incidence rate produced by the radiation only (new cases per 100,000 per year). The total incidence rate of thyroid cancer R_k for a population of age k is given by

$$R_k = R_{o,k} + R_{1,k,i}$$

For an individual exposed to a dose D at age i, the probability of surviving through age k without a thyroid cancer can be expressed as:

$$L_k = L_{k-1} \cdot \left(1 - R_k \cdot Dt\right) \qquad k = i+1, i+2, \ldots$$

To attain age k without acquiring a thyroid cancer means attaining age k-1 with no thyroid cancer (L_{k-1}) and getting no thyroid cancer in year k. The studied individual is assumed to have had no thyroid cancer before the age i when exposure takes place, thus $L_i = 1$. The time step for which incidence of thyroid cancer is detected is $\Delta t = 1$ yr.

For an individual exposed to a dose D at age i, the probability of acquiring a thyroid cancer at age k for any reason, can be expressed as:

$$T_k = L_{k-1} \cdot (R_k \cdot Dt) \qquad k = i+1, i+2, \ldots$$

Moreover, for the same individual, the probability of acquiring a **radiation-induced** thyroid cancer at age k is:

$$TRI_k = L_{k-1} \cdot (R_{1,k,i} \cdot Dt) \qquad k = i+1, i+2, \ldots$$

Thus, the lifetime probability of acquiring a **radiation-induced** thyroid cancer [(or the excess lifetime risk (*ELR*) of thyroid cancer for an individual exposed to a dose *D* at age *i*)] can be written as

$$\begin{aligned} ELR(D_i) &= \sum_{k=i}^{max\ age} L_{k-1} \cdot (R_{1,k,i} \cdot \Delta t) \\ &= \sum_{k=i}^{max\ age} \left\{1 \cdot [1 - R_1 \cdot \Delta t] \cdot [1 - R_2 \cdot \Delta t] \cdot \ldots [1 - R_{k-1} \cdot \Delta t]\right\} \cdot (R_{1,k,i} \cdot \Delta t) \end{aligned} \qquad (12A.1)$$

The risk of acquiring a certain disease from exposure to a radiation dose *D* can be expressed by a linear relative model:

$$R = R_0 \cdot h = R_0 \cdot (1 + \beta \cdot D)$$

where

R = total risk,
R_0 = background risk,
h = dose-response function,
β = excess relative risk per unit dose, and
D = radiation dose.

Using this model, one can identify

R-R_0 = the excess (absolute) risk (EAR)

$(R-R_0)/R_0$ = the excess relative risk (ERR)

$\beta = (R-R_0)/(R_0 D)$ = the excess relative risk per unit dose.

Further, assuming the linear dependence of the dose-response function, the incidence rate of radiation-induced thyroid cancer can be written as:

$$\begin{aligned} R_{1,k,i} &= 0 && \text{for } i \le k < i+5 \\ &= R_{0,k} \cdot \beta_i \cdot D_i && \text{for } k \ge i+5 \end{aligned}$$

This expression is based on experimental evidence (Ron et al., 1995) suggesting that (a) there is no observed effect in the first 5 years after the exposure and (b) that the radiation-induced thyroid cancer rate is proportional to the exposure dose (D) and to the background rate ($R_{o,\,k}$) at the age of interest (k). The proportionality constant (β) is assumed to depend only on the age at exposure (i).

For computing the excess lifetime risk (*ELR*) of thyroid cancer after an exposure at age *i*, by using equation 12A.1 one can notice first that the terms $(1-R_k\Delta t)$ are less than but very close to 1, because the incidence rates R_k are less than 10^{-2} per year. Thus, a good approximation for estimating *ELR* is

$$ELR(D_i) \cong \sum_{k=i}^{lifime}(R_{1,k,i}\cdot\Delta t) = \sum_{k=i}^{lifetime}(R_{0,k}\cdot\beta_i\cdot D_i\cdot\Delta t)$$
$$= \beta_i\cdot D_i\cdot\sum_{k=i}^{lifetime}(R_{0,k}\cdot\Delta t) = \beta_i\cdot D_i\cdot B_i \qquad (12A.2)$$

where

B_i = Lifetime background risk of thyroid cancer from an exposure at age *i*.

Equation 12A.2 will always indicate a larger risk than equation 12A.1, but the relative difference is less than 10% for doses of about 500 rad, and less than 1% for doses of about 50 rad.

From equation 12A.1, the quantity B_i (called "lifetime background risk of thyroid cancer") is calculated as

$$B_i = \sum_{k=i}^{lifetime}\left(R_{0,k}\cdot\Delta t\right) \qquad (12A.3)$$

where

$R_{0,k}$ = age-specific thyroid cancer incidence rate for age "*k*."

In the absence of exposure to radiation

In this case, the lifetime risk of acquiring (thyroid) cancer for an individual at age *i* is given by the probability of attaining age *i* without contracting a cancer (or dying), and by the probability of contracting cancer in the years following age *i*.

$$B_i = \sum_{k=i}^{\max age} L_{k-1}\cdot(R_k\cdot\Delta t)$$
$$= \sum_{k=i}^{\max age}\left\{1\cdot\left[1-R_1\cdot\Delta t\right]\cdot\left[1-R_2\cdot\Delta t\right]\cdot\ldots\left[1-R_{k-1}\cdot\Delta t\right]\right\}\cdot(R_k\cdot\Delta t) \qquad (12A.4)$$

Again, the terms $(1-R_k\Delta t)$ are less than but very close to 1, because the incidence rates R_k are less than 10^{-2} per year. Thus, an approximation of the lifetime risk of acquiring cancer from natural causes for an individual of age i is

$$B_i = \sum_{k=i}^{lifetime}\left(R_k \cdot \Delta t\right) = \sum_{k=i}^{lifetime}\left(R_{0,k} \cdot \Delta t\right) \qquad (12A.5)$$

In this case, R_k equals $R_{0,k}$ because no exposure to radiation occurred. Therefore, equations 12A.3 and 12A.5 are identical.

The age-specific thyroid cancer incidence rates for Tennessee were provided by the Tennessee Department of Health in Nashville (Bashor, 1996). These data are gender-specific, and they are separated into three groups: (a) incidence rates for all Tennessee counties (Table 12A.1), (b) incidence rates for Anderson, Roane, Loudon and Knox counties (Table 12A.2), and (c) incidence rates for all counties in Tennessee other than Anderson, Roane, Loudon and Knox (Table 12A.3). The latter data were used for estimation of the background risk of thyroid cancer both because they are considered to be specific for Tennessee areas and because they represent people that most probably had not been exposed to ^{131}I released from the Oak Ridge Reservation.

Table 12A.1 Thyroid cancer incidence data for the entire State of Tennessee. (1986-1993 data; Bashor, 1996).

FEMALES			
Age	Cases	Population	Age-specific rate
0-4	0	1,300,713	0.0
5-9	0	1,320,060	0.0
10-14	4	1,333,134	0.3
15-19	31	1,438,404	2.2
20-24	38	1,516,355	2.5
25-29	67	1,637,915	4.1
30-34	129	1,638,977	7.9
35-39	130	1,551,345	8.4
40-44	113	1,397,258	8.1
45-49	95	1,154,829	8.2
50-54	78	1,009,022	7.7
55-59	77	961,705	8.0
60-64	70	931,002	7.5
65-69	76	883,732	8.6
70-74	60	730,055	8.2
75-79	46	600,615	7.7
80-84	30	410,864	7.3
85+	25	338,594	7.4
TOTAL	**1069**	**20,154,579**	**5.3**

Table 12A.1 (continued)

MALES Age	Cases	Population	Age-specific rate
0-4	1	1,364,694	0.1
5-9	0	1,390,708	0.0
10-14	3	1,403,430	0.2
15-19	2	1,516,743	0.1
20-24	9	1,506,500	0.6
25-29	26	1,581,146	1.6
30-34	32	1,552,790	2.1
35-39	30	1,473,699	2.0
40-44	29	1,333,626	2.2
45-49	41	1,096,480	3.7
50-54	35	932,655	3.8
55-59	32	848,422	3.8
60-64	30	787,530	3.8
65-69	32	698,573	4.6
70-74	19	519,353	3.7
75-79	20	366,325	5.5
80-84	8	206,050	3.9
85+	6	128,089	4.7
Unknown	1		
TOTAL	**356**	**18,706,813**	**1.9**

Table 12A.2 Thyroid cancer incidence data for Anderson, Roane, Loudon or Knox counties in Tennessee. (1986-1993 data; Bashor, 1996).

FEMALES Age	Cases	Population	Age-specific rate
0-4	0	117,648	0.0
5-9	0	120,776	0.0
10-14	0	120,108	0.0
15-19	3	139,776	2.1
20-24	6	158,880	3.8
25-29	10	160,430	6.2
30-34	17	161,645	10.5
35-39	17	155,754	10.9
40-44	11	140,881	7.8
45-49	10	116,293	8.6
50-54	9	101,807	8.8
55-59	7	99,593	7.0
60-64	11	100,386	11.0
65-69	9	96,676	9.3
70-74	3	77,358	3.9
75-79	2	63,017	3.2
80-84	4	42,891	9.3
85+	2	34,394	5.8
TOTAL	**121**	**2,008,313**	**6.0**

Table 12A.2 (continued)

MALES Age	Cases	Population	Age-specific rate
0-4	0	123,098	0.0
5-9	0	125,386	0.0
10-14	1	126,284	0.8
15-19	0	145,376	0.0
20-24	1	161,599	0.6
25-29	2	154,158	1.3
30-34	4	154,968	2.6
35-39	3	147,963	2.0
40-44	3	132,973	2.3
45-49	6	110,752	5.4
50-54	6	93,900	6.4
55-59	4	85,545	4.7
60-64	4	82,210	4.9
65-69	2	73,936	2.7
70-74	1	53,271	1.9
75-79	2	36,391	5.5
80-84	1	20,053	5.0
85+	1	11,523	8.7
Unknown			
TOTAL	**41**	**1,839,386**	**2.2**

Table 12A.3 Thyroid cancer incidence data for all Tennessee counties other than Anderson, Roane, Loudon or Knox counties (1986-1993 data; Bashor, 1996).

FEMALES			
Age	Cases	Population	Age-specific rate
0-4	0	1,183,065	0.0
5-9	0	1,199,284	0.0
10-14	4	1,213,026	0.3
15-19	28	1,298,628	2.2
20-24	32	1,357,475	2.4
25-29	57	1,477,485	3.9
30-34	112	1,477,332	7.6
35-39	113	1,395,591	8.1
40-44	102	1,256,377	8.1
45-49	85	1,038,536	8.2
50-54	69	907,215	7.6
55-59	70	862,112	8.1
60-64	59	830,616	7.1
65-69	67	787,056	8.5
70-74	57	652,697	8.7
75-79	44	537,598	8.2
80-84	26	367,973	7.1
85+	23	304,200	7.6
TOTAL	**948**	**18,146,266**	**5.2**

Table 12A.3 (continued)

MALES Age	Cases	Population	Age-specific rate
0-4	1	1,241,596	0.1
5-9	0	1,265,322	0.0
10-14	2	1,277,146	0.2
15-19	2	1,371,367	0.1
20-24	8	1,344,901	0.6
25-29	24	1,426,988	1.7
30-34	28	1,397,822	2.0
35-39	27	1,325,736	2.0
40-44	26	1,200,653	2.2
45-49	35	985,728	3.6
50-54	29	838,755	3.5
55-59	28	762,877	3.7
60-64	26	705,320	3.7
65-69	30	624,637	4.8
70-74	18	466,082	3.9
75-79	18	329,934	5.5
80-84	7	185,997	3.8
85+	5	116,566	4.3
Unknown	1		0.0
TOTAL	**314**	**16,867,427**	**1.9**

APPENDIX 13A

ORGAN-SPECIFIC DOSES FOR EACH PATHWAY

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Table 13A.1 Organ doses (cSv) from all radionuclides resulting from the consumption of fish for category I males exposed during the entire study period (48 years)[a].

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
Organs	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Adrenals	3.6 E-02	4.2 E-01	4.1 E+00	1.0 E-02	7.1 E-02	5.6 E-01	7.5 E-03	4.9 E-02	3.3 E-01	7.4 E-03	4.7 E-02	3.4 E-01
Bladder	4.0 E-02	4.1 E-01	3.8 E+00	1.1 E-02	6.5 E-02	5.2 E-01	6.4 E-03	4.5 E-02	3.4 E-01	6.7 E-03	4.4 E-02	3.4 E-01
Bone	6.7 E-02	8.1 E-01	7.4 E+00	1.4 E-02	1.3 E-01	9.0 E-01	1.1 E-02	9.2 E-02	6.0 E-01	1.1 E-02	9.6 E-02	5.8 E-01
Brain	3.1 E-02	3.5 E-01	3.2 E+00	8.6 E-03	5.9 E-02	3.5 E-01	4.6 E-03	3.8 E-02	2.3 E-01	5.5 E-03	3.8 E-02	2.3 E-01
Stomach	4.1 E-02	4.0 E-01	4.0 E+00	1.1 E-02	6.9 E-02	4.6 E-01	6.4 E-03	4.7 E-02	2.9 E-01	7.2 E-03	4.6 E-02	3.1 E-01
Small Intestine	4.1 E-02	3.9 E-01	3.8 E+00	1.1 E-02	6.6 E-02	4.0 E-01	6.7 E-03	4.5 E-02	2.6 E-01	6.2 E-03	4.4 E-02	2.6 E-01
Upper Large Intestine	4.3 E-02	4.8 E-01	4.1 E+00	1.3 E-02	7.4 E-02	4.6 E-01	8.5 E-03	4.9 E-02	3.2 E-01	8.2 E-03	5.2 E-02	3.1 E-01
Lower Large Intestine	5.3 E-02	5.7 E-01	5.2 E+00	1.7 E-02	9.5 E-02	6.4 E-01	1.1 E-02	6.6 E-02	4.2 E-01	1.0 E-02	6.4 E-02	4.0 E-01
Kidneys	3.5 E-02	4.2 E-01	3.6 E+00	1.1 E-02	6.9 E-02	4.4 E-01	6.1 E-03	4.7 E-02	2.8 E-01	5.8 E-03	4.7 E-02	2.8 E-01
Liver	3.7 E-02	4.2 E-01	3.3 E+00	1.1 E-02	7.0 E-02	5.0 E-01	6.0 E-03	4.7 E-02	3.3 E-01	6.1 E-03	4.8 E-02	3.3 E-01
Lungs	3.1 E-02	3.6 E-01	3.2 E+00	8.9 E-03	6.2 E-02	4.4 E-01	5.7 E-03	4.1 E-02	2.5 E-01	5.8 E-03	4.0 E-02	2.7 E-01
Pancreas	4.2 E-02	4.4 E-01	3.6 E+00	1.0 E-02	7.1 E-02	5.1 E-01	6.3 E-03	4.7 E-02	3.3 E-01	5.8 E-03	4.6 E-02	3.2 E-01
Red Bone Marrow	5.2 E-02	6.0 E-01	4.8 E+00	1.5 E-02	9.6 E-02	6.4 E-01	9.5 E-03	6.6 E-02	4.1 E-01	9.5 E-03	6.5 E-02	4.0 E-01
Skin	2.7 E-02	3.1 E-01	2.8 E+00	7.9 E-03	5.4 E-02	3.5 E-01	4.9 E-03	3.7 E-02	2.3 E-01	5.4 E-03	3.5 E-02	2.4 E-01
Spleen	3.8 E-02	4.0 E-01	3.8 E+00	1.1 E-02	6.8 E-02	4.7 E-01	6.9 E-03	4.5 E-02	2.7 E-01	7.4 E-03	4.5 E-02	3.0 E-01
Testes	3.5 E-02	4.2 E-01	5.5 E+00	9.7 E-03	6.9 E-02	5.8 E-01	6.0 E-03	4.4 E-02	3.6 E-01	5.9 E-03	4.7 E-02	3.7 E-01
Thymus	3.5 E-02	4.0 E-01	4.3 E+00	9.3 E-03	6.5 E-02	6.0 E-01	6.4 E-03	4.5 E-02	4.3 E-01	5.9 E-03	4.4 E-02	4.0 E-01
Thyroid	4.3 E-02	5.2 E-01	5.3 E+00	1.1 E-02	9.3 E-02	8.1 E-01	5.7 E-03	6.3 E-02	5.7 E-01	6.6 E-03	6.1 E-02	6.5 E-01

[a] Consumption rate varies from 7.7 to 33 kg y^{-1} (95% subjective confidence interval). It was assumed that 60% (range of 20 to 100%) of the fish was contaminated, and 85% (range of 80 to 90%) of the radioactivity in the fish was retained after processing (sections 7, 13.1).

Table 13A.2 Organ doses (cSv) from all radionuclides resulting from the consumption of fish for category II males exposed during the entire study period (48 years)[a].

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
Organs	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Adrenals	1.3 E-02	1.7 E-01	1.7 E+00	3.9 E-03	3.2 E-02	2.3 E-01	2.2 E-03	2.0 E-02	1.5 E-01	2.2 E-03	2.0 E-02	1.5 E-01
Bladder	1.4 E-02	1.8 E-01	1.8 E+00	3.9 E-03	3.0 E-02	2.2 E-01	2.3 E-03	2.0 E-02	1.3 E-01	2.2 E-03	2.0 E-02	1.4 E-01
Bone	2.3 E-02	3.3 E-01	3.2 E+00	6.8 E-03	5.7 E-02	3.5 E-01	4.6 E-03	4.0 E-02	2.5 E-01	5.0 E-03	4.1 E-02	2.5 E-01
Brain	1.2 E-02	1.5 E-01	1.2 E+00	2.8 E-03	2.7 E-02	1.9 E-01	1.8 E-03	1.7 E-02	1.1 E-01	1.8 E-03	1.7 E-02	1.1 E-01
Stomach	1.4 E-02	1.6 E-01	1.5 E+00	4.0 E-03	3.1 E-02	2.0 E-01	2.1 E-03	2.2 E-02	1.3 E-01	2.1 E-03	2.1 E-02	1.3 E-01
Small Intestine	1.2 E-02	1.7 E-01	1.5 E+00	3.4 E-03	2.9 E-02	1.8 E-01	2.2 E-03	1.9 E-02	1.4 E-01	2.0 E-03	1.9 E-02	1.2 E-01
Upper Large Intestine	1.7 E-02	1.9 E-01	1.6 E+00	4.4 E-03	3.3 E-02	2.0 E-01	2.7 E-03	2.2 E-02	1.4 E-01	3.0 E-03	2.2 E-02	1.5 E-01
Lower Large Intestine	2.2 E-02	2.3 E-01	2.0 E+00	5.7 E-03	4.1 E-02	2.8 E-01	3.7 E-03	2.8 E-02	1.6 E-01	3.6 E-03	2.8 E-02	1.8 E-01
Kidneys	1.1 E-02	1.7 E-01	1.4 E+00	3.6 E-03	3.0 E-02	1.9 E-01	2.4 E-03	2.1 E-02	1.2 E-01	2.2 E-03	2.0 E-02	1.1 E-01
Liver	1.1 E-02	1.8 E-01	1.5 E+00	3.1 E-03	3.2 E-02	2.3 E-01	1.9 E-03	2.1 E-02	1.5 E-01	1.8 E-03	2.1 E-02	1.6 E-01
Lungs	1.1 E-02	1.4 E-01	1.2 E+00	2.8 E-03	2.7 E-02	1.7 E-01	1.8 E-03	1.8 E-02	1.1 E-01	1.5 E-03	1.8 E-02	1.1 E-01
Pancreas	1.4 E-02	1.8 E-01	1.5 E+00	3.3 E-03	3.2 E-02	2.2 E-01	2.2 E-03	2.0 E-02	1.4 E-01	2.1 E-03	2.1 E-02	1.5 E-01
Red Bone Marrow	1.8 E-02	2.4 E-01	2.0 E+00	4.7 E-03	4.1 E-02	2.6 E-01	3.1 E-03	2.7 E-02	1.6 E-01	2.9 E-03	2.7 E-02	1.8 E-01
Skin	8.8 E-03	1.3 E-01	1.1 E+00	2.7 E-03	2.2 E-02	1.6 E-01	1.7 E-03	1.5 E-02	9.1 E-02	1.7 E-03	1.6 E-02	9.7 E-02
Spleen	1.5 E-02	1.8 E-01	1.5 E+00	3.5 E-03	3.1 E-02	2.0 E-01	2.1 E-03	2.0 E-02	1.2 E-01	2.2 E-03	2.0 E-02	1.3 E-01
Testes	1.2 E-02	1.9 E-01	2.4 E+00	3.1 E-03	3.0 E-02	2.6 E-01	1.9 E-03	2.0 E-02	1.8 E-01	2.0 E-03	1.9 E-02	1.5 E-01
Thymus	1.4 E-02	1.7 E-01	1.8 E+00	3.6 E-03	2.8 E-02	2.5 E-01	2.0 E-03	1.9 E-02	1.8 E-01	2.2 E-03	1.9 E-02	1.7 E-01
Thyroid	1.3 E-02	2.3 E-01	2.3 E+00	3.6 E-03	4.0 E-02	3.2 E-01	2.6 E-03	2.7 E-02	1.8 E-01	2.5 E-03	2.7 E-02	1.8 E-01

[a] Consumption rate varies from 2.2 to 16 kg y^{-1} (95% subjective confidence interval). It was assumed that 60% (range of 20 to 100%) of the fish was contaminated, and 85% (range of 80 to 90%) of the radioactivity in the fish was retained after processing (sections 7, 13.1).

Table 13A.3 Organ doses (cSv) from all radionuclides resulting from the consumption of fish for category III males exposed during the entire study period (48 years)[a].

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
Organs	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Adrenals	2.7 E-03	4.0 E-02	4.3 E-01	8.1 E-04	6.8 E-03	5.8 E-02	5.0 E-04	4.5 E-03	3.2 E-02	4.9 E-04	4.6 E-03	3.3 E-02
Bladder	1.9 E-03	4.1 E-02	4.0 E-01	8.1 E-04	6.7 E-03	5.5 E-02	5.6 E-04	4.5 E-03	3.2 E-02	4.5 E-04	4.5 E-03	3.2 E-02
Bone	4.6 E-03	8.1 E-02	7.8 E-01	1.2 E-03	1.4 E-02	9.5 E-02	8.1 E-04	9.2 E-03	6.2 E-02	8.6 E-04	9.7 E-03	6.6 E-02
Brain	2.4 E-03	3.2 E-02	3.2 E-01	6.7 E-04	5.8 E-03	4.5 E-02	4.1 E-04	3.7 E-03	2.5 E-02	4.1 E-04	3.9 E-03	2.6 E-02
Stomach	2.8 E-03	3.8 E-02	3.9 E-01	6.8 E-04	7.3 E-03	5.4 E-02	4.6 E-04	4.5 E-03	3.3 E-02	4.6 E-04	4.7 E-03	2.9 E-02
Small Intestine	2.5 E-03	3.8 E-02	3.5 E-01	7.1 E-04	7.0 E-03	4.9 E-02	4.9 E-04	4.7 E-03	2.9 E-02	4.2 E-04	4.8 E-03	2.9 E-02
Upper Large Intestine	2.9 E-03	4.3 E-02	4.4 E-01	9.0 E-04	7.5 E-03	5.9 E-02	6.9 E-04	5.1 E-03	3.4 E-02	5.6 E-04	4.9 E-03	3.7 E-02
Lower Large Intestine	4.3 E-03	5.7 E-02	4.9 E-01	1.1 E-03	9.7 E-03	7.0 E-02	7.9 E-04	6.4 E-03	4.2 E-02	6.9 E-04	6.2 E-03	4.5 E-02
Kidneys	2.7 E-03	3.8 E-02	3.3 E-01	8.2 E-04	6.8 E-03	5.0 E-02	5.1 E-04	4.5 E-03	3.2 E-02	4.8 E-04	4.5 E-03	3.1 E-02
Liver	2.8 E-03	4.3 E-02	4.0 E-01	5.9 E-04	7.2 E-03	6.3 E-02	4.3 E-04	4.6 E-03	3.9 E-02	4.1 E-04	4.7 E-03	3.8 E-02
Lungs	2.4 E-03	3.5 E-02	3.1 E-01	6.7 E-04	6.4 E-03	4.8 E-02	4.6 E-04	4.0 E-03	2.6 E-02	3.9 E-04	4.2 E-03	2.9 E-02
Pancreas	2.8 E-03	4.3 E-02	3.7 E-01	6.8 E-04	7.2 E-03	4.9 E-02	4.7 E-04	4.5 E-03	3.2 E-02	4.5 E-04	4.7 E-03	3.3 E-02
Red Bone Marrow	4.3 E-03	5.5 E-02	4.9 E-01	1.1 E-03	1.0 E-02	6.6 E-02	7.2 E-04	6.4 E-03	4.6 E-02	6.8 E-04	6.5 E-03	4.7 E-02
Skin	1.8 E-03	3.1 E-02	2.8 E-01	4.9 E-04	5.5 E-03	4.1 E-02	3.7 E-04	3.5 E-03	2.3 E-02	3.1 E-04	3.6 E-03	2.4 E-02
Spleen	2.5 E-03	4.1 E-02	4.1 E-01	8.6 E-04	7.4 E-03	4.8 E-02	5.7 E-04	4.7 E-03	3.1 E-02	5.3 E-04	4.8 E-03	3.2 E-02
Testes	2.5 E-03	4.1 E-02	5.0 E-01	6.6 E-04	7.3 E-03	6.4 E-02	4.7 E-04	4.8 E-03	3.9 E-02	4.8 E-04	4.9 E-03	3.7 E-02
Thymus	2.7 E-03	3.7 E-02	3.8 E-01	6.3 E-04	6.8 E-03	5.2 E-02	3.5 E-04	4.4 E-03	3.6 E-02	4.2 E-04	4.6 E-03	3.7 E-02
Thyroid	2.9 E-03	5.0 E-02	6.0 E-01	9.5 E-04	9.5 E-03	8.2 E-02	5.9 E-04	6.1 E-03	5.1 E-02	5.3 E-04	6.4 E-03	5.2 E-02

[a] Consumption rate varies from 0.39 to 4.3 kg y^{-1} (95% subjective confidence interval). It was assumed that 60% (range of 20 to 100%) of the fish was contaminated, and 85% (range of 80 to 90%) of the radioactivity in the fish was retained after processing (sections 7, 13.1).

Table 13A.4 Organ doses (cSv) from all radionuclides resulting from the consumption of fish for category I females exposed during the entire study period (48 years)[a].

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
Organs	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Adrenals	2.7 E-02	3.4 E-01	3.5 E+00	7.6 E-03	6.0 E-02	4.0 E-01	6.1 E-03	4.0 E-02	2.6 E-01	5.3 E-03	3.8 E-02	2.4 E-01
Bladder	3.1 E-02	3.2 E-01	4.2 E+00	8.8 E-03	5.6 E-02	4.5 E-01	6.1 E-03	3.7 E-02	2.3 E-01	5.9 E-03	3.7 E-02	2.4 E-01
Bone	5.8 E-02	6.0 E-01	7.9 E+00	1.6 E-02	1.1 E-01	8.1 E-01	1.1 E-02	7.6 E-02	5.3 E-01	1.1 E-02	7.4 E-02	5.4 E-01
Brain	2.7 E-02	2.5 E-01	2.6 E+00	7.5 E-03	4.8 E-02	2.9 E-01	5.4 E-03	3.2 E-02	1.8 E-01	5.0 E-03	3.1 E-02	1.8 E-01
Breast	2.4 E-02	2.4 E-01	3.5 E+00	6.8 E-03	4.6 E-02	3.5 E-01	4.7 E-03	3.0 E-02	1.9 E-01	4.9 E-03	3.0 E-02	1.9 E-01
Stomach	3.3 E-02	3.1 E-01	4.0 E+00	8.9 E-03	5.8 E-02	4.2 E-01	6.4 E-03	4.0 E-02	2.6 E-01	6.4 E-03	3.8 E-02	2.5 E-01
Small Intestine	2.6 E-02	2.8 E-01	3.5 E+00	8.7 E-03	5.6 E-02	4.0 E-01	5.7 E-03	3.7 E-02	2.1 E-01	5.5 E-03	3.6 E-02	2.2 E-01
Upper Large Intestine	3.6 E-02	3.5 E-01	3.6 E+00	1.0 E-02	6.3 E-02	4.4 E-01	7.3 E-03	4.2 E-02	2.9 E-01	6.7 E-03	4.0 E-02	2.7 E-01
Lower Large Intestine	4.6 E-02	4.3 E-01	4.5 E+00	1.4 E-02	7.9 E-02	4.6 E-01	9.6 E-03	5.3 E-02	2.9 E-01	9.1 E-03	5.4 E-02	2.9 E-01
Kidneys	2.9 E-02	3.2 E-01	3.2 E+00	7.0 E-03	6.0 E-02	3.8 E-01	5.5 E-03	3.9 E-02	2.3 E-01	5.3 E-03	3.8 E-02	2.1 E-01
Liver	2.9 E-02	3.3 E-01	3.0 E+00	7.9 E-03	5.9 E-02	3.8 E-01	5.8 E-03	3.9 E-02	2.7 E-01	5.4 E-03	3.8 E-02	2.5 E-01
Lungs	2.4 E-02	2.7 E-01	3.0 E+00	6.3 E-03	5.2 E-02	3.6 E-01	4.9 E-03	3.3 E-02	2.2 E-01	4.3 E-03	3.3 E-02	2.1 E-01
Ovaries	1.7 E-02	1.8 E-01	2.1 E+00	4.6 E-03	3.4 E-02	2.3 E-01	3.3 E-03	2.1 E-02	1.2 E-01	3.3 E-03	2.1 E-02	1.3 E-01
Pancreas	2.7 E-02	3.0 E-01	3.2 E+00	9.0 E-03	6.0 E-02	3.7 E-01	5.8 E-03	3.8 E-02	2.7 E-01	6.0 E-03	3.7 E-02	2.1 E-01
Red Bone Marrow	3.9 E-02	4.2 E-01	4.8 E+00	1.5 E-02	7.5 E-02	4.9 E-01	1.0 E-02	5.2 E-02	3.3 E-01	9.5 E-03	5.0 E-02	3.0 E-01
Skin	2.2 E-02	2.3 E-01	2.8 E+00	6.5 E-03	4.5 E-02	2.9 E-01	4.7 E-03	2.9 E-02	2.0 E-01	4.4 E-03	2.8 E-02	1.9 E-01
Spleen	3.3 E-02	3.1 E-01	3.5 E+00	8.5 E-03	5.9 E-02	3.6 E-01	6.0 E-03	3.8 E-02	2.1 E-01	6.1 E-03	3.7 E-02	2.3 E-01
Thymus	3.2 E-02	3.1 E-01	3.8 E+00	8.1 E-03	5.4 E-02	4.7 E-01	5.7 E-03	3.5 E-02	3.1 E-01	6.1 E-03	3.5 E-02	3.3 E-01
Thyroid	2.85E-02	4.23E-01	5.07E+00	8.74E-03	7.79E-02	6.01E-01	5.72E-03	5.15E-02	3.87E-01	5.33E-03	5.36E-02	3.74E-01
Uterus	3.09E-02	3.18E-01	3.00E+00	8.32E-03	5.75E-02	3.65E-01	6.04E-03	3.90E-02	2.16E-01	6.11E-03	3.85E-02	2.18E-01

[a] Consumption rate varies from 5.7 to 27 kg y^{-1} (95% subjective confidence interval). It was assumed that 60% (range of 20 to 100%) of the fish was contaminated, and 85% (range of 80 to 90%) of the radioactivity in the fish was retained after processing (sections 7, 13.1).

Table 13A.5 Organ doses (cSv) from all radionuclides resulting from the consumption of fish for category II females exposed during the entire study period (48 years)[a].

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
Organs	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Adrenals	1.1 E-02	1.4 E-01	1.4 E+00	3.2 E-03	2.6 E-02	1.9 E-01	1.9 E-03	1.6 E-02	1.3 E-01	1.8 E-03	1.6 E-02	1.3 E-01
Bladder	1.1 E-02	1.5 E-01	1.5 E+00	3.2 E-03	2.5 E-02	1.8 E-01	1.9 E-03	1.6 E-02	1.1 E-01	1.8 E-03	1.7 E-02	1.2 E-01
Bone	1.9 E-02	2.8 E-01	2.7 E+00	5.5 E-03	4.7 E-02	2.9 E-01	3.7 E-03	3.3 E-02	2.1 E-01	4.1 E-03	3.4 E-02	2.1 E-01
Brain	1.0 E-02	1.2 E-01	1.0 E+00	2.3 E-03	2.2 E-02	1.5 E-01	1.5 E-03	1.4 E-02	8.8 E-02	1.5 E-03	1.4 E-02	9.3 E-02
Breast	8.9 E-03	1.1 E-01	9.6 E-01	2.4 E-03	2.0 E-02	1.4 E-01	1.4 E-03	1.3 E-02	9.6 E-02	1.5 E-03	1.3 E-02	9.1 E-02
Stomach	1.1 E-02	1.4 E-01	1.2 E+00	3.2 E-03	2.6 E-02	1.6 E-01	1.7 E-03	1.8 E-02	1.0 E-01	1.8 E-03	1.8 E-02	1.1 E-01
Small Intestine	1.0 E-02	1.4 E-01	1.3 E+00	2.8 E-03	2.4 E-02	1.5 E-01	1.9 E-03	1.6 E-02	1.1 E-01	1.7 E-03	1.6 E-02	1.0 E-01
Upper Large Intestine	1.4 E-02	1.6 E-01	1.3 E+00	3.6 E-03	2.7 E-02	1.7 E-01	2.3 E-03	1.8 E-02	1.2 E-01	2.4 E-03	1.8 E-02	1.2 E-01
Lower Large Intestine	1.8 E-02	1.9 E-01	1.7 E+00	4.8 E-03	3.4 E-02	2.3 E-01	3.1 E-03	2.3 E-02	1.4 E-01	2.9 E-03	2.3 E-02	1.5 E-01
Kidneys	9.4 E-03	1.4 E-01	1.2 E+00	2.9 E-03	2.5 E-02	1.6 E-01	1.9 E-03	1.7 E-02	9.8 E-02	1.8 E-03	1.6 E-02	8.9 E-02
Liver	8.7 E-03	1.5 E-01	1.2 E+00	2.5 E-03	2.6 E-02	1.9 E-01	1.6 E-03	1.7 E-02	1.3 E-01	1.5 E-03	1.7 E-02	1.3 E-01
Lungs	8.7 E-03	1.2 E-01	9.8 E-01	2.3 E-03	2.3 E-02	1.4 E-01	1.5 E-03	1.5 E-02	8.9 E-02	1.3 E-03	1.5 E-02	9.5 E-02
Ovaries	6.9 E-03	7.7 E-02	6.8 E-01	1.7 E-03	1.5 E-02	8.5 E-02	9.9 E-04	9.6 E-03	5.9 E-02	9.6 E-04	9.8 E-03	6.1 E-02
Pancreas	1.1 E-02	1.5 E-01	1.3 E+00	2.7 E-03	2.6 E-02	1.8 E-01	1.8 E-03	1.7 E-02	1.2 E-01	1.7 E-03	1.7 E-02	1.2 E-01
Red Bone Marrow	1.5 E-02	2.0 E-01	1.6 E+00	3.9 E-03	3.4 E-02	2.2 E-01	2.6 E-03	2.2 E-02	1.4 E-01	2.4 E-03	2.2 E-02	1.5 E-01
Skin	7.2 E-03	1.1 E-01	8.7 E-01	2.2 E-03	1.8 E-02	1.3 E-01	1.4 E-03	1.2 E-02	7.6 E-02	1.4 E-03	1.3 E-02	8.0 E-02
Spleen	1.2 E-02	1.4 E-01	1.2 E+00	2.8 E-03	2.5 E-02	1.6 E-01	1.8 E-03	1.7 E-02	1.0 E-01	1.8 E-03	1.6 E-02	1.0 E-01
Thymus	1.1 E-02	1.4 E-01	1.5 E+00	2.9 E-03	2.3 E-02	2.1 E-01	1.7 E-03	1.5 E-02	1.5 E-01	1.8 E-03	1.5 E-02	1.4 E-01
Thyroid	1.10E-02	1.85E-01	1.90E+00	2.99E-03	3.31E-02	2.69E-01	2.14E-03	2.26E-02	1.50E-01	2.06E-03	2.25E-02	1.52E-01
Uterus	9.91E-03	1.39E-01	1.13E+00	2.49E-03	2.46E-02	1.63E-01	1.48E-03	1.61E-02	1.14E-01	1.53E-03	1.62E-02	1.06E-01

[a] Consumption rate varies from 1.8 to 14 kg y^{-1} (95% subjective confidence interval). It was assumed that 60% (range of 20 to 100%) of the fish was contaminated, and 85% (range of 80 to 90%) of the radioactivity in the fish was retained after processing (sections 7, 13.1).

Table 13A.6 Organ doses (cSv) from all radionuclides resulting from the consumption of fish for category III females exposed during the entire study period (48 years)[a].

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
Organs	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Adrenals	2.2 E-03	3.3 E-02	4.2 E-01	7.0 E-04	5.9 E-03	4.7 E-02	4.1 E-04	3.9 E-03	3.4 E-02	4.0 E-04	3.8 E-03	3.3 E-02
Bladder	2.3 E-03	3.4 E-02	4.2 E-01	6.4 E-04	5.3 E-03	6.6 E-02	4.3 E-04	3.6 E-03	3.2 E-02	4.6 E-04	3.6 E-03	3.5 E-02
Bone	3.8 E-03	5.9 E-02	8.1 E-01	1.2 E-03	1.2 E-02	7.4 E-02	7.0 E-04	7.9 E-03	5.3 E-02	9.1 E-04	7.9 E-03	5.3 E-02
Brain	1.8 E-03	2.6 E-02	3.1 E-01	5.9 E-04	4.4 E-03	4.5 E-02	3.5 E-04	3.1 E-03	2.6 E-02	3.2 E-04	2.9 E-03	2.9 E-02
Breast	1.8 E-03	2.5 E-02	4.0 E-01	5.2 E-04	4.3 E-03	5.2 E-02	3.3 E-04	2.8 E-03	2.6 E-02	3.2 E-04	2.8 E-03	2.5 E-02
Stomach	2.4 E-03	3.1 E-02	5.1 E-01	7.6 E-04	5.5 E-03	5.7 E-02	4.9 E-04	3.7 E-03	3.4 E-02	4.1 E-04	3.6 E-03	3.2 E-02
Small Intestine	2.5 E-03	3.2 E-02	4.2 E-01	6.3 E-04	5.2 E-03	4.5 E-02	4.1 E-04	3.5 E-03	3.0 E-02	3.5 E-04	3.4 E-03	3.0 E-02
Upper Large Intestine	2.8 E-03	3.5 E-02	4.3 E-01	7.8 E-04	5.9 E-03	6.0 E-02	4.8 E-04	4.0 E-03	3.8 E-02	4.4 E-04	4.0 E-03	3.6 E-02
Lower Large Intestine	3.9 E-03	4.2 E-02	5.2 E-01	8.7 E-04	7.3 E-03	6.0 E-02	6.2 E-04	5.0 E-03	3.8 E-02	6.0 E-04	5.0 E-03	3.8 E-02
Kidneys	2.2 E-03	3.3 E-02	4.4 E-01	6.4 E-04	5.8 E-03	5.1 E-02	3.7 E-04	3.9 E-03	3.0 E-02	4.2 E-04	3.7 E-03	3.1 E-02
Liver	2.5 E-03	3.5 E-02	3.7 E-01	6.7 E-04	5.5 E-03	5.4 E-02	3.9 E-04	3.7 E-03	3.4 E-02	3.7 E-04	3.8 E-03	3.4 E-02
Lungs	2.0 E-03	2.7 E-02	4.0 E-01	6.2 E-04	4.7 E-03	4.8 E-02	3.9 E-04	3.2 E-03	3.0 E-02	3.7 E-04	3.1 E-03	2.9 E-02
Ovaries	1.3 E-03	1.8 E-02	2.4 E-01	4.2 E-04	3.1 E-03	3.1 E-02	2.6 E-04	2.1 E-03	1.9 E-02	2.3 E-04	2.1 E-03	1.9 E-02
Pancreas	2.3 E-03	3.2 E-02	3.9 E-01	6.3 E-04	5.5 E-03	5.2 E-02	3.7 E-04	3.7 E-03	3.3 E-02	3.9 E-04	3.8 E-03	3.1 E-02
Red Bone Marrow	3.6 E-03	4.3 E-02	6.1 E-01	1.0 E-03	8.0 E-03	6.5 E-02	6.8 E-04	5.3 E-03	3.9 E-02	7.1 E-04	5.5 E-03	4.1 E-02
Skin	1.8 E-03	2.5 E-02	4.0 E-01	5.2 E-04	4.1 E-03	4.0 E-02	3.7 E-04	2.8 E-03	2.4 E-02	3.1 E-04	2.7 E-03	2.4 E-02
Spleen	2.3 E-03	3.2 E-02	4.7 E-01	7.3 E-04	5.4 E-03	4.9 E-02	4.7 E-04	3.7 E-03	3.0 E-02	4.7 E-04	3.8 E-03	3.3 E-02
Thymus	2.5 E-03	3.3 E-02	5.0 E-01	5.3 E-04	5.0 E-03	6.2 E-02	4.2 E-04	3.5 E-03	3.9 E-02	3.9 E-04	3.6 E-03	4.2 E-02
Thyroid	2.80E-03	4.28E-02	4.97E-01	7.69E-04	7.83E-03	7.05E-02	5.31E-04	5.11E-03	5.01E-02	4.36E-04	5.08E-03	4.00E-02
Uterus	2.62E-03	3.14E-02	4.92E-01	6.56E-04	5.38E-03	4.86E-02	4.20E-04	3.70E-03	3.09E-02	3.88E-04	3.67E-03	3.03E-02

[a] Consumption rate varies from 0.32 to 3.6 kg y^{-1} (95% subjective confidence interval). It was assumed that 60% (range of 20 to 100%) of the fish was contaminated, and 85% (range of 80 to 90%) of the radioactivity in the fish was retained after processing (sections 7, 13.1).

Table 13A.7 Organ doses (cSv) from all radionuclides for external exposure to shoreline sediments for individuals exposed during the entire study period (48 years) [a].

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
Organs	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Adrenals	1.5 E-03	7.3 E-03	3.4 E-02	5.4 E-03	2.8 E-02	1.2 E-01	6.5 E-03	2.9 E-02	1.2 E-01	6.4 E-03	3.2 E-02	1.3 E-01
Bladder	1.6 E-03	7.6 E-03	3.1 E-02	5.2 E-03	2.9 E-02	1.4 E-01	5.5 E-03	2.9 E-02	1.3 E-01	6.4 E-03	3.2 E-02	1.5 E-01
Bone	2.6 E-03	1.2 E-02	5.9 E-02	8.1 E-03	4.7 E-02	2.2 E-01	8.0 E-03	4.5 E-02	2.2 E-01	8.9 E-03	5.0 E-02	2.4 E-01
Brain	1.7 E-03	8.0 E-03	3.1 E-02	6.7 E-03	3.0 E-02	1.2 E-01	6.8 E-03	3.2 E-02	1.2 E-01	7.7 E-03	3.4 E-02	1.4 E-01
Breast	1.8 E-03	9.0 E-03	3.9 E-02	7.0 E-03	3.4 E-02	1.5 E-01	7.1 E-03	3.6 E-02	1.4 E-01	7.6 E-03	3.7 E-02	1.6 E-01
Oral Cavity	1.7 E-03	8.1 E-03	3.2 E-02	6.8 E-03	3.1 E-02	1.2 E-01	6.9 E-03	3.2 E-02	1.2 E-01	7.8 E-03	3.4 E-02	1.4 E-01
Esophagus	1.4 E-03	6.7 E-03	2.6 E-02	5.7 E-03	2.6 E-02	1.0 E-01	5.8 E-03	2.7 E-02	1.0 E-01	6.5 E-03	2.9 E-02	1.2 E-01
Stomach	1.7 E-03	7.9 E-03	3.3 E-02	6.2 E-03	3.0 E-02	1.3 E-01	6.4 E-03	3.0 E-02	1.3 E-01	6.8 E-03	3.3 E-02	1.4 E-01
Small Intestine	1.4 E-03	6.5 E-03	2.8 E-02	4.7 E-03	2.4 E-02	1.1 E-01	5.8 E-03	2.5 E-02	1.1 E-01	5.8 E-03	2.7 E-02	1.2 E-01
Upper Large Intestine	1.5 E-03	7.0 E-03	3.2 E-02	5.3 E-03	2.8 E-02	1.2 E-01	5.7 E-03	2.9 E-02	1.2 E-01	6.6 E-03	3.3 E-02	1.3 E-01
Colon	1.3 E-03	7.1 E-03	3.0 E-02	5.6 E-03	2.7 E-02	1.4 E-01	5.8 E-03	2.7 E-02	1.3 E-01	6.5 E-03	2.9 E-02	1.3 E-01
Rectum	1.5 E-03	7.0 E-03	2.7 E-02	6.0 E-03	2.7 E-02	1.1 E-01	6.0 E-03	2.8 E-02	1.1 E-01	6.9 E-03	3.0 E-02	1.2 E-01
Gallbladder	1.5 E-03	6.9 E-03	2.7 E-02	5.8 E-03	2.6 E-02	1.1 E-01	6.0 E-03	2.8 E-02	1.1 E-01	6.7 E-03	3.0 E-02	1.2 E-01
Kidneys	1.4 E-03	7.3 E-03	3.5 E-02	6.0 E-03	2.9 E-02	1.2 E-01	6.3 E-03	3.0 E-02	1.1 E-01	7.3 E-03	3.3 E-02	1.3 E-01
Liver	1.4 E-03	7.5 E-03	3.2 E-02	5.3 E-03	2.8 E-02	1.2 E-01	6.1 E-03	2.9 E-02	1.2 E-01	6.5 E-03	3.1 E-02	1.3 E-01
Lungs	1.5 E-03	8.0 E-03	3.2 E-02	6.1 E-03	2.9 E-02	1.1 E-01	6.3 E-03	3.0 E-02	1.2 E-01	7.9 E-03	3.3 E-02	1.3 E-01
Ovaries	7.9 E-04	3.8 E-03	1.6 E-02	3.0 E-03	1.5 E-02	6.6 E-02	3.5 E-03	1.6 E-02	6.5 E-02	3.7 E-03	1.7 E-02	6.9 E-02
Pancreas	1.4 E-03	6.6 E-03	3.1 E-02	5.1 E-03	2.6 E-02	1.2 E-01	5.8 E-03	2.7 E-02	1.2 E-01	6.1 E-03	2.9 E-02	1.2 E-01
Prostate	1.74E-03	8.09E-03	3.16E-02	6.82E-03	3.10E-02	1.25E-01	6.90E-03	3.21E-02	1.22E-01	7.80E-03	3.45E-02	1.39E-01
Red Bone Marrow	1.59E-03	7.72E-03	3.78E-02	5.24E-03	2.86E-02	1.26E-01	6.06E-03	2.98E-02	1.26E-01	6.46E-03	3.16E-02	1.48E-01
Skin	2.17E-03	1.00E-02	3.92E-02	8.81E-03	3.99E-02	1.57E-01	9.78E-03	4.41E-02	1.63E-01	1.12E-02	4.65E-02	1.86E-01
Spleen	1.60E-03	7.43E-03	2.90E-02	6.28E-03	2.85E-02	1.14E-01	6.35E-03	2.96E-02	1.12E-01	7.19E-03	3.17E-02	1.28E-01
Testes	2.02E-03	9.97E-03	4.27E-02	7.07E-03	3.58E-02	2.11E-01	7.53E-03	3.61E-02	2.07E-01	8.97E-03	4.01E-02	2.25E-01
Thymus	1.44E-03	7.97E-03	4.15E-02	4.95E-03	3.22E-02	1.80E-01	5.33E-03	3.26E-02	1.69E-01	5.90E-03	3.64E-02	1.94E-01
Thyroid	1.90E-03	1.08E-02	5.19E-02	6.45E-03	3.85E-02	1.81E-01	7.72E-03	3.96E-02	1.86E-01	8.48E-03	4.40E-02	1.86E-01
Uterus	1.47E-03	6.80E-03	2.65E-02	5.78E-03	2.61E-02	1.05E-01	5.85E-03	2.72E-02	1.03E-01	6.66E-03	2.92E-02	1.17E-01
Remainder	1.82E-03	8.25E-03	3.70E-02	5.62E-03	3.32E-02	1.44E-01	6.48E-03	3.30E-02	1.40E-01	7.09E-03	3.67E-02	1.56E-01

[a] Exposure rate (95% subjective confidence interval) varies from 75-430 h y^{-1} for CRM 20.5, 85-440 h y^{-1} for CRM 14, and 130-490 h y^{-1} for CRM 3.5 and CRM 0.

Table 13A.8 Organ doses (cSv) from all radionuclides for the ingestion of drinking water for individuals exposed during the entire study period (48 years)[a].

	CRM 14			CRM 3.5			CRM 0, stationary[b]			CRM 0, mobile		
Organs	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Adrenals	3.7 E-04	2.3 E-03	1.6 E-02	2.3 E-04	1.4 E-03	1.2 E-02	1.3 E-05	1.5 E-04	2.5 E-03	1.1 E-05	1.3 E-04	1.6 E-03
Bladder	4.1 E-04	2.3 E-03	1.8 E-02	2.3 E-04	1.5 E-03	1.6 E-02	1.3 E-05	1.5 E-04	2.1 E-03	1.2 E-05	1.2 E-04	1.5 E-03
Bone	2.5 E-02	1.1 E-01	5.5 E-01	1.1 E-02	5.1 E-02	2.0 E-01	5.3 E-04	3.5 E-03	1.8 E-02	4.4 E-04	2.8 E-03	1.5 E-02
Brain	3.8 E-04	2.1 E-03	1.7 E-02	2.1 E-04	1.4 E-03	1.4 E-02	1.3 E-05	1.2 E-04	1.7 E-03	1.3 E-05	9.8 E-05	1.1 E-03
Breast	3.4 E-04	2.1 E-03	1.6 E-02	2.1 E-04	1.3 E-03	1.2 E-02	1.4 E-05	1.2 E-04	1.4 E-03	1.1 E-05	1.1 E-04	1.2 E-03
Stomach	9.1 E-04	5.1 E-03	3.2 E-02	6.6 E-04	3.6 E-03	2.7 E-02	4.2 E-05	3.6 E-04	4.2 E-03	3.3 E-05	2.8 E-04	3.9 E-03
Small Intestine	1.7 E-03	6.3 E-03	2.7 E-02	1.3 E-03	5.1 E-03	2.2 E-02	6.6 E-05	5.1 E-04	3.2 E-03	6.2 E-05	4.5 E-04	2.7 E-03
Upper Large Intestine	7.7 E-03	3.4 E-02	1.4 E-01	6.2 E-03	2.6 E-02	9.2 E-02	3.8 E-04	2.7 E-03	1.8 E-02	2.6 E-04	2.1 E-03	1.2 E-02
Lower Large Intestine	1.9 E-02	8.1 E-02	3.7 E-01	1.5 E-02	5.8 E-02	2.4 E-01	9.8 E-04	6.2 E-03	3.9 E-02	7.5 E-04	5.1 E-03	3.0 E-02
Kidneys	4.9 E-04	2.4 E-03	1.7 E-02	2.7 E-04	1.7 E-03	1.4 E-02	1.8 E-05	1.5 E-04	1.8 E-03	1.2 E-05	1.4 E-04	1.5 E-03
Liver	4.5 E-04	2.4 E-03	1.9 E-02	2.7 E-04	1.6 E-03	1.6 E-02	1.6 E-05	1.5 E-04	2.1 E-03	1.3 E-05	1.4 E-04	1.8 E-03
Lungs	3.6 E-04	2.2 E-03	1.7 E-02	2.1 E-04	1.4 E-03	1.6 E-02	1.6 E-05	1.5 E-04	1.4 E-03	1.2 E-05	1.2 E-04	1.3 E-03
Ovaries	2.5 E-04	1.4 E-03	1.2 E-02	1.4 E-04	9.8 E-04	1.1 E-02	9.6 E-06	1.1 E-04	1.3 E-03	8.7 E-06	8.2 E-05	9.4 E-04
Pancreas	3.9 E-04	2.4 E-03	1.9 E-02	2.1 E-04	1.6 E-03	1.5 E-02	1.5 E-05	1.5 E-04	2.3 E-03	1.2 E-05	1.2 E-04	1.4 E-03
Red Bone Marrow	1.2 E-02	4.6 E-02	1.9 E-01	5.8 E-03	2.2 E-02	9.9 E-02	2.2 E-04	1.7 E-03	9.7 E-03	1.9 E-04	1.4 E-03	7.2 E-03
Skin	3.6 E-04	2.4 E-03	1.4 E-02	2.0 E-04	1.5 E-03	1.1 E-02	1.7 E-05	1.4 E-04	1.6 E-03	1.2 E-05	1.2 E-04	1.1 E-03
Spleen	4.5 E-04	2.5 E-03	1.8 E-02	2.2 E-04	1.6 E-03	1.3 E-02	1.4 E-05	1.6 E-04	2.1 E-03	9.5 E-06	1.3 E-04	1.4 E-03
Testes	4.2 E-04	2.6 E-03	2.9 E-02	2.3 E-04	1.7 E-03	2.0 E-02	1.2 E-05	1.6 E-04	3.3 E-03	1.3 E-05	1.3 E-04	2.5 E-03
Thymus	3.72E-04	2.44E-03	2.53E-02	2.37E-04	1.47E-03	2.32E-02	1.72E-05	1.53E-04	1.68E-03	1.32E-05	1.42E-04	1.77E-03
Thyroid	5.44E-04	3.40E-03	2.14E-02	2.86E-04	2.18E-03	1.97E-02	2.26E-05	1.93E-04	3.07E-03	2.04E-05	1.57E-04	1.83E-03
Uterus	4.33E-04	2.55E-03	2.12E-02	2.38E-04	1.70E-03	1.64E-02	1.87E-05	1.60E-04	1.91E-03	1.38E-05	1.45E-04	1.74E-03

a Unless otherwise noted, an ingestion of 20 to 60% of filtered, treated water from the Clinch River is assumed.
b An ingestion of 20 to 80% of filtered, treated water from the Clinch River is assumed for an individual who resides and works near CRM 0.

Table 13A.9 Organ doses (cSv) from all radionuclides for the ingestion of meat for individuals exposed during the entire study period (48 years).

	CRM 20.5[a]			CRM 14[a]			CRM 3.5[b]			CRM 0[b]		
Organs	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Adrenals	3.3 E-06	3.3 E-05	2.0 E-04	4.8 E-05	3.7 E-04	2.1 E-03	1.8 E-05	1.7 E-04	9.3 E-04	1.7 E-05	1.6 E-04	9.5 E-04
Bladder	3.6 E-06	3.2 E-05	2.1 E-04	4.5 E-05	3.7 E-04	2.5 E-03	1.3 E-05	1.6 E-04	1.1 E-03	1.6 E-05	1.6 E-04	1.2 E-03
Bone	1.0 E-05	1.2 E-04	2.8 E-03	1.2 E-04	1.4 E-03	3.0 E-02	4.6 E-05	5.7 E-04	1.6 E-02	4.4 E-05	5.8 E-04	1.8 E-02
Brain	3.5 E-06	2.9 E-05	1.8 E-04	4.0 E-05	3.2 E-04	2.2 E-03	1.5 E-05	1.4 E-04	9.6 E-04	1.4 E-05	1.4 E-04	9.1 E-04
Breast	3.1 E-06	2.6 E-05	1.9 E-04	3.7 E-05	3.1 E-04	1.7 E-03	1.2 E-05	1.3 E-04	1.0 E-03	1.4 E-05	1.2 E-04	8.7 E-04
Stomach	4.8 E-06	4.2 E-05	4.0 E-04	6.0 E-05	4.8 E-04	2.9 E-03	2.0 E-05	2.0 E-04	1.6 E-03	2.0 E-05	2.0 E-04	1.5 E-03
Small Intestine	4.8 E-06	4.5 E-05	3.3 E-04	5.8 E-05	5.0 E-04	3.4 E-03	1.8 E-05	2.1 E-04	1.7 E-03	2.3 E-05	2.2 E-04	1.6 E-03
Upper Large Intestine	8.9 E-06	1.2 E-04	1.3 E-03	8.8 E-05	1.2 E-03	1.0 E-02	4.3 E-05	5.4 E-04	5.8 E-03	4.1 E-05	5.5 E-04	6.7 E-03
Lower Large Intestine	1.3 E-05	2.3 E-04	3.4 E-03	1.5 E-04	2.1 E-03	2.9 E-02	6.8 E-05	1.1 E-03	1.4 E-02	6.6 E-05	1.1 E-03	1.3 E-02
Kidneys	4.1 E-06	3.2 E-05	2.3 E-04	4.9 E-05	3.8 E-04	2.4 E-03	1.9 E-05	1.6 E-04	1.2 E-03	1.6 E-05	1.6 E-04	1.3 E-03
Liver	4.7 E-06	3.3 E-05	2.4 E-04	4.9 E-05	4.0 E-04	2.2 E-03	1.8 E-05	1.6 E-04	1.0 E-03	1.7 E-05	1.7 E-04	1.3 E-03
Lungs	3.5 E-06	3.1 E-05	2.2 E-04	4.5 E-05	3.3 E-04	2.3 E-03	1.5 E-05	1.4 E-04	8.9 E-04	1.5 E-05	1.4 E-04	1.0 E-03
Ovaries	2.2 E-06	2.0 E-05	1.4 E-04	2.5 E-05	2.1 E-04	1.3 E-03	9.6 E-06	9.3 E-05	5.9 E-04	9.6 E-06	9.5 E-05	6.8 E-04
Pancreas	4.0 E-06	3.4 E-05	2.5 E-04	4.9 E-05	3.8 E-04	2.5 E-03	1.7 E-05	1.6 E-04	1.3 E-03	1.8 E-05	1.7 E-04	1.4 E-03
Red Bone Marrow	7.9 E-06	7.1 E-05	1.5 E-03	1.0 E-04	8.1 E-04	1.7 E-02	3.7 E-05	3.5 E-04	7.8 E-03	3.7 E-05	3.2 E-04	7.9 E-03
Skin	3.0 E-06	2.7 E-05	1.8 E-04	4.2 E-05	3.1 E-04	1.8 E-03	1.3 E-05	1.4 E-04	8.9 E-04	1.3 E-05	1.4 E-04	9.5 E-04
Spleen	4.0 E-06	3.3 E-05	2.2 E-04	5.4 E-05	3.8 E-04	2.6 E-03	1.6 E-05	1.5 E-04	1.2 E-03	1.8 E-05	1.6 E-04	1.2 E-03
Testes	3.7 E-06	3.5 E-05	3.9 E-04	4.7 E-05	3.9 E-04	3.1 E-03	1.6 E-05	1.6 E-04	1.7 E-03	1.3 E-05	1.7 E-04	1.6 E-03
Thymus	3.03E-06	3.41E-05	2.41E-04	3.20E-05	3.68E-04	2.53E-03	1.39E-05	1.63E-04	1.16E-03	1.17E-05	1.74E-04	1.27E-03
Thyroid	4.75E-06	4.39E-05	3.59E-04	5.92E-05	4.99E-04	3.85E-03	2.05E-05	2.21E-04	1.76E-03	1.79E-05	2.37E-04	1.77E-03
Uterus	4.59E-06	3.31E-05	2.33E-04	4.65E-05	3.73E-04	2.52E-03	1.75E-05	1.67E-04	1.13E-03	2.13E-05	1.71E-04	1.11E-03

[a] Based on ingestion of 30 to 80% of meat from cattle that had access to the Clinch River.

[b] Based on ingestion of 10 to 60% of meat from cattle that had access to the Clinch River.

Table 13A.10 Organ doses (cSv) from all radionuclides for the ingestion of milk for individuals exposed during the entire study period (48 years)[a].

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
Organs	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Adrenals	6.8 E-07	5.1 E-06	4.4 E-05	7.1 E-06	6.4 E-05	5.4 E-04	4.6 E-06	4.1 E-05	3.0 E-04	4.6 E-06	4.2 E-05	3.3 E-04
Bladder	5.5 E-07	5.4 E-06	4.1 E-05	6.4 E-06	6.3 E-05	5.3 E-04	4.1 E-06	4.3 E-05	3.1 E-04	4.3 E-06	4.2 E-05	3.1 E-04
Bone	1.1 E-05	7.8 E-05	7.0 E-04	1.3 E-04	8.4 E-04	6.6 E-03	1.0 E-04	5.9 E-04	5.2 E-03	9.0 E-05	6.2 E-04	5.0 E-03
Brain	4.2 E-07	4.1 E-06	3.7 E-05	5.6 E-06	5.3 E-05	4.9 E-04	4.0 E-06	3.5 E-05	2.6 E-04	4.3 E-06	3.3 E-05	2.6 E-04
Breast	5.2 E-07	3.9 E-06	3.8 E-05	5.3 E-06	4.6 E-05	4.3 E-04	3.5 E-06	3.1 E-05	2.7 E-04	4.0 E-06	3.1 E-05	2.8 E-04
Stomach	7.0 E-07	5.4 E-06	4.3 E-05	8.5 E-06	6.5 E-05	4.8 E-04	5.3 E-06	4.4 E-05	3.0 E-04	5.4 E-06	4.3 E-05	2.8 E-04
Small Intestine	6.5 E-07	5.0 E-06	4.4 E-05	6.8 E-06	5.7 E-05	4.0 E-04	4.7 E-06	3.7 E-05	2.8 E-04	4.9 E-06	3.9 E-05	3.0 E-04
Upper Large Intestine	1.0 E-06	7.4 E-06	4.7 E-05	1.3 E-05	7.9 E-05	5.9 E-04	9.3 E-06	5.2 E-05	3.5 E-04	9.0 E-06	5.3 E-05	3.7 E-04
Lower Large Intestine	1.5 E-06	1.1 E-05	6.5 E-05	2.3 E-05	1.3 E-04	7.4 E-04	1.5 E-05	9.0 E-05	4.5 E-04	1.5 E-05	9.0 E-05	5.1 E-04
Kidneys	6.5 E-07	5.0 E-06	4.2 E-05	7.4 E-06	5.9 E-05	5.0 E-04	4.6 E-06	4.0 E-05	3.4 E-04	5.6 E-06	4.0 E-05	3.0 E-04
Liver	6.3 E-07	5.5 E-06	5.1 E-05	6.6 E-06	6.4 E-05	5.7 E-04	5.0 E-06	4.2 E-05	3.2 E-04	5.0 E-06	4.2 E-05	3.7 E-04
Lungs	5.6 E-07	4.4 E-06	3.8 E-05	6.7 E-06	5.4 E-05	5.2 E-04	4.3 E-06	3.5 E-05	2.6 E-04	4.5 E-06	3.4 E-05	2.9 E-04
Ovaries	4.1 E-07	2.9 E-06	2.6 E-05	5.0 E-06	3.8 E-05	3.0 E-04	3.0 E-06	2.4 E-05	2.0 E-04	3.2 E-06	2.4 E-05	2.0 E-04
Pancreas	6.2 E-07	5.3 E-06	4.7 E-05	7.9 E-06	6.1 E-05	4.7 E-04	5.0 E-06	4.1 E-05	3.4 E-04	5.7 E-06	4.1 E-05	2.8 E-04
Red Bone Marrow	4.8 E-06	3.9 E-05	2.5 E-04	6.4 E-05	4.2 E-04	2.7 E-03	4.7 E-05	3.0 E-04	2.0 E-03	4.3 E-05	3.0 E-04	2.1 E-03
Skin	4.5 E-07	3.8 E-06	3.3 E-05	5.5 E-06	4.8 E-05	4.2 E-04	4.5 E-06	3.0 E-05	2.4 E-04	4.1 E-06	3.1 E-05	2.7 E-04
Spleen	5.4 E-07	5.1 E-06	4.5 E-05	7.0 E-06	6.2 E-05	5.3 E-04	4.7 E-06	3.9 E-05	3.1 E-04	5.0 E-06	4.0 E-05	3.1 E-04
Testes	5.6 E-07	5.1 E-06	6.0 E-05	5.5 E-06	6.2 E-05	8.5 E-04	4.1 E-06	4.0 E-05	4.7 E-04	4.6 E-06	3.9 E-05	4.0 E-04
Thymus	3.81E-07	5.08E-06	4.43E-05	4.58E-06	5.86E-05	5.40E-04	3.64E-06	3.98E-05	3.55E-04	3.47E-06	4.08E-05	3.39E-04
Thyroid	6.98E-07	6.64E-06	7.25E-05	7.91E-06	8.47E-05	7.66E-04	6.01E-06	5.57E-05	4.65E-04	5.97E-06	5.43E-05	4.92E-04
Uterus	5.63E-07	4.96E-06	4.66E-05	6.20E-06	6.14E-05	4.85E-04	4.29E-06	4.20E-05	2.99E-04	5.22E-06	4.03E-05	3.11E-04

[a] Based on ingestion of 63 to 100% of milk from cattle that had access to the Clinch River.

APPENDIX 13B

ORGAN-SPECIFIC RISKS FOR EACH PATHWAY

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Table 13B.1 Organ-specific risks of various types of cancer from all radionuclides for a category I male consumer of fish[a] exposed during the entire study period (48 years).

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
Cancer Type	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Bladder	7.8 E-07	1.2 E-05	1.9 E-04	2.1 E-07	2.1 E-06	2.2 E-05	1.3 E-07	1.4 E-06	1.5 E-05	1.4 E-07	1.3 E-06	1.4 E-05
Stomach	8.1 E-08	3.1 E-06	1.4 E-04	1.8 E-08	5.6 E-07	1.3 E-05	1.1 E-08	3.6 E-07	9.7 E-06	1.1 E-08	3.6 E-07	1.0 E-05
Colon	2.5 E-06	2.7 E-05	2.8 E-04	5.9 E-07	4.7 E-06	4.4 E-05	3.2 E-07	3.3 E-06	2.7 E-05	3.4 E-07	3.2 E-06	3.1 E-05
Kidney	1.9 E-07	3.2 E-06	4.9 E-05	3.3 E-08	5.2 E-07	6.9 E-06	2.1 E-08	3.4 E-07	4.6 E-06	2.2 E-08	3.7 E-07	4.7 E-06
Liver	8.1 E-08	2.2 E-06	1.3 E-04	1.6 E-08	4.3 E-07	1.5 E-05	1.2 E-08	2.6 E-07	8.7 E-06	1.3 E-08	2.7 E-07	8.3 E-06
Lung	1.4 E-06	1.9 E-05	2.2 E-04	3.8 E-07	2.9 E-06	2.4 E-05	1.9 E-07	2.1 E-06	1.5 E-05	1.9 E-07	2.0 E-06	1.7 E-05
Pancreas	3.5 E-08	9.4 E-07	3.1 E-05	9.7 E-09	1.6 E-07	4.8 E-06	5.4 E-09	1.0 E-07	2.7 E-06	5.8 E-09	9.5 E-08	2.9 E-06
Leukemia (RBM[b])	2.5 E-06	3.7 E-05	3.4 E-04	7.9 E-07	6.1 E-06	4.1 E-05	5.3 E-07	4.3 E-06	2.6 E-05	5.4 E-07	4.3 E-06	2.7 E-05
Thyroid	3.6 E-07	5.8 E-06	9.0 E-05	7.5 E-08	1.0 E-06	1.1 E-05	4.2 E-08	6.6 E-07	7.1 E-06	4.6 E-08	6.6 E-07	6.5 E-06

[a] Consumption rate varies from 7.1 to 33 kg y^{-1} (95% subjective confidence interval). It was assumed that 60% (range of 20 to 100%) of the fish was contaminated, and 85% (range of 80 to 90%) of the radioactivity in the fish was retained after processing (sections 7, 13.1).

[b] RBM = Red Bone Marrow

Table 13B.2 Organ-specific risks of various types of cancer from all radionuclides for a category II male consumer of fish[a] exposed during the entire study period (48 years).

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
Cancer Type	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Bladder	3.6 E-07	4.4 E-06	9.0 E-05	7.4 E-08	8.7 E-07	9.6 E-06	4.4 E-08	5.9 E-07	6.3 E-06	5.1 E-08	5.5 E-07	6.8 E-06
Stomach	3.1 E-08	1.3 E-06	6.6 E-05	6.7 E-09	2.2 E-07	6.6 E-06	4.2 E-09	1.4 E-07	4.7 E-06	4.0 E-09	1.4 E-07	4.7 E-06
Colon	7.0 E-07	1.1 E-05	1.3 E-04	1.9 E-07	2.1 E-06	2.1 E-05	1.1 E-07	1.4 E-06	1.2 E-05	1.0 E-07	1.4 E-06	1.2 E-05
Kidney	5.0 E-08	1.5 E-06	2.3 E-05	1.5 E-08	2.4 E-07	3.0 E-06	9.7 E-09	1.6 E-07	2.0 E-06	9.5 E-09	1.7 E-07	2.0 E-06
Liver	3.5 E-08	1.1 E-06	3.9 E-05	9.0 E-09	1.9 E-07	5.3 E-06	6.1 E-09	1.2 E-07	3.9 E-06	6.1 E-09	1.2 E-07	3.6 E-06
Lung	5.1 E-07	7.4 E-06	8.0 E-05	1.2 E-07	1.3 E-06	1.1 E-05	7.0 E-08	8.5 E-07	7.2 E-06	6.5 E-08	8.7 E-07	7.0 E-06
Pancreas	1.5 E-08	4.2 E-07	1.2 E-05	3.1 E-09	7.0 E-08	2.1 E-06	1.7 E-09	4.6 E-08	1.2 E-06	2.0 E-09	4.6 E-08	1.2 E-06
Leukemia (RBM[b])	8.6 E-07	1.6 E-05	1.3 E-04	2.5 E-07	2.7 E-06	1.9 E-05	1.5 E-07	1.9 E-06	1.2 E-05	1.5 E-07	1.9 E-06	1.2 E-05
Thyroid	1.4 E-07	2.8 E-06	3.6 E-05	2.7 E-08	4.3 E-07	4.7 E-06	2.1 E-08	3.1 E-07	3.4 E-06	1.7 E-08	3.0 E-07	3.0 E-06

[a] Consumption rate varies from 2.2 to 16 kg y^{-1}. It was assumed that 60% (range of 20 to 100%) of the fish was contaminated, and 85% (range of 80 to 90%) of the radioactivity in the fish was retained after processing (sections 7, 13.1).

[b] RBM = Red Bone Marrow

Table 13B.3 Organ-specific risks of various types of cancer from all radionuclides for a category III male consumer of fish[a] exposed during the entire study period (48 years).

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
Cancer Type	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Bladder	6.0 E-08	1.1 E-06	2.0 E-05	1.6 E-08	2.0 E-07	2.5 E-06	1.1 E-08	1.3 E-07	1.5 E-06	9.2 E-09	1.3 E-07	1.8 E-06
Stomach	6.1 E-09	3.2 E-07	1.1 E-05	1.4 E-09	5.2 E-08	1.7 E-06	8.5 E-10	3.3 E-08	1.2 E-06	9.0 E-10	3.6 E-08	1.0 E-06
Colon	1.7 E-07	2.5 E-06	3.4 E-05	4.8 E-08	4.7 E-07	4.7 E-06	3.1 E-08	3.1 E-07	2.9 E-06	2.9 E-08	3.2 E-07	3.3 E-06
Kidney	1.3 E-08	3.4 E-07	4.8 E-06	3.5 E-09	5.6 E-08	8.9 E-07	2.1 E-09	3.9 E-08	5.2 E-07	2.1 E-09	3.7 E-08	5.0 E-07
Liver	7.0 E-09	2.3 E-07	8.6 E-06	1.1 E-09	4.6 E-08	1.4 E-06	8.4 E-10	2.9 E-08	9.0 E-07	8.8 E-10	2.8 E-08	8.9 E-07
Lung	1.1 E-07	1.8 E-06	1.6 E-05	2.5 E-08	3.2 E-07	2.6 E-06	1.7 E-08	2.1 E-07	1.7 E-06	1.8 E-08	2.1 E-07	1.8 E-06
Pancreas	3.0 E-09	9.4 E-08	2.4 E-06	6.8 E-10	1.5 E-08	4.8 E-07	4.2 E-10	1.0 E-08	2.4 E-07	4.0 E-10	1.0 E-08	3.4 E-07
Leukemia (RBM[b])	1.8 E-07	3.8 E-06	3.7 E-05	6.0 E-08	6.7 E-07	5.5 E-06	4.0 E-08	4.3 E-07	3.2 E-06	3.5 E-08	4.4 E-07	3.3 E-06
Thyroid	2.8 E-08	5.9 E-07	9.6 E-06	5.8 E-09	1.0 E-07	1.1 E-06	3.8 E-09	6.7 E-08	8.2 E-07	4.1 E-09	6.7 E-08	7.1 E-07

[a] Consumption rate varies from 0.39 to 4.3 kg y^{-1} (95% subjective confidence interval). It was assumed that 60% (range of 20 to 100%) of the fish was contaminated, and 85% (range of 80 to 90%) of the radioactivity in the fish was retained after processing (sections 7, 13.1).

[b] RBM = Red Bone Marrow

Table 13B.4 Organ-specific risks of various types of cancer from all radionuclides for a category I female consumer of fish[a] exposed during the entire study period (48 years).

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
Cancer Type	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Bladder	8.5 E-07	8.9 E-06	1.7 E-04	1.6 E-07	1.6 E-06	2.1 E-05	1.1 E-07	1.1 E-06	1.2 E-05	1.1 E-07	1.1 E-06	1.3 E-05
Breast	4.3 E-06	5.5 E-05	9.2 E-04	1.4 E-06	9.7 E-06	1.1 E-04	8.5 E-07	6.6 E-06	6.9 E-05	9.1 E-07	6.5 E-06	7.1 E-05
Stomach	7.6 E-08	2.4 E-06	1.0 E-04	2.0 E-08	4.3 E-07	9.0 E-06	1.2 E-08	2.8 E-07	6.5 E-06	1.4 E-08	2.7 E-07	6.5 E-06
Colon	1.6 E-06	2.2 E-05	2.6 E-04	5.2 E-07	4.0 E-06	3.4 E-05	3.1 E-07	2.7 E-06	2.3 E-05	3.4 E-07	2.8 E-06	2.3 E-05
Kidney	1.2 E-07	2.6 E-06	4.0 E-05	2.7 E-08	4.5 E-07	5.3 E-06	2.1 E-08	3.2 E-07	4.0 E-06	1.9 E-08	3.0 E-07	4.4 E-06
Liver	6.4 E-08	2.0 E-06	7.7 E-05	1.3 E-08	4.0 E-07	9.4 E-06	9.9 E-09	2.7 E-07	6.5 E-06	9.3 E-09	2.5 E-07	6.1 E-06
Lung	1.2 E-06	1.3 E-05	2.0 E-04	3.1 E-07	2.6 E-06	1.9 E-05	2.1 E-07	1.7 E-06	1.1 E-05	2.0 E-07	1.7 E-06	1.3 E-05
Ovarian	2.7 E-07	5.1 E-06	8.9 E-05	8.0 E-08	9.8 E-07	9.6 E-06	4.8 E-08	6.5 E-07	6.1 E-06	5.4 E-08	6.1 E-07	6.2 E-06
Pancreas	3.5 E-08	6.8 E-07	2.8 E-05	8.6 E-09	1.3 E-07	3.2 E-06	4.5 E-09	9.2 E-08	1.9 E-06	5.2 E-09	8.4 E-08	2.1 E-06
Leukemia (RBM[b])	2.5 E-06	2.7 E-05	4.0 E-04	7.1 E-07	5.1 E-06	3.7 E-05	4.4 E-07	3.5 E-06	2.5 E-05	4.3 E-07	3.5 E-06	2.3 E-05
Thyroid	3.6 E-07	4.8 E-06	8.8 E-05	7.6 E-08	8.7 E-07	8.9 E-06	5.2 E-08	5.5 E-07	6.2 E-06	5.3 E-08	5.7 E-07	6.1 E-06

[a] Consumption rate varies from 5.7 to 27 kg y^{-1} (95% subjective confidence interval). It was assumed that 60% (range of 20 to 100%) of the fish was contaminated, and 85% (range of 80 to 90%) of the radioactivity in the fish was retained after processing (sections 7, 13.1).

[b] RBM = Red Bone Marrow

Table 13B.5 Organ-specific risks of various types of cancer from all radionuclides for a category II female consumer of fish[a] exposed during the entire study period (48 years).

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
Cancer Type	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Bladder	2.2 E-07	3.8 E-06	8.4 E-05	5.0 E-08	6.9 E-07	1.1 E-05	3.5 E-08	4.6 E-07	6.9 E-06	3.9 E-08	4.6 E-07	5.9 E-06
Breast	1.9 E-06	2.3 E-05	4.1 E-04	5.0 E-07	4.2 E-06	4.9 E-05	3.2 E-07	2.8 E-06	3.5 E-05	2.9 E-07	2.8 E-06	3.3 E-05
Stomach	3.6 E-08	9.8 E-07	3.2 E-05	7.0 E-09	1.8 E-07	4.4 E-06	4.9 E-09	1.2 E-07	2.8 E-06	5.1 E-09	1.2 E-07	2.8 E-06
Colon	5.8 E-07	9.3 E-06	1.4 E-04	1.4 E-07	1.6 E-06	1.8 E-05	1.0 E-07	1.2 E-06	1.0 E-05	8.9 E-08	1.2 E-06	1.1 E-05
Kidney	4.8 E-08	1.1 E-06	1.9 E-05	1.3 E-08	2.0 E-07	3.1 E-06	8.1 E-09	1.4 E-07	2.1 E-06	7.9 E-09	1.3 E-07	2.1 E-06
Liver	2.3 E-08	8.3 E-07	3.2 E-05	5.5 E-09	1.7 E-07	5.0 E-06	3.9 E-09	1.1 E-07	2.5 E-06	3.9 E-09	1.1 E-07	2.5 E-06
Lung	4.8 E-07	5.7 E-06	8.2 E-05	1.1 E-07	1.1 E-06	9.9 E-06	7.1 E-08	7.0 E-07	5.5 E-06	6.7 E-08	7.0 E-07	6.4 E-06
Ovarian	1.1 E-07	2.2 E-06	4.4 E-05	3.0 E-08	3.8 E-07	4.3 E-06	2.1 E-08	2.4 E-07	3.1 E-06	2.0 E-08	2.4 E-07	3.2 E-06
Pancreas	1.0 E-08	3.3 E-07	1.2 E-05	3.2 E-09	5.5 E-08	1.5 E-06	1.8 E-09	3.8 E-08	8.2 E-07	1.9 E-09	3.5 E-08	8.7 E-07
Leukemia (RBM[b])	8.6 E-07	1.2 E-05	1.8 E-04	2.3 E-07	2.2 E-06	1.7 E-05	1.7 E-07	1.6 E-06	1.2 E-05	1.5 E-07	1.5 E-06	1.1 E-05
Thyroid	1.2 E-07	2.1 E-06	4.0 E-05	3.0 E-08	3.7 E-07	5.0 E-06	1.9 E-08	2.4 E-07	3.2 E-06	1.8 E-08	2.4 E-07	3.2 E-06

[a] Consumption rate varies from 1.8 to 14 kg y^{-1} (95% subjective confidence interval). It was assumed that 60% (range of 20 to 100%) of the fish was contaminated, and 85% (range of 80 to 90%) of the radioactivity in the fish was retained after processing (sections 7, 13.1).

[b] RBM = Red Bone Marrow

Table 13B.6 Organ-specific risks of various types of cancer from all radionuclides for a category III female consumer of fish[a] exposed during the entire study period (48 years).

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
Cancer Type	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Bladder	5.7 E-08	9.0 E-07	1.7 E-05	1.3 E-08	1.6 E-07	2.6 E-06	8.0 E-09	1.1 E-07	1.9 E-06	8.3 E-09	1.1 E-07	1.7 E-06
Breast	3.7 E-07	5.6 E-06	1.0 E-04	9.0 E-08	9.9 E-07	1.3 E-05	5.4 E-08	6.4 E-07	8.1 E-06	5.2 E-08	6.6 E-07	8.4 E-06
Stomach	6.3 E-09	2.5 E-07	8.9 E-06	1.4 E-09	4.2 E-08	1.2 E-06	1.0 E-09	2.9 E-08	7.0 E-07	8.9 E-10	2.9 E-08	7.5 E-07
Colon	1.4 E-07	2.0 E-06	3.2 E-05	3.6 E-08	3.7 E-07	4.5 E-06	2.9 E-08	2.5 E-07	3.3 E-06	2.5 E-08	2.6 E-07	2.8 E-06
Kidney	1.0 E-08	2.7 E-07	5.2 E-06	2.2 E-09	4.7 E-08	6.9 E-07	1.5 E-09	3.1 E-08	4.5 E-07	1.6 E-09	3.0 E-08	5.0 E-07
Liver	6.0 E-09	2.0 E-07	8.0 E-06	1.2 E-09	3.7 E-08	1.2 E-06	8.6 E-10	2.4 E-08	7.8 E-07	8.4 E-10	2.4 E-08	8.4 E-07
Lung	1.0 E-07	1.3 E-06	2.0 E-05	2.4 E-08	2.4 E-07	2.7 E-06	1.4 E-08	1.7 E-07	1.7 E-06	1.3 E-08	1.6 E-07	1.6 E-06
Ovarian	2.3 E-08	5.2 E-07	1.0 E-05	6.8 E-09	8.5 E-08	1.3 E-06	4.2 E-09	5.7 E-08	7.2 E-07	4.1 E-09	5.6 E-08	8.5 E-07
Pancreas	3.1 E-09	7.3 E-08	2.7 E-06	6.9 E-10	1.2 E-08	3.9 E-07	4.4 E-10	8.5 E-09	2.4 E-07	4.8 E-10	8.2 E-09	2.6 E-07
Leukemia (RBM[b])	1.6 E-07	2.7 E-06	4.9 E-05	5.4 E-08	4.8 E-07	5.0 E-06	3.3 E-08	3.3 E-07	3.2 E-06	3.5 E-08	3.3 E-07	3.2 E-06
Thyroid	3.0 E-08	4.8 E-07	1.2 E-05	6.3 E-09	9.1 E-08	1.1 E-06	4.1 E-09	5.7 E-08	8.5 E-07	4.0 E-09	5.9 E-08	7.0 E-07

[a] Consumption rate varies from 0.32 to 3.6 kg y^{-1} (95% subjective confidence interval). It was assumed that 60% (range of 20 to 100%) of the fish was contaminated, and 85% (range of 80 to 90%) of the radioactivity in the fish was retained after processing (sections 7, 13.1).

[b] RBM = Red Bone Marrow

Table 13B.7 Organ-specific risks of various types of cancer from all radionuclides for external exposure to shoreline sediment during the entire study period (48 years) [a].

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
Cancer Type	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Bladder	2.6 E-08	2.3 E-07	2.0 E-06	1.1 E-07	8.1 E-07	6.8 E-06	1.1 E-07	8.5 E-07	6.4 E-06	1.2 E-07	9.6 E-07	6.9 E-06
Breast	3.3 E-07	2.1 E-06	1.3 E-05	1.1 E-06	7.7 E-06	5.9 E-05	1.4 E-06	8.1 E-06	5.2 E-05	1.5 E-06	8.7 E-06	5.8 E-05
Stomach	2.5 E-09	5.8 E-08	9.7 E-07	8.7 E-09	2.1 E-07	4.4 E-06	9.6 E-09	2.1 E-07	4.6 E-06	1.0 E-08	2.3 E-07	5.2 E-06
Colon	4.6 E-08	3.4 E-07	2.7 E-06	1.9 E-07	1.3 E-06	1.0 E-05	2.1 E-07	1.3 E-06	9.6 E-06	2.4 E-07	1.5 E-06	1.1 E-05
Kidney	5.8 E-09	6.1 E-08	5.2 E-07	1.5 E-08	2.5 E-07	2.8 E-06	1.7 E-08	2.5 E-07	2.5 E-06	1.6 E-08	2.7 E-07	2.7 E-06
Liver	2.2 E-09	4.9 E-08	1.0 E-06	7.2 E-09	1.8 E-07	3.6 E-06	8.3 E-09	1.8 E-07	3.3 E-06	9.5 E-09	2.0 E-07	3.5 E-06
Lung	6.1 E-08	4.1 E-07	2.0 E-06	2.1 E-07	1.4 E-06	8.9 E-06	2.2 E-07	1.4 E-06	9.1 E-06	2.5 E-07	1.6 E-06	1.0 E-05
Ovarian	1.2 E-08	1.1 E-07	9.6 E-07	4.4 E-08	4.5 E-07	4.2 E-06	4.5 E-08	4.5 E-07	4.3 E-06	5.6 E-08	4.9 E-07	4.8 E-06
Pancreas	9.4 E-10	1.7 E-08	3.0 E-07	4.1 E-09	6.6 E-08	1.0 E-06	4.0 E-09	6.3 E-08	9.3 E-07	4.6 E-09	7.2 E-08	1.1 E-06
Leukemia (RBM[b])	8.5 E-08	5.0 E-07	3.3 E-06	2.4 E-07	1.8 E-06	1.3 E-05	3.0 E-07	1.8 E-06	1.2 E-05	3.1 E-07	2.0 E-06	1.3 E-05
Thyroid	1.5 E-08	1.2 E-07	8.6 E-07	5.0 E-08	4.2 E-07	3.0 E-06	5.1 E-08	4.3 E-07	3.1 E-06	6.1 E-08	4.8 E-07	3.3 E-06

[a] Exposure rate (95% subjective confidence interval) varies from 75-430 h y^{-1} for CRM 20.5, 85-440 h y^{-1} for CRM 14, and 130-490 h y^{-1} for CRM 3.5 and CRM 0.

[b] RBM = Red Bone Marrow

Table 13B.8 Organ-specific risks of various types of cancer from all radionuclides for the ingestion of drinking water[a] during the entire study period (48 years).

	CRM 14			CRM 3.5			CRM 0, stationary[b]			CRM 0, mobile		
Cancer Type	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Bladder	7.4 E-09	6.9 E-08	9.3 E-07	4.6 E-09	4.5 E-08	6.7 E-07	3.2 E-10	4.4 E-09	8.1 E-08	3.0 E-10	3.7 E-09	6.2 E-08
Breast	5.4 E-08	4.3 E-07	4.4 E-06	3.1 E-08	3.0 E-07	3.3 E-06	2.1 E-09	2.9 E-08	4.5 E-07	1.7 E-09	2.4 E-08	3.3 E-07
Stomach	1.7 E-09	3.6 E-08	1.2 E-06	9.1 E-10	2.5 E-08	7.7 E-07	7.1 E-11	2.5 E-09	1.0 E-07	7.1 E-11	2.0 E-09	7.8 E-08
Colon	5.2 E-07	3.9 E-06	2.4 E-05	4.2 E-07	3.0 E-06	1.8 E-05	3.2 E-08	3.0 E-07	2.7 E-06	2.2 E-08	2.5 E-07	2.0 E-06
Kidney	1.8 E-09	2.2 E-08	2.9 E-07	1.1 E-09	1.4 E-08	2.0 E-07	6.6 E-11	1.2 E-09	2.6 E-08	4.4 E-11	9.8 E-10	2.1 E-08
Liver	6.3 E-10	1.5 E-08	4.3 E-07	3.9 E-10	9.7 E-09	4.1 E-07	2.5 E-11	1.1 E-09	4.1 E-08	1.9 E-11	9.1 E-10	3.8 E-08
Lung	1.5 E-08	1.1 E-07	1.0 E-06	8.7 E-09	7.0 E-08	9.4 E-07	5.6 E-10	7.5 E-09	7.5 E-08	4.3 E-10	6.3 E-09	6.6 E-08
Ovarian	3.6 E-09	4.2 E-08	6.0 E-07	2.3 E-09	2.8 E-08	5.3 E-07	1.9 E-10	3.2 E-09	4.1 E-08	1.1 E-10	2.5 E-09	3.6 E-08
Pancreas	3.1 E-10	6.2 E-09	1.0 E-07	2.2 E-10	3.9 E-09	8.8 E-08	1.8 E-11	3.9 E-10	1.1 E-08	1.7 E-11	3.5 E-10	8.8 E-09
Leukemia (RBM[c])	5.7 E-07	2.9 E-06	2.0 E-05	3.0 E-07	1.4 E-06	7.7 E-06	1.1 E-08	1.1 E-07	7.4 E-07	9.6 E-09	8.7 E-08	6.2 E-07
Thyroid	3.5 E-09	3.6 E-08	4.0 E-07	1.8 E-09	2.4 E-08	3.2 E-07	2.1 E-10	2.0 E-09	4.5 E-08	1.6 E-10	1.7 E-09	3.0 E-08

[a] Unless otherwose noted, an ingestion of 20 to 60% of filtered, treated water from the Clinch River is assumed.

[b] An ingestion of 20 to 80% of filtered, treated water from the Clinch River is assumed for an individual who resides and works near CRM 0.

[c] RBM = Red Bone Marrow

Table 13B.9 Organ-specific risks of various types of cancer from all radionuclides for the ingestion of meat during the entire study period (48 years).

	CRM 20.5[a]			CRM 14[a]			CRM 3.5[b]			CRM 0[b]		
Cancer Type	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Bladder	7.7 E-11	9.3 E-10	9.7 E-09	8.5 E-10	1.0 E-08	1.2 E-07	3.5 E-10	4.8 E-09	5.4 E-08	3.3 E-10	4.3 E-09	4.7 E-08
Breast	4.9 E-10	6.1 E-09	4.5 E-08	7.9 E-09	7.4 E-08	5.4 E-07	2.2 E-09	3.1 E-08	2.3 E-07	2.1 E-09	3.0 E-08	2.7 E-07
Stomach	9.0 E-12	2.9 E-10	9.3 E-09	1.4 E-10	3.5 E-09	8.5 E-08	5.8 E-11	1.3 E-09	3.8 E-08	5.5 E-11	1.4 E-09	4.1 E-08
Colon	4.8 E-10	1.2 E-08	2.3 E-07	6.1 E-09	1.1 E-07	1.8 E-06	2.7 E-09	5.4 E-08	9.5 E-07	2.1 E-09	5.4 E-08	8.2 E-07
Kidney	1.3 E-11	2.6 E-10	3.2 E-09	1.5 E-10	3.0 E-09	4.0 E-08	5.9 E-11	1.4 E-09	1.8 E-08	6.2 E-11	1.4 E-09	1.8 E-08
Liver	6.6 E-12	2.4 E-10	6.6 E-09	8.2 E-11	2.6 E-09	7.4 E-08	3.7 E-11	1.1 E-09	2.4 E-08	3.6 E-11	1.1 E-09	3.1 E-08
Lung	1.6 E-10	1.5 E-09	1.3 E-08	2.0 E-09	1.7 E-08	1.4 E-07	6.9 E-10	7.1 E-09	5.7 E-08	5.3 E-10	6.7 E-09	6.4 E-08
Ovarian	4.6 E-11	5.2 E-10	7.8 E-09	4.5 E-10	5.8 E-09	7.1 E-08	1.8 E-10	2.5 E-09	3.6 E-08	1.7 E-10	2.5 E-09	3.1 E-08
Pancreas	3.3 E-12	8.7 E-11	2.2 E-09	3.7 E-11	9.1 E-10	2.1 E-08	1.6 E-11	3.4 E-10	8.6 E-09	1.9 E-11	3.8 E-10	8.6 E-09
Leukemia (RBM[c])	4.5 E-10	4.5 E-09	8.7 E-08	4.9 E-09	5.5 E-08	1.1 E-06	1.7 E-09	2.3 E-08	5.2 E-07	1.8 E-09	2.2 E-08	4.5 E-07
Thyroid	3.7 E-11	4.8 E-10	4.7 E-09	4.4 E-10	5.7 E-09	6.2 E-08	1.4 E-10	2.4 E-09	2.7 E-08	1.4 E-10	2.6 E-09	2.1 E-08

[a] Based on ingestion of 30 to 80% of meat from cattle that had access to the Clinch River.
[b] Based on ingestion of 10 to 60% of meat from cattle that had access to the Clinch River.
[c] RBM = Red Bone Marrow

Table 13B.10 Organ-specific risks of various types of cancer from all radionuclides for the ingestion of milk[a] during the entire study period (48 years).

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
Cancer Type	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Bladder	1.3 E-11	1.6 E-10	2.0 E-09	1.5 E-10	1.8 E-09	2.3 E-08	9.8 E-11	1.3 E-09	1.5 E-08	1.1 E-10	1.2 E-09	1.4 E-08
Breast	7.6 E-11	9.7 E-10	8.8 E-09	8.6 E-10	1.2 E-08	1.1 E-07	5.8 E-10	7.7 E-09	6.6 E-08	6.4 E-10	7.6 E-09	6.4 E-08
Stomach	1.5 E-12	3.7 E-11	9.7 E-10	1.8 E-11	4.5 E-10	1.1 E-08	1.2 E-11	2.8 E-10	8.0 E-09	1.3 E-11	2.8 E-10	6.4 E-09
Colon	5.5 E-11	5.3 E-10	5.5 E-09	5.5 E-10	6.4 E-09	6.1 E-08	4.5 E-10	4.5 E-09	3.6 E-08	4.2 E-10	4.5 E-09	3.7 E-08
Kidney	2.3 E-12	4.4 E-11	6.3 E-10	2.6 E-11	4.9 E-10	7.0 E-09	1.7 E-11	3.5 E-10	5.5 E-09	1.6 E-11	3.4 E-10	4.9 E-09
Liver	9.1 E-13	3.8 E-11	1.1 E-09	9.3 E-12	3.9 E-10	1.3 E-08	7.3 E-12	2.6 E-10	7.6 E-09	6.7 E-12	2.7 E-10	6.7 E-09
Lung	1.9 E-11	2.1 E-10	2.6 E-09	2.4 E-10	2.5 E-09	3.5 E-08	1.7 E-10	1.7 E-09	2.0 E-08	1.7 E-10	1.6 E-09	1.8 E-08
Ovarian	6.9 E-12	8.8 E-11	1.2 E-09	6.8 E-11	1.0 E-09	1.4 E-08	4.5 E-11	6.9 E-10	9.2 E-09	4.5 E-11	6.4 E-10	8.6 E-09
Pancreas	5.6 E-13	1.3 E-11	3.4 E-10	6.6 E-12	1.5 E-10	4.2 E-09	3.7 E-12	9.5 E-11	2.3 E-09	4.2 E-12	9.7 E-11	2.6 E-09
Leukemia (RBM[b])	2.2 E-10	2.3 E-09	1.9 E-08	2.7 E-09	2.9 E-08	2.0 E-07	2.3 E-09	2.0 E-08	1.4 E-07	2.1 E-09	2.1 E-08	1.5 E-07
Thyroid	6.2 E-12	6.8 E-11	8.7 E-10	8.9 E-11	8.9 E-10	1.1 E-08	6.0 E-11	6.0 E-10	5.6 E-09	6.6 E-11	6.0 E-10	6.8 E-09

[a] Based on ingestion of 63 to 100% of milk from cattle that had access to the Clinch River.

[b] RBM = Red Bone Marrow

APPENDIX 13C

TOTAL RISKS FOR EACH PATHWAY AND RADIONUCLIDE

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Table 13C.1 Excess lifetime risk resulting from the consumption of fish for males exposed during the entire study period (48 years).

Location = CRM 20.5

	Category 1 Male			Category 2 Male			Category 3 Male		
Isotope	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Cs-137	3.0E-05	2.6E-04	3.4E-03	1.2E-05	1.2E-04	1.4E-03	2.8E-06	2.7E-05	3.6E-04
Ru-106	9.8E-08	1.7E-06	3.0E-05	3.9E-08	7.3E-07	1.3E-05	1.1E-08	1.8E-07	3.0E-06
Sr-90	6.8E-07	1.1E-05	1.2E-04	2.2E-07	3.8E-06	7.3E-05	5.2E-08	9.7E-07	1.5E-05
Co-60	6.6E-08	9.8E-07	1.4E-05	2.9E-08	4.1E-07	6.1E-06	5.9E-09	9.2E-08	1.4E-06
Total[a]	3.6E-05	2.8E-04	3.5E-03	1.4E-05	1.3E-04	1.5E-03	3.1E-06	2.9E-05	3.7E-04

Location = CRM 14

	Category 1 Male			Category 2 Male			Category 3 Male		
Isotope	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Cs-137	6.7E-06	5.1E-05	4.0E-04	2.4E-06	2.1E-05	1.5E-04	6.4E-07	5.4E-06	3.4E-05
Ru-106	2.6E-08	3.4E-07	3.5E-06	1.0E-08	1.4E-07	1.5E-06	2.0E-09	3.1E-08	3.6E-07
Sr-90	1.6E-07	1.9E-06	1.9E-05	5.5E-08	7.6E-07	1.1E-05	1.2E-08	1.6E-07	2.1E-06
Co-60	2.0E-08	1.9E-07	1.6E-06	7.0E-09	7.9E-08	6.7E-07	1.5E-09	1.8E-08	1.7E-07
Total[a]	8.2E-06	5.7E-05	4.1E-04	2.9E-06	2.2E-05	1.6E-04	6.8E-07	5.8E-06	3.5E-05

Location = CRM 3.5

	Category 1 Male			Category 2 Male			Category 3 Male		
Isotope	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Cs-137	4.4E-06	3.4E-05	2.3E-04	1.7E-06	1.3E-05	1.0E-04	3.8E-07	3.4E-06	2.2E-05
Ru-106	2.1E-08	2.8E-07	3.2E-06	8.0E-09	1.1E-07	1.5E-06	1.7E-09	2.6E-08	3.8E-07
Sr-90	1.1E-07	1.4E-06	1.4E-05	4.2E-08	5.4E-07	7.7E-06	8.5E-09	1.2E-07	1.6E-06
Co-60	1.3E-08	1.3E-07	1.1E-06	4.7E-09	5.8E-08	5.4E-07	1.0E-09	1.4E-08	1.3E-07
Total[a]	5.2E-06	3.8E-05	2.4E-04	2.1E-06	1.4E-05	1.1E-04	4.6E-07	3.8E-06	2.2E-05

Location = CRM 0

	Category 1 Male			Category 2 Male			Category 3 Male		
Isotope	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Cs-137	4.4E-06	3.4E-05	2.6E-04	1.5E-06	1.3E-05	1.0E-04	3.8E-07	3.3E-06	2.4E-05
Ru-106	1.8E-08	2.8E-07	3.3E-06	7.1E-09	1.2E-07	1.7E-06	1.2E-09	2.5E-08	3.2E-07
Sr-90	1.1E-07	1.4E-06	1.3E-05	4.3E-08	5.4E-07	8.3E-06	9.2E-09	1.2E-07	1.7E-06
Co-60	1.4E-08	1.4E-07	1.4E-06	5.1E-09	5.7E-08	5.3E-07	1.0E-09	1.2E-08	1.4E-07
Total[a]	5.6E-06	3.7E-05	2.6E-04	1.8E-06	1.5E-05	1.1E-04	4.3E-07	3.6E-06	2.4E-05

[a] Because the total risks are propagated using Monte Carlo techniques, the percentiles may not add directly.

Table 13C.2 Excess lifetime risk resulting from the consumption of fish for females exposed during the entire study period (48 years).

Location = CRM 20.5

	Category 1 Female			Category 2 Female			Category 3 Female		
Isotope	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Cs-137	2.4E-05	2.2E-04	2.8E-03	9.6E-06	9.6E-05	1.1E-03	2.2E-06	2.2E-05	3.0E-04
Ru-106	8.1E-08	1.4E-06	2.5E-05	3.2E-08	6.0E-07	1.1E-05	9.1E-09	1.5E-07	2.5E-06
Sr-90	5.5E-07	9.0E-06	1.0E-04	1.8E-07	3.1E-06	6.1E-05	4.3E-08	7.9E-07	1.2E-05
Co-60	5.5E-08	8.1E-07	1.1E-05	2.4E-08	3.3E-07	5.0E-06	4.9E-09	7.6E-08	1.2E-06
Total[a]	2.9E-05	2.3E-04	2.8E-03	1.2E-05	1.1E-04	1.3E-03	2.5E-06	2.4E-05	3.1E-04

Location = CRM 14

	Category 1 Female			Category 2 Female			Category 3 Female		
Isotope	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Cs-137	5.5E-06	4.3E-05	3.3E-04	2.0E-06	1.7E-05	1.2E-04	5.2E-07	4.4E-06	2.8E-05
Ru-106	2.1E-08	2.8E-07	2.9E-06	8.1E-09	1.1E-07	1.2E-06	1.7E-09	2.6E-08	2.9E-07
Sr-90	1.3E-07	1.6E-06	1.6E-05	4.6E-08	6.3E-07	8.7E-06	9.9E-09	1.3E-07	1.7E-06
Co-60	1.6E-08	1.5E-07	1.3E-06	5.8E-09	6.5E-08	5.6E-07	1.3E-09	1.4E-08	1.4E-07
Total[a]	6.7E-06	4.8E-05	3.4E-04	2.4E-06	1.8E-05	1.3E-04	5.6E-07	4.8E-06	2.9E-05

Location = CRM 3.5

	Category 1 Female			Category 2 Female			Category 3 Female		
Isotope	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Cs-137	3.6E-06	2.8E-05	1.9E-04	1.4E-06	1.1E-05	8.5E-05	3.1E-07	2.8E-06	1.8E-05
Ru-106	1.7E-08	2.3E-07	2.6E-06	6.6E-09	9.0E-08	1.2E-06	1.4E-09	2.1E-08	3.1E-07
Sr-90	9.2E-08	1.1E-06	1.2E-05	3.5E-08	4.4E-07	6.3E-06	7.1E-09	9.5E-08	1.3E-06
Co-60	1.0E-08	1.1E-07	8.9E-07	3.8E-09	4.7E-08	4.4E-07	8.2E-10	1.1E-08	1.1E-07
Total[a]	4.3E-06	3.1E-05	2.0E-04	1.7E-06	1.2E-05	8.8E-05	3.8E-07	3.1E-06	1.8E-05

Location = CRM 0

	Category 1 Female			Category 2 Female			Category 3 Female		
Isotope	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Cs-137	3.6E-06	2.8E-05	2.1E-04	1.3E-06	1.1E-05	8.7E-05	3.2E-07	2.7E-06	1.9E-05
Ru-106	1.5E-08	2.3E-07	2.7E-06	5.9E-09	1.0E-07	1.4E-06	1.0E-09	2.0E-08	2.6E-07
Sr-90	9.4E-08	1.1E-06	1.1E-05	3.4E-08	4.4E-07	6.9E-06	7.6E-09	9.6E-08	1.4E-06
Co-60	1.1E-08	1.1E-07	1.2E-06	4.3E-09	4.7E-08	4.4E-07	8.5E-10	1.0E-08	1.1E-07
Total[a]	4.6E-06	3.0E-05	2.1E-04	1.5E-06	1.2E-05	9.0E-05	3.6E-07	3.0E-06	2.0E-05

[a] Because the total risks are propagated using Monte Carlo techniques, the percentiles may not add directly.

Table 13C.3 Radionuclide-specific risks from additional exposure pathways for individuals exposed during the entire study period (48 years).

External

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
Isotope	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Cs-137	1.1E-06	5.8E-06	2.7E-05	3.2E-06	1.7E-05	7.6E-05	2.7E-06	1.3E-05	5.8E-05	3.1E-06	1.5E-05	6.9E-05
Ru-106	9.1E-09	4.5E-08	2.1E-07	5.3E-08	2.6E-07	1.2E-06	1.3E-07	6.5E-07	2.7E-06	1.5E-07	6.5E-07	2.8E-06
Sr-90	3.9E-11	2.0E-10	8.9E-10	2.8E-10	1.4E-09	6.3E-09	3.8E-10	1.7E-09	7.0E-09	4.5E-10	1.9E-09	8.6E-09
Co-60	2.2E-07	1.1E-06	4.9E-06	1.4E-06	7.4E-06	3.4E-05	2.0E-06	1.1E-05	4.8E-05	2.5E-06	1.2E-05	5.1E-05
Nb-95	8.0E-11	4.7E-10	2.2E-09	3.1E-09	1.6E-08	9.9E-08	6.0E-09	3.7E-08	3.5E-07	5.6E-09	3.6E-08	3.5E-07
Zr-95	3.2E-11	1.7E-10	8.1E-10	3.7E-08	1.8E-07	8.7E-07	8.2E-08	4.7E-07	2.3E-06	8.8E-08	4.5E-07	2.1E-06
Ce-144	1.1E-12	5.9E-12	2.8E-11	8.6E-09	4.3E-08	2.0E-07	1.7E-08	8.2E-08	3.5E-07	2.0E-08	9.3E-08	4.4E-07
Total[a]	1.3E-06	7.0E-06	3.2E-05	4.7E-06	2.5E-05	1.1E-04	4.9E-06	2.6E-05	1.1E-04	6.2E-06	2.8E-05	1.2E-04

Drinking Water

	CRM 14			CRM 3.5			CRM 0, stationary			CRM 0, mobile		
Isotope	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Cs-137	5.1E-08	2.2E-07	9.7E-07	1.9E-08	6.6E-08	2.5E-07	8.4E-10	6.8E-09	3.4E-08	8.3E-10	5.3E-09	2.5E-08
Ru-106	1.7E-06	7.1E-06	3.3E-05	1.3E-06	5.6E-06	2.2E-05	6.4E-08	6.5E-07	3.7E-06	6.5E-08	4.9E-07	3.1E-06
Sr-90	9.0E-07	3.9E-06	1.8E-05	4.3E-07	1.8E-06	8.2E-06	1.6E-08	1.3E-07	6.9E-07	1.6E-08	1.0E-07	5.8E-07
Total[a]	3.5E-06	1.2E-05	4.6E-05	2.1E-06	8.2E-06	2.6E-05	8.7E-08	8.3E-07	4.5E-06	8.2E-08	6.5E-07	3.6E-06

Meat

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
Isotope	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Cs-137	2.0E-09	1.6E-08	1.1E-07	2.7E-08	1.8E-07	1.2E-06	7.1E-09	7.7E-08	5.8E-07	8.8E-09	8.0E-08	5.4E-07
Ru-106	4.6E-10	1.9E-08	2.4E-07	3.7E-09	1.7E-07	2.2E-06	1.9E-09	8.0E-08	1.2E-06	1.7E-09	7.5E-08	1.3E-06
Sr-90	7.6E-11	2.8E-09	1.1E-07	7.8E-10	3.0E-08	8.2E-07	2.9E-10	1.3E-08	4.3E-07	3.4E-10	1.3E-08	4.2E-07
Co-60	2.0E-12	5.4E-11	1.8E-09	7.0E-12	2.4E-10	7.0E-09	1.8E-12	1.0E-10	2.9E-09	3.0E-12	8.9E-11	3.3E-09
Total[a]	6.2E-09	5.0E-08	3.4E-07	5.2E-08	5.3E-07	3.6E-06	2.1E-08	2.3E-07	2.0E-06	2.8E-08	2.4E-07	1.6E-06

Milk

	CRM 20.5			CRM 14			CRM 3.5			CRM 0		
Isotope	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
Cs-137	2.4E-10	3.5E-09	2.7E-08	3.1E-09	4.2E-08	3.4E-07	2.2E-09	2.8E-08	2.3E-07	2.2E-09	2.7E-08	2.3E-07
Ru-106	3.2E-10	2.6E-09	2.4E-08	4.5E-09	2.9E-08	2.4E-07	3.5E-09	2.1E-08	1.7E-07	3.6E-09	2.1E-08	1.7E-07
Sr-90	3.1E-12	9.8E-11	1.8E-09	1.5E-11	4.0E-10	6.3E-09	1.2E-11	2.7E-10	4.5E-09	1.2E-11	2.7E-10	5.3E-09
Co-60	1.2E-09	7.6E-09	4.3E-08	1.3E-08	8.6E-08	4.8E-07	9.5E-09	5.9E-08	3.2E-07	9.3E-09	6.0E-08	2.9E-07
Total[a]	6.2E-09	5.0E-08	3.4E-07	5.2E-08	5.3E-07	3.6E-06	2.1E-08	2.3E-07	2.0E-06	2.8E-08	2.4E-07	1.6E-06

[a] Because the total risks are propagated using Monte Carlo techniques, the percentiles may not add directly.

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APPENDIX 13D

TOTAL RISKS ACROSS PATHWAYS[1]

[1] Please note that values for risks for each radionuclide and the total risks for each pathway may be slightly different from those presented in Appendix 13C. These slight discrepancies result because the associated calculations were performed in two separate simulations that used Monte Carlo techniques. These techniques use sequences of random numbers that may have been different from one simulation to the next. The conclusions are the same.

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Table 13D.1 Risks summed over various pathways for males exposed during the entire study period (48 years) at CRM 0.

	Male - Category I			Male - Category II			Male - Category III		
	95% subjective confidence interval			95% subjective confidence interval			95% subjective confidence interval		
	2.50%	50.00%	97.50%	2.50%	50.00%	97.50%	2.50%	50.00%	97.50%
Drinking Water									
Cs-137	6.5 E-10	5.9 E-09	3.4 E-08	6.5 E-10	5.9 E-09	3.4 E-08	6.5 E-10	5.9 E-09	3.4 E-08
Ru-106	5.9 E-08	5.6 E-07	3.7 E-06	5.9 E-08	5.6 E-07	3.7 E-06	5.9 E-08	5.6 E-07	3.7 E-06
Sr-90	1.3 E-08	1.2 E-07	9.6 E-07	1.3 E-08	1.2 E-07	9.6 E-07	1.3 E-08	1.2 E-07	9.6 E-07
Total	7.3 E-08	6.9 E-07	4.7 E-06	7.3 E-08	6.9 E-07	4.7 E-06	7.3 E-08	6.9 E-07	4.7 E-06
Fish									
Cs-137	3.4 E-06	2.8 E-05	2.4 E-04	1.2 E-06	1.2 E-05	1.1 E-04	2.6 E-07	2.7 E-06	2.8 E-05
Ru-106	2.2 E-08	2.6 E-07	3.7 E-06	9.1 E-09	1.1 E-07	1.3 E-06	1.8 E-09	2.5 E-08	3.4 E-07
Sr-90	2.6 E-07	2.1 E-06	2.4 E-05	7.9 E-08	9.0 E-07	1.1 E-05	2.0 E-08	2.0 E-07	2.9 E-06
Co-60	4.1 E-09	6.4 E-08	8.9 E-07	1.5 E-09	2.7 E-08	4.2 E-07	3.4 E-10	5.8 E-09	1.1 E-07
Total	3.7 E-06	3.1 E-05	2.7 E-04	1.3 E-06	1.3 E-05	1.3 E-04	2.8 E-07	2.9 E-06	3.2 E-05
External									
Cs-137	3.3 E-06	1.4 E-05	6.8 E-05	3.3 E-06	1.4 E-05	6.8 E-05	3.3 E-06	1.4 E-05	6.8 E-05
Ru-106	1.4 E-07	6.3 E-07	3.0 E-06	1.4 E-07	6.3 E-07	3.0 E-06	1.4 E-07	6.3 E-07	3.0 E-06
Sr-90	4.3 E-10	1.9 E-09	8.6 E-09	4.3 E-10	1.9 E-09	8.6 E-09	4.3 E-10	1.9 E-09	8.6 E-09
Co-60	2.6 E-06	1.1 E-05	5.2 E-05	2.6 E-06	1.1 E-05	5.2 E-05	2.6 E-06	1.1 E-05	5.2 E-05
Nb-95	5.9 E-09	3.4 E-08	3.3 E-07	5.9 E-09	3.4 E-08	3.3 E-07	5.9 E-09	3.4 E-08	3.3 E-07
Sr-95	9.4 E-08	4.2 E-07	2.2 E-06	9.4 E-08	4.2 E-07	2.2 E-06	9.4 E-08	4.2 E-07	2.2 E-06
Ce-144	2.0 E-08	8.9 E-08	4.1 E-07	2.0 E-08	8.9 E-08	4.1 E-07	2.0 E-08	8.9 E-08	4.1 E-07
Total	6.3 E-06	2.7 E-05	1.3 E-04	6.3 E-06	2.7 E-05	1.3 E-04	6.3 E-06	2.7 E-05	1.3 E-04
Summed Risk									
Cs-137	6.7 E-06	4.3 E-05	3.1 E-04	4.4 E-06	2.6 E-05	1.8 E-04	3.5 E-06	1.7 E-05	9.7 E-05
Ru-106	2.2 E-07	1.5 E-06	1.0 E-05	2.1 E-07	1.3 E-06	8.1 E-06	2.0 E-07	1.2 E-06	7.1 E-06
Sr-90	2.7 E-07	2.2 E-06	2.5 E-05	9.3 E-08	1.0 E-06	1.2 E-05	3.4 E-08	3.2 E-07	3.9 E-06
Co-60	2.6 E-06	1.1 E-05	5.3 E-05	2.6 E-06	1.1 E-05	5.2 E-05	2.6 E-06	1.1 E-05	5.2 E-05
Nb-95	5.9 E-09	3.4 E-08	3.3 E-07	5.9 E-09	3.4 E-08	3.3 E-07	5.9 E-09	3.4 E-08	3.3 E-07
Sr-95	9.4 E-08	4.2 E-07	2.2 E-06	9.4 E-08	4.2 E-07	2.2 E-06	9.4 E-08	4.2 E-07	2.2 E-06
Ce-144	2.0 E-08	8.9 E-08	4.1 E-07	2.0 E-08	8.9 E-08	4.1 E-07	2.0 E-08	8.9 E-08	4.1 E-07
Total Summed Risk	1.0 E-05	5.8 E-05	4.0 E-04	7.6 E-06	4.1 E-05	2.6 E-04	6.6 E-06	3.1 E-05	1.6 E-04

Table 13D.2 Risks summed over various pathways for males exposed during the entire study period (48 years) at CRM 3.5.

	Male - Category I			Male - Category II			Male - Category III		
	95% subjective confidence interval			95% subjective confidence interval			95% subjective confidence interval		
	2.50%	50.00%	97.50%	2.50%	50.00%	97.50%	2.50%	50.00%	97.50%
Drinking Water									
Cs-137	2.4 E-08	1.3 E-07	7.2 E-07	2.4 E-08	1.3 E-07	7.2 E-07	2.4 E-08	1.2 E-07	7.2 E-07
Ru-106	1.4 E-06	5.5 E-06	2.8 E-05	1.4 E-06	5.5 E-06	2.8 E-05	1.2 E-06	5.8 E-06	2.5 E-05
Sr-90	5.9 E-07	2.6 E-06	1.6 E-05	5.9 E-07	2.6 E-06	1.6 E-05	5.2 E-07	2.7 E-06	1.4 E-05
Total	2.0 E-06	8.3 E-06	4.4 E-05	2.0 E-06	8.3 E-06	4.4 E-05	1.8 E-06	8.6 E-06	3.9 E-05
Fish									
Cs-137	3.2 E-06	3.0 E-05	2.5 E-04	1.2 E-06	1.3 E-05	1.2 E-04	2.4 E-07	2.9 E-06	2.8 E-05
Ru-106	2.6 E-08	2.8 E-07	3.0 E-06	1.1 E-08	1.1 E-07	1.4 E-06	2.1 E-09	2.5 E-08	3.7 E-07
Sr-90	2.3 E-07	2.3 E-06	2.1 E-05	8.5 E-08	9.1 E-07	1.1 E-05	1.9 E-08	2.2 E-07	1.9 E-06
Co-60	3.9 E-09	6.6 E-08	9.6 E-07	1.6 E-09	2.6 E-08	5.0 E-07	2.5 E-10	6.4 E-09	8.9 E-08
Total	3.5 E-06	3.3 E-05	2.7 E-04	1.3 E-06	1.4 E-05	1.3 E-04	2.6 E-07	3.2 E-06	3.0 E-05
External									
Cs-137	2.6 E-06	1.3 E-05	5.3 E-05	2.6 E-06	1.3 E-05	5.3 E-05	2.8 E-06	1.3 E-05	5.4 E-05
Ru-106	1.2 E-07	6.4 E-07	2.7 E-06	1.2 E-07	6.4 E-07	2.7 E-06	1.4 E-07	6.1 E-07	2.3 E-06
Sr-90	3.1 E-10	1.7 E-09	6.7 E-09	3.1 E-10	1.7 E-09	6.7 E-09	3.4 E-10	1.6 E-09	6.1 E-09
Co-60	2.0 E-06	1.0 E-05	4.3 E-05	2.0 E-06	1.0 E-05	4.3 E-05	2.3 E-06	1.0 E-05	4.1 E-05
Nb-95	5.8 E-09	3.5 E-08	3.7 E-07	5.8 E-09	3.5 E-08	3.7 E-07	6.0 E-09	3.6 E-08	5.0 E-07
Sr-95	7.2 E-08	4.3 E-07	2.5 E-06	7.2 E-08	4.3 E-07	2.5 E-06	8.4 E-08	4.2 E-07	2.0 E-06
Ce-144	1.5 E-08	7.9 E-08	3.6 E-07	1.5 E-08	7.9 E-08	3.6 E-07	1.8 E-08	7.6 E-08	3.2 E-07
Total	4.6 E-06	2.5 E-05	1.0 E-04	4.6 E-06	2.5 E-05	1.0 E-04	5.7 E-06	2.5 E-05	9.6 E-05
Summed Risk									
Cs-137	5.8 E-06	4.3 E-05	3.0 E-04	3.7 E-06	2.6 E-05	1.7 E-04	3.1 E-06	1.6 E-05	8.2 E-05
Ru-106	1.5 E-06	6.4 E-06	3.3 E-05	1.5 E-06	6.3 E-06	3.2 E-05	1.4 E-06	6.4 E-06	2.7 E-05
Sr-90	8.1 E-07	5.0 E-06	3.7 E-05	6.7 E-07	3.5 E-06	2.7 E-05	5.4 E-07	2.9 E-06	1.6 E-05
Co-60	2.0 E-06	1.1 E-05	4.4 E-05	2.0 E-06	1.1 E-05	4.4 E-05	2.3 E-06	1.0 E-05	4.1 E-05
Nb-95	5.8 E-09	3.5 E-08	3.7 E-07	5.8 E-09	3.5 E-08	3.7 E-07	6.0 E-09	3.6 E-08	5.0 E-07
Sr-95	7.2 E-08	4.3 E-07	2.5 E-06	7.2 E-08	4.3 E-07	2.5 E-06	8.4 E-08	4.2 E-07	2.0 E-06
Ce-144	1.5 E-08	7.9 E-08	3.6 E-07	1.5 E-08	7.9 E-08	3.6 E-07	1.8 E-08	7.6 E-08	3.2 E-07
Total Summed Risk	1.0 E-05	6.5 E-05	4.2 E-04	7.8 E-06	4.6 E-05	2.8 E-04	7.7 E-06	3.6 E-05	1.7 E-04

Table 13D.3 Risks summed over various pathways for males exposed during the entire study period (48 years) at CRM 14.

	Male - Category I			Male - Category II			Male - Category III		
	95% subjective confidence interval			95% subjective confidence interval			95% subjective confidence interval		
	2.50%	50.00%	97.50%	2.50%	50.00%	97.50%	2.50%	50.00%	97.50%
Drinking Water									
Cs-137	3.3 E-08	1.9 E-07	1.1 E-06	3.4 E-08	1.9 E-07	1.0 E-06	3.4 E-08	1.9 E-07	1.0 E-06
Ru-106	1.5 E-06	6.9 E-06	3.5 E-05	1.4 E-06	6.9 E-06	3.3 E-05	1.4 E-06	6.9 E-06	3.3 E-05
Sr-90	6.9 E-07	3.6 E-06	2.2 E-05	7.6 E-07	3.6 E-06	2.1 E-05	7.6 E-07	3.6 E-06	2.1 E-05
Total	2.2 E-06	1.1 E-05	5.8 E-05	2.2 E-06	1.1 E-05	5.5 E-05	2.2 E-06	1.1 E-05	5.5 E-05
Fish									
Cs-137	5.5 E-06	4.5 E-05	4.0 E-04	1.8 E-06	1.9 E-05	1.8 E-04	3.6 E-07	4.5 E-06	4.0 E-05
Ru-106	2.8 E-08	3.2 E-07	3.5 E-06	9.9 E-09	1.3 E-07	1.6 E-06	2.5 E-09	2.9 E-08	4.1 E-07
Sr-90	3.2 E-07	3.2 E-06	2.8 E-05	1.4 E-07	1.3 E-06	1.1 E-05	2.6 E-08	3.0 E-07	2.6 E-06
Co-60	5.1 E-09	8.9 E-08	1.4 E-06	1.6 E-09	3.6 E-08	6.5 E-07	3.0 E-10	8.8 E-09	1.4 E-07
Total	5.8 E-06	4.9 E-05	4.3 E-04	1.9 E-06	2.0 E-05	1.9 E-04	3.9 E-07	4.9 E-06	4.3 E-05
External									
Cs-137	2.7 E-06	1.6 E-05	7.5 E-05	3.2 E-06	1.7 E-05	6.4 E-05	3.2 E-06	1.7 E-05	6.4 E-05
Ru-106	4.4 E-08	2.5 E-07	1.1 E-06	4.9 E-08	2.6 E-07	1.0 E-06	4.9 E-08	2.6 E-07	1.0 E-06
Sr-90	2.3 E-10	1.4 E-09	6.2 E-09	2.6 E-10	1.4 E-09	5.6 E-09	2.6 E-10	1.4 E-09	5.6 E-09
Co-60	1.2 E-06	7.2 E-06	3.3 E-05	1.4 E-06	7.2 E-06	3.0 E-05	1.4 E-06	7.2 E-06	3.0 E-05
Nb-95	2.6 E-09	1.8 E-08	9.1 E-08	2.8 E-09	1.6 E-08	9.2 E-08	2.8 E-09	1.6 E-08	9.2 E-08
Sr-95	3.0 E-08	1.7 E-07	9.0 E-07	3.3 E-08	1.8 E-07	8.0 E-07	3.3 E-08	1.8 E-07	8.0 E-07
Ce-144	7.4 E-09	4.3 E-08	2.1 E-07	8.5 E-09	4.4 E-08	1.7 E-07	8.5 E-09	4.4 E-08	1.7 E-07
Total	4.1 E-06	2.4 E-05	1.1 E-04	4.6 E-06	2.5 E-05	9.6 E-05	4.6 E-06	2.5 E-05	9.6 E-05
Summed Risk									
Cs-137	8.2 E-06	6.2 E-05	4.7 E-04	5.0 E-06	3.6 E-05	2.4 E-04	3.6 E-06	2.2 E-05	1.1 E-04
Ru-106	1.5 E-06	7.4 E-06	3.9 E-05	1.5 E-06	7.3 E-06	3.6 E-05	1.5 E-06	7.2 E-06	3.5 E-05
Sr-90	1.0 E-06	6.9 E-06	5.0 E-05	8.9 E-07	4.8 E-06	3.2 E-05	7.8 E-07	3.9 E-06	2.3 E-05
Co-60	1.3 E-06	7.3 E-06	3.5 E-05	1.4 E-06	7.2 E-06	3.1 E-05	1.4 E-06	7.2 E-06	3.0 E-05
Nb-95	2.6 E-09	1.8 E-08	9.1 E-08	2.8 E-09	1.6 E-08	9.2 E-08	2.8 E-09	1.6 E-08	9.2 E-08
Sr-95	3.0 E-08	1.7 E-07	9.0 E-07	3.3 E-08	1.8 E-07	8.0 E-07	3.3 E-08	1.8 E-07	8.0 E-07
Ce-144	7.4 E-09	4.3 E-08	2.1 E-07	8.5 E-09	4.4 E-08	1.7 E-07	8.5 E-09	4.4 E-08	1.7 E-07
Total Summed Risk	1.2 E-05	8.4 E-05	5.9 E-04	8.8 E-06	5.5 E-05	3.4 E-04	7.2 E-06	4.0 E-05	1.9 E-04

Table 13D.4 Risks summed over various pathways for males exposed during the entire study period (48 years) at CRM 20.5.

	Male - Category I			Male - Category II			Male - Category III		
	95% subjective confidence interval			95% subjective confidence interval			95% subjective confidence interval		
	2.50%	50.00%	97.50%	2.50%	50.00%	97.50%	2.50%	50.00%	97.50%
Fish									
Cs-137	1.8 E-05	2.6 E-04	3.3 E-03	9.2 E-06	1.0 E-04	1.5 E-03	1.5 E-06	2.5 E-05	3.6 E-04
Ru-106	1.0 E-07	1.6 E-06	2.7 E-05	3.1 E-08	6.9 E-07	1.3 E-05	9.0 E-09	1.7 E-07	3.5 E-06
Sr-90	1.4 E-06	1.6 E-05	2.2 E-04	6.3 E-07	6.6 E-06	1.0 E-04	1.3 E-07	1.7 E-06	2.7 E-05
Co-60	1.8 E-08	4.7 E-07	1.3 E-05	6.4 E-09	2.0 E-07	5.9 E-06	1.5 E-09	4.7 E-08	1.2 E-06
Total	1.9 E-05	2.8 E-04	3.5 E-03	9.8 E-06	1.1 E-04	1.7 E-03	1.7 E-06	2.7 E-05	3.9 E-04
External									
Cs-137	2.3 E-06	7.1 E-06	2.1 E-05	2.3 E-06	7.1 E-06	2.1 E-05	2.3 E-06	7.1 E-06	2.1 E-05
Ru-106	2.3 E-08	8.4 E-08	2.7 E-07	2.3 E-08	8.4 E-08	2.7 E-07	2.3 E-08	8.4 E-08	2.7 E-07
Sr-90	7.7 E-11	2.4 E-10	6.9 E-10	7.7 E-11	2.4 E-10	6.9 E-10	7.7 E-11	2.4 E-10	6.9 E-10
Co-60	5.2 E-07	1.6 E-06	4.9 E-06	5.2 E-07	1.6 E-06	4.9 E-06	5.2 E-07	1.6 E-06	4.9 E-06
Nb-95	9.1 E-12	4.7 E-11	2.4 E-10	9.1 E-12	4.7 E-11	2.4 E-10	9.1 E-12	4.7 E-11	2.4 E-10
Sr-95	1.4 E-10	6.3 E-10	3.2 E-09	1.4 E-10	6.3 E-10	3.2 E-09	1.4 E-10	6.3 E-10	3.2 E-09
Ce-144	2.7 E-10	1.2 E-09	4.9 E-09	2.7 E-10	1.2 E-09	4.9 E-09	2.7 E-10	1.2 E-09	4.9 E-09
Total	2.8 E-06	9.0 E-06	2.6 E-05	2.8 E-06	9.0 E-06	2.6 E-05	2.8 E-06	9.0 E-06	2.6 E-05
Summed Risk									
Cs-137	2.0 E-05	2.6 E-04	3.3 E-03	1.1 E-05	1.1 E-04	1.6 E-03	3.8 E-06	3.2 E-05	3.8 E-04
Ru-106	1.3 E-07	1.7 E-06	2.7 E-05	5.4 E-08	7.7 E-07	1.3 E-05	3.2 E-08	2.5 E-07	3.8 E-06
Sr-90	1.4 E-06	1.6 E-05	2.2 E-04	6.3 E-07	6.6 E-06	1.0 E-04	1.3 E-07	1.7 E-06	2.7 E-05
Co-60	5.3 E-07	2.1 E-06	1.8 E-05	5.2 E-07	1.8 E-06	1.1 E-05	5.2 E-07	1.7 E-06	6.1 E-06
Nb-95	9.1 E-12	4.7 E-11	2.4 E-10	9.1 E-12	4.7 E-11	2.4 E-10	9.1 E-12	4.7 E-11	2.4 E-10
Sr-95	1.4 E-10	6.3 E-10	3.2 E-09	1.4 E-10	6.3 E-10	3.2 E-09	1.4 E-10	6.3 E-10	3.2 E-09
Ce-144	2.7 E-10	1.2 E-09	4.9 E-09	2.7 E-10	1.2 E-09	4.9 E-09	2.7 E-10	1.2 E-09	4.9 E-09
Total Summed Risk	2.2 E-05	2.8 E-04	3.6 E-03	1.3 E-05	1.2 E-04	1.7 E-03	4.5 E-06	3.6 E-05	4.1 E-04

Table 13D.5 Risks summed for fish consumption at CRM 20.5 and drinking water consumption and external exposure at CRM 14 for males exposed during the entire study period (48 years).

	Male - Category I			Male - Category II			Male - Category III		
	95% subjective confidence interval			95% subjective confidence interval			95% subjective confidence interval		
	2.50%	50.00%	97.50%	2.50%	50.00%	97.50%	2.50%	50.00%	97.50%
Drinking Water									
Cs-137	3.2 E-08	1.9 E-07	1.1 E-06	3.2 E-08	1.9 E-07	1.1 E-06	3.2 E-08	1.9 E-07	1.1 E-06
Ru-106	1.4 E-06	6.8 E-06	3.1 E-05	1.4 E-06	6.8 E-06	3.1 E-05	1.4 E-06	6.8 E-06	3.1 E-05
Sr-90	6.2 E-07	3.7 E-06	2.2 E-05	6.2 E-07	3.7 E-06	2.2 E-05	6.2 E-07	3.7 E-06	2.2 E-05
Total	2.0 E-06	1.1 E-05	5.5 E-05	2.0 E-06	1.1 E-05	5.5 E-05	2.0 E-06	1.1 E-05	5.5 E-05
Fish									
Cs-137	2.4 E-05	2.4 E-04	3.3 E-03	8.2 E-06	1.0 E-04	1.6 E-03	1.8 E-06	2.3 E-05	3.3 E-04
Ru-106	1.2 E-07	1.8 E-06	2.6 E-05	4.2 E-08	7.1 E-07	9.0 E-06	7.7 E-09	1.6 E-07	2.7 E-06
Sr-90	1.6 E-06	1.6 E-05	2.5 E-04	5.2 E-07	6.6 E-06	1.2 E-04	1.2 E-07	1.4 E-06	3.1 E-05
Co-60	2.6 E-08	4.7 E-07	8.8 E-06	8.7 E-09	2.0 E-07	4.4 E-06	2.1 E-09	4.3 E-08	1.0 E-06
Total	2.6 E-05	2.6 E-04	3.6 E-03	8.7 E-06	1.1 E-04	1.8 E-03	1.9 E-06	2.5 E-05	3.7 E-04
External									
Cs-137	3.4 E-06	1.6 E-05	8.1 E-05	3.4 E-06	1.6 E-05	8.1 E-05	3.4 E-06	1.6 E-05	8.1 E-05
Ru-106	5.3 E-08	2.5 E-07	1.3 E-06	5.3 E-08	2.5 E-07	1.3 E-06	5.3 E-08	2.5 E-07	1.3 E-06
Sr-90	2.8 E-10	1.4 E-09	6.6 E-09	2.8 E-10	1.4 E-09	6.6 E-09	2.8 E-10	1.4 E-09	6.6 E-09
Co-60	1.5 E-06	7.1 E-06	3.5 E-05	1.5 E-06	7.1 E-06	3.5 E-05	1.5 E-06	7.1 E-06	3.5 E-05
Nb-95	3.1 E-09	1.6 E-08	1.0 E-07	3.1 E-09	1.6 E-08	1.0 E-07	3.1 E-09	1.6 E-08	1.0 E-07
Sr-95	3.5 E-08	1.8 E-07	9.0 E-07	3.5 E-08	1.8 E-07	9.0 E-07	3.5 E-08	1.8 E-07	9.0 E-07
Ce-144	8.5 E-09	4.1 E-08	2.1 E-07	8.5 E-09	4.1 E-08	2.1 E-07	8.5 E-09	4.1 E-08	2.1 E-07
Total	5.1 E-06	2.4 E-05	1.2 E-04	5.1 E-06	2.4 E-05	1.2 E-04	5.1 E-06	2.4 E-05	1.2 E-04
Summed Risk									
Cs-137	2.7 E-05	2.6 E-04	3.4 E-03	1.2 E-05	1.2 E-04	1.7 E-03	5.3 E-06	4.0 E-05	4.2 E-04
Ru-106	1.6 E-06	8.8 E-06	5.8 E-05	1.5 E-06	7.7 E-06	4.2 E-05	1.5 E-06	7.2 E-06	3.5 E-05
Sr-90	2.2 E-06	2.0 E-05	2.7 E-04	1.1 E-06	1.0 E-05	1.5 E-04	7.4 E-07	5.1 E-06	5.4 E-05
Co-60	1.5 E-06	7.6 E-06	4.4 E-05	1.5 E-06	7.3 E-06	4.0 E-05	1.5 E-06	7.1 E-06	3.6 E-05
Nb-95	3.1 E-09	1.6 E-08	1.0 E-07	3.1 E-09	1.6 E-08	1.0 E-07	3.1 E-09	1.6 E-08	1.0 E-07
Sr-95	3.5 E-08	1.8 E-07	9.0 E-07	3.5 E-08	1.8 E-07	9.0 E-07	3.5 E-08	1.8 E-07	9.0 E-07
Ce-144	8.5 E-09	4.1 E-08	2.1 E-07	8.5 E-09	4.1 E-08	2.1 E-07	8.5 E-09	4.1 E-08	2.1 E-07
Total Summed Risk	3.3 E-05	3.0 E-04	3.8 E-03	1.6 E-05	1.4 E-04	1.9 E-03	9.0 E-06	5.9 E-05	5.4 E-04

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APPENDIX 14A

COMPILATION OF DATA AVAILABLE FOR THE SPECIAL SCENARIOS

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Appendix 14A: Compilation of Data Available for the Special Scenarios

14A.1 Contaminated Fish From White Oak Lake

Table 14A.1 Concentration of ^{137}Cs measured in bluegill collected from White Oak Lake.

Number of Samples	^{137}Cs Concentration in Bq kg^{-1}	Date	Reference
115	713 ± 48 [a]	1969-1970	Auerbach et al., 1971
5	1410 ± 315 [b]	1966	Auerbach et al., 1966
186	1480 ± 563 [c]	1969	Kolehmainen & Nelson, 1969
20	1470 ± 563 [c]	1969	Kolehmainen & Nelson, 1969
6	2000 ± 0.7 [c]	1987	Loar et al., 1994a
4	2780 ± 778 [c]	1988	Loar et al., 1994b
10	333 ± 78 [c]	1987	Loar et al., 1992b
9	3000 ± 1190 [c] (range 2110-6000)	1986	Loar et al., 1992b
4	341 ± 26	1992	Loar et al., 1992b
4	744 ± 1150 [c]	1994	Peterson et al., 1994

a = two standard errors
b = one standard error
c = standard deviation

Table 14.2 Concentrations of ^{137}Cs, ^{60}Co, and ^{90}Sr measured in largemouth bass collected from White Oak Lake.

Number of Samples	^{137}Cs Concentration in Bq kg^{-1}	^{60}Co Concentration in Bq kg^{-1}	^{90}Sr Concentration in Bq kg^{-1}	Date	Reference
5	1300 ± 296	230 ± 22	1330 ± 281	1966	Auerbach et al., 1966
6	1960 ± 485			1969	Kolehmainen & Nelson, 1969
13	3020 ± 1450			1985	Blaylock, personal communication
10	963 ± 852	22 ± 15	230 ± 119	1987	Loar et al., 1992b
6	485 ±41		159	1991	Ashwood et al., 1993
8	452 ± 32			1992	Ashwood et al., 1993

14A.2 Contaminated Deer on the Oak Ridge Reservation

The first road-killed white-tail deer (*Odocoileus virginianus*) was recorded by the Environmental Sciences Division in 1969 (Story and Kitchings, 1979). Flynn (1976) estimated that the deer population in the study area in 1974 - 1975 was one deer per 50 hectares (1 hectare = 124 acres), with a total deer herd of not more than 250 animals at the end of 1975.

Because almost no natural deer predators existed in the region, the deer population started to increase rapidly, and removal attempts by the Tennessee Wildlife Resources Agency (TWRA) were unsuccessful. From October 1969 through December 1977, 126 deer were killed or reported hit by vehicles on reservation roads. By 1985, the number of deer-vehicle collisions per year had reached 271. In an effort to reduce the growing number of deer-vehicle collisions, controlled public deer hunting on portions of the Oak Ridge Reservation was initiated in 1985 (Martin Marietta Energy Systems, 1986). Each deer taken during the controlled hunts is evaluated for radioactivity at a check-in station using a whole-body scanner. The data considered in the present analysis come from a compilation of samples from deer taken during hunts (Tables 12A.3 and 12A.4; Scolfield, 1996). If levels of ^{90}Sr measured more than 740 Bq kg^{-1} or if concentrations of ^{137}Cs measured more than 185 Bq kg^{-1}, the deer was confiscated, and the hunter was given another deer permit. From 1985 until 1995, a total of 5885 deer carcasses from the Oak Ridge Reservation were scanned for radioactivity. Of the total deer killed, 147 deer (2.5%) were confiscated due to a high concentration of either ^{90}Sr or ^{137}Cs. In addition to tissue sampling of confiscated deer, samples of muscle, liver, and bone were taken randomly from non-confiscated deer, and all samples were further analyzed in the laboratory.

Table 14A.3: Concentrations of ^{137}Cs in Deer from the Oak Ridge Reservation, 1990-1994

DRAFT

Cs-137 Field and Laboratory Results - 1994

**Data correction as per N. Teasl

Deer No.	Cs-137 Field		Cs-137 Lab. Results			
	Tissue Conc. (pCi/g)	(Bq/g)	Muscle Conc. (Bq/g)	Std Error (+/-)	Liver Conc. (Bq/g)	Std Error (+/-)
7	0.06	2.22E-03	3.10E-02	2.00E-03	5.60E-03	1.40E-03
8	1.21	4.48E-02			1.10E-02	2.00E-03
9	0.05	1.85E-03			5.10E-03	1.60E-03
35	0.13	4.81E-03			7.50E-03	1.80E-03
77	-0.16	-5.93E-03			1.80E-03	1.20E-03
92	0.45	1.67E-02	5.20E-03	1.80E-03	6.00E-03	0.00E+00
100	0.55	2.04E-02	8.00E-03	0.00E+00		
102	0.75	2.78E-02			1.40E-02	2.00E-03
110	1.53	5.67E-02	3.30E-02	3.00E-03		
117	-0.22	-8.15E-03			2.80E-03	1.50E-03
120	-0.24	-8.89E-03			3.40E-03	1.20E-03
139	-0.01	-3.70E-04			3.90E-03	1.90E-03
143	0.14	5.19E-03			3.30E-03	1.60E-03
145	0.07	2.59E-03	6.30E-03	1.60E-03	1.70E-03	1.50E-03
147	-0.04	-1.48E-03	8.00E-04	0.00E+00	1.30E-03	1.50E-03
157	0.4	1.48E-02	7.20E-01	5.80E-01	3.70E-02	4.00E-03
174	0.14	5.19E-03	1.50E-01	2.00E-02	4.40E-02	6.00E-03
175	0.16	5.93E-03	1.00E-02	1.00E-02	3.30E-02	6.00E-03
181	0.21	7.78E-03	1.10E-01	1.00E-02	3.50E-02	6.00E-03
220	0.04	1.48E-03	9.90E-02	1.42E-02	3.00E-02	5.00E-03
231*	0.17	6.30E-03	4.40E-03	2.60E-03	3.60E-03	1.90E-03
247	0.34	1.26E-02			4.60E-02	6.00E-03
248*	0.41	1.52E-02	2.80E-02	3.00E-03	4.90E-03	1.60E-03
253	0.01	3.70E-04				
283*	17.3	6.41E-01	9.80E-01	2.00E-02		
289*	0.04	1.48E-03	3.00E-04	2.90E-03	8.00E-03	1.52E-02
291*	0.52	1.93E-02	7.00E-03	1.90E-03	8.00E-03	0.00E+00
308	0.33	1.22E-02			3.40E-02	3.00E-03
319	1.98	7.33E-02			3.70E-02	6.00E-03
341	1.14	4.22E-02			3.60E-02	8.50E-02
347	1.72	6.37E-02			3.30E-02	5.00E-03
353	0.54	2.00E-02			4.00E-02	5.20E-03
388	0.11	4.07E-03	4.30E-02	6.00E-03		
405	0.89	3.30E-02	6.00E-02	6.00E-03	3.00E-02	5.00E-03
406	0.85	3.15E-02	1.00E-01	1.50E-01	2.80E-02	4.40E-02
409* **	740	2.74E+01	4.30E+01	1.00E+00	3.20E+01	2.00E-03
412	0.23	8.52E-03			2.00E-02	0.00E+00
418	0.62	2.30E-02	3.30E-03	1.70E-03		
429*	0.38	1.41E-02	2.70E-03	2.50E-03	4.20E-03	3.90E-03
435	0.49	1.81E-02			9.00E-03	0.00E+00
441*	0.31	1.15E-02	3.60E-03	2.80E-03		
451	0.04	1.48E-03			1.40E-03	1.60E-03
479	0.28	1.04E-02	4.80E-03	3.00E-03		
491	0.04	1.48E-03	1.80E-03	3.30E-03		
				Bkg1 (Liver)	3.70E-02	5.00E-03
				Bkg2 (Liver)	4.30E-02	4.00E-03

* Denotes the animal has been retained.

Conversion Factors: 1Bq = 27 pCi; 1 Ci = 3.70E+10 Bq.

Table 14A.3: Concentrations of ^{137}Cs in Deer from the Oak Ridge Reservation, 1990-1994

Cs-137 Field and Laboratory Results - 1993 DRAFT

Deer No.	Cs-137 Field		Cs-137 Lab. Results			
	Tissue Conc. (pCi/g)	(Bq/g)	Muscle Conc. (Bq/g)	Std Error (+/-)	Liver Conc. (Bq/g)	Error (+/-)
2	0.36	1.33E-02			2.70E-03	1.80E-03
6	0.21	7.78E-03				
13	0.31	1.15E-02			4.90E-03	2.50E-03
21*	0.43	1.59E-02				
33	0.35	1.30E-02			3.10E-03	2.50E-03
73	1.00	3.70E-02				
75*	1.00	3.70E-02	6.40E-03	4.90E-03	-1.20E-03	6.80E-03
81	0.72	2.67E-02			9.70E-03	4.50E-03
99	0.21	7.78E-03			5.00E-03	2.90E-03
102	0.16	5.93E-03			7.60E-03	4.60E-03
122	0.08	2.96E-03			1.00E-04	2.60E-03
123*	0.36	1.33E-02	1.10E-02	3.00E-03	3.90E-03	3.50E-03
163	0.00	0.00E+00			1.90E-03	4.10E-03
200	-0.28	-1.04E-02			-4.00E-04	3.50E-03
215	0.30	1.11E-02			9.00E-04	2.70E-03
227	0.27	1.00E-02			2.80E-03	5.30E-03
261*	-0.10	-3.70E-03	6.10E-03	2.80E-03	-4.00E-04	2.40E-03
268	-0.02	-7.41E-04			-8.00E-04	3.50E-03
273	0.26	9.63E-03			4.20E-03	5.10E-03
278*	-0.01	-3.70E-04	6.20E-03	2.80E-03	2.60E-03	1.50E-03
300	0.13	4.81E-03			2.50E-03	2.40E-03
315	0.16	5.93E-03			4.00E-03	5.90E-03
317*	0.07	2.59E-03	2.50E-03	3.20E-03	5.00E-04	2.60E-03
333	0.39	1.44E-02			2.60E-03	2.00E-03
340*	0.17	6.30E-03	2.40E-03	3.20E-03	-2.00E-04	2.60E-03
344	0.14	5.19E-03				
385	0.27	1.00E-02			1.40E-03	2.60E-03

* Denotes the animal has been retained.

Conversion Factors: 1Bq = 27 pCi; 1 Ci = 3.70E+10 Bq.

Laboratory Results were converted from Bq/Kg to Bq/g.

No Background Readings

Standard error value is greater than anal

Table 14A.3: Concentrations of ^{137}Cs in Deer from the Oak Ridge Reservation, 1990-1994

Cs-137 Field and Laboratory Results - 1992 DRAFT

Deer No.	Cs-137 Field		Cs-137 Lab. Results			
	Tissue Conc. (pCi/g)	(Bq/g)	Muscle Conc. (pCi/g)	Std Error (+/-)	Liver Conc. (pCi/g)	Error (+/-)
49C	0.22	8.15E-03	No Data		No Data	
58C	0.17	6.30E-03	No Data		No Data	
64C	0.57	2.11E-02	No Data		No Data	
68C	0.19	7.04E-03	No Data		No Data	
127C	0.40	1.48E-02	No Data		No Data	
134C	0.35	1.30E-02	No Data		No Data	
158	0.11	4.07E-03	No Data		No Data	
166	0.46	1.70E-02	No Data		No Data	
177	-0.14	-5.19E-03	No Data		No Data	
198C	0.34	1.26E-02	No Data		No Data	
229	0.12	4.44E-03	No Data		No Data	
230C	0.21	7.78E-03	No Data		No Data	
245C	0.24	8.89E-03	No Data		No Data	
246C	0.03	1.11E-03	No Data		No Data	
270	0.24	8.89E-03	No Data		No Data	
277C	0.43	1.59E-02	No Data		No Data	
281C	0.25	9.26E-03	No Data		No Data	
288	0.22	8.15E-03	No Data		No Data	
294	0.44	1.63E-02	No Data		No Data	
297	0.04	1.48E-03	No Data		No Data	
311	0.18	6.67E-03	No Data		No Data	
361	0.26	9.63E-03	No Data		No Data	
362	0.32	1.19E-02	No Data		No Data	
368	0.42	1.56E-02	No Data		No Data	
370	-0.21	-7.78E-03	No Data		No Data	

"C" Denotes the animal has been retained.
Conversion Factors: 1Bq = 27 pCi; 1 Ci = 3.70E+10 Bq.

Table 14A.3: Concentrations of ^{137}Cs in Deer from the Oak Ridge Reservation, 1990-1994

Cs-137 Field and Laboratory Results - 1991 DRAFT

Deer No.	Cs-137 Tissue (pCi/g)	Field Conc. (Bq/g)	Cs-137 Lab. Results			
			Muscle Conc. (pCi/g)	Std Error (+/-)	Liver Conc. (pCi/g)	Error (+/-)
1	-0.05	-1.85E-03			-7.00E+00	1.50E+02
7	0.03	1.11E-03			3.90E+00	3.60E+00
8C	0.19	7.04E-03	7.70E+00	4.50E+00	4.50E+00	6.00E+00
10	0.06	2.22E-03			7.10E+00	9.00E+00
13	0.12	4.44E-03			9.50E+00	9.90E+00
18	0.03	1.11E-03			3.00E-01	7.90E+00
35	0.42	1.56E-02			3.90E+00	4.50E+00
53	0	0.00E+00	5.00E+00	1.60E+01		
59	0.30	1.11E-02	5.00E-01	9.50E+00		
63C	0.93	3.44E-02	2.70E+00	3.10E+00	-2.00E+00	1.60E+01
64	-0.22	-8.15E-03			-1.00E+00	1.70E+01
88	-0.10	-3.70E-03			-1.00E+00	1.00E+01
103	0.36	1.33E-02			-4.00E+00	1.50E+01
134	0.02	7.41E-04			4.20E+00	6.00E+00
136	-0.07	-2.59E-03			1.80E+00	7.80E+00
140	0.11	4.07E-03	4.10E+00	5.80E+00		

"C" Denotes the animal has been retained.
Conversion Factors: 1Bq = 27 pCi; 1 Ci = 3.70E+10 Bq.
Standard error value is greater than analyte reading.

Table 14A.3: Concentrations of ^{137}Cs in Deer from the Oak Ridge Reservation, 1990-1994

Cs-137 Field and Laboratory Results - 1990 DRAFT

Deer No.	Cs-137 Field		Cs-137 Lab. Results			
	Tissue Conc. (pCi/g)	(Bq/g)	Muscle Conc. (pCi/g)	Std Error (+/-)	Liver Conc. (pCi/g)	Error (+/-)
10	-0.07	-2.59E-03	No Data		No Data	
15	0.03	1.11E-03	No Data		No Data	
17	0.21	7.78E-03	No Data		No Data	
20	0.27	1.00E-02	No Data		No Data	
30	0.06	2.22E-03	No Data		No Data	
31	0.24	8.89E-03	No Data		No Data	
32	0.03	1.11E-03	No Data		No Data	
40	-0.27	-1.00E-02	No Data		No Data	
50	-0.01	-3.70E-04	No Data		No Data	
59	0.40	1.48E-02	No Data		No Data	
60	0.24	8.89E-03	No Data		No Data	
65	-0.07	-2.59E-03	No Data		No Data	
70	0.23	8.52E-03	No Data		No Data	
80	0.40	1.48E-02	No Data		No Data	
90	0.45	1.67E-02	No Data		No Data	
95	0.28	1.04E-02	No Data		No Data	
100	0.30	1.11E-02	No Data		No Data	
101	0.21	7.78E-03	No Data		No Data	
103	-0.09	-3.33E-03	No Data		No Data	
109	0.10	3.70E-03	No Data		No Data	
110	0.33	1.22E-02	No Data		No Data	
120	0.76	2.81E-02	No Data		No Data	
123	0.32	1.19E-02	No Data		No Data	
130	0.40	1.48E-02	No Data		No Data	
132	0.29	1.07E-02	No Data		No Data	
134	0.30	1.11E-02	No Data		No Data	
140	0.13	4.81E-03	No Data		No Data	
141	0.1	3.70E-03	No Data		No Data	
143	0	0.00E+00	No Data		No Data	
144	0.08	2.96E-03	No Data		No Data	
163C	-0.29	-1.07E-02	5.94E-02	2.70E-02	-1.00E-02	1.30E-01
189C	-0.08	-2.96E-03	1.40E-01	4.32E-02	5.40E-02	3.24E-02
277C	-0.17	-6.30E-03	4.59E-01	5.40E-02	-9.99E-02	1.05E-01

"C" Denotes the animal has been retained.

Standard error value is greater than analyte reading.

Table 14A.4: Concentrations of ^{90}Sr in Deer from the Oak Ridge Reservation in 1993 and 1994

DRAFT

Deer Sr-90 Concentration Muscle to Bone Ratio - 1993

Deer No.	Sr-90 Laboratory Results			Muscle/Bone Ratio	Muscle Used Comment
	Muscle Conc (Bq/Kg)	Liver Conc (Bq/Kg)	Bone Conc (Bq/Kg)		(m/b or l/b)
2		2.90E+01	5.60E+02	5.18E-02	Liver**
6		3.50E+01	8.00E+01	4.38E-01	Liver**
13		2.90E+01	9.00E+01	3.22E-01	Liver**
21*	None Availabl	None Availabl	1.20E+03		None Available
33		3.10E+01	2.70E+02	1.15E-01	Liver
73	Missing Data	Missing Data	Missing Data		None Available
75*	4.70E+01	1.00E+01	1.20E+03	3.92E-02	Muscle**
81		-2.00E+00	3.00E+01	-6.67E-02	Liver**
99		-2.90E+01	-3.00E+01	9.67E-01	Liver**
102		-7.00E+00	3.60E+02	-1.94E-02	Liver**
122		-3.30E+01	9.00E+01	-3.67E-01	Liver**
123*	-1.00E+01	-1.60E+01	2.30E+03	-4.35E-03	Muscle**
163		-1.30E+01	-9.00E+01	1.44E-01	Liver**
200		1.10E+01	1.70E+01	6.47E-01	Liver**
215		4.00E+00	2.70E+02	1.48E-02	Liver**
227		1.80E+01	7.00E+01	2.57E-01	Liver**
261*	-5.00E+00	-1.80E+01	9.70E+02	-5.15E-03	Muscle**
268		-2.60E+01	-4.00E+01	6.50E-01	Liver**
273		-5.00E+00	3.50E+02	-1.43E-02	Liver**
278*	-6.00E+01	3.50E+01	1.40E+03	-4.29E-02	Muscle**
300		-3.20E+01	None Available		None Available
315		8.00E+00	4.00E+01	2.00E-01	Liver**
317*	3.00E+00	-4.50E+01	2.50E+03	1.20E-03	Muscle**
333		-2.00E+01	None Available		None Available
340*	8.30E+01	-2.00E+00	1.10E+03	7.55E-02	Muscle**
344	None Available	None Available	6.00E+02		None Available
385		-2.10E+01	1.00E+02	-2.10E-01	Liver**

*Confiscated **Data is < std error reading.

Table 14A.4: Concentrations of ^{90}Sr in Deer from the Oak Ridge Reservation in 1993 and 1994

DRAFT

Deer Sr-90 Concentration Muscle to Bone Ratio - 1994

Deer No.	Sr-90 Laboratory Results			Muscle/Bone Ratio	Muscle Used Comment
	Muscle Conc (Bq/g)	Liver Conc (Bq/g)	Bone Conc (Bq/g)		(m/b or l/b)
7	4.80E-02		1.30E-01	3.69E-01	
8		2.70E-02	9.90E-02	2.73E-01	Liver
9		3.50E-02	9.70E-02	3.61E-01	Liver
35		1.90E-02	1.50E-01	1.27E-01	Liver
77		3.10E-02	8.20E-02	3.78E-01	Liver
92	1.50E-02	1.50E-02	1.10E-01	1.36E-01	
100	2.70E-02		1.10E-01	2.45E-01	
102		4.90E-02	1.30E+00	3.77E-02	Liver
110	3.90E-02		8.20E-02	4.76E-01	
117		3.70E-02	3.80E-02	9.74E-01	Liver**
120		3.30E-02	3.20E-02	1.03E+00	Liver**
139		3.10E-02	-1.90E-02	-1.63E+00	Liver**
143		3.00E-02	2.30E-02	1.30E+00	Liver**
145	2.80E-02	2.70E-02	1.20E-01	2.33E-01	
147	1.70E-02	2.20E-02	1.20E-01	1.42E-01	
157	8.80E-01	2.90E-02	9.40E-02	9.36E+00	
174	8.10E-02	4.40E-02	1.10E-01	7.36E-01	
175	2.70E-02	2.80E-02	1.40E-01	1.93E-01	
181	6.10E-02	2.00E-02	1.20E-01	1.67E-01	Liver
220	8.30E-03	1.10E-02	1.00E-01	8.30E-02	
231*	3.90E-02	2.80E-02	1.20E+00	3.25E-02	
247		2.60E-02	1.90E-01	1.37E-01	Liver
248*	4.70E-02	2.30E-02	1.10E+01	4.27E-03	
253	None Available	None Available	1.80E-01		None Available
283*	5.20E-02		1.50E+01	3.47E-03	
289*	5.50E-02	1.70E-02	2.50E+00	2.20E-02	
291*	5.70E-02	5.40E-02	5.30E+00	1.08E-02	

Continued on next page

Table 14A.4: Concentrations of ^{90}Sr in Deer from the Oak Ridge Reservation in 1993 and 1994

Deer No.	Sr-90 Laboratory Results			Muscle/Bone Ratio	Muscle Used Comment
	Muscle Conc (Bq/g)	Liver Conc (Bq/g)	Bone Conc (Bq/g)		(m/b or l/b)
308		3.90E-02	1.90E-01	2.05E-01	Liver
319		2.80E-02	1.80E-01	1.56E-01	Liver**
341		1.30E-02	1.70E-01	7.65E-02	Liver**
347		4.70E-02	9.80E-02	4.80E-01	Liver
353	None Available	2.20E-02			None Available
388	3.20E-02		7.60E-02	4.21E-01	
405	4.30E-02	2.40E-02	5.10E-02	8.43E-01	
406	1.30E-02	2.40E-02	1.50E-01	8.67E-02	Muscle**
409*	3.80E-01	1.10E-01	2.20E+01	1.73E-02	
412		3.50E-02	7.50E-02	4.67E-01	Liver**
418	8.40E-02		1.70E-01	4.94E-01	
429*	5.10E-02	1.80E-02	1.70E+00	3.00E-02	
435		2.20E-02	6.30E-02	3.49E-01	Liver**
441*	3.90E-02		2.30E+00	1.70E-02	Muscle**
451		4.10E-02	2.10E-01	1.95E-01	Liver
479	1.90E-02		1.60E-01	1.19E-01	Muscle**
491	5.90E-02		3.80E-01	1.55E-01	
Average	Bq/g 8.81E-02	Bg/kg 8.81E+01			

*Confiscated Deer

**Data is < std error reading.

13A.3 Contaminated Waterfowl On White Oak Lake and the Oak Ridge Reservation

Populations of waterfowl found on White Oak Lake can vary from fewer than 10 to over 500 depending on the season. Most are transient, spending only a few weeks on the lake during seasonal migration. However, some northern migrant waterfowl take up residence during the winter months and use the lake as a source of food. These birds usually have the highest body burden of radionuclides (Krumholz, 1954). Krumholz found that the radioactivity of the muscle tissue of 19 waterfowl that fed primarily on White Oak Lake was approximately 35 times greater than radioactivity found in 30 migrant waterfowl that used the lake only as a temporary sanctuary. Several sets of data were found to help evaluate radionuclide concentrations in waterfowl that used water areas on the Oak Ridge Reservation for a food source. More than one study was done on each of three species: mallards (*Anas platyrhynehos*), Canada geese (*Branta canadensis*) and American coots (*Fulica americana*).

One of the reasons cited for the draining of White Oak Lake in 1955 was to eliminate the use of the lake by waterfowl (Lee and Auerbach, 1959). In 1989, a field experiment was conducted to determine the accumulation of radionuclides in ducks that feed primarily at White Oak Lake (Waters, 1990). A group of wing-pinioned domestic mallard ducks was released on White Oak Lake in May 1989, and another group was released in October 1989. In the group of mallards released in May, the concentration of ^{137}Cs increased from undetectable at the beginning of the experiment to 352 Bq kg^{-1} in the breast tissue after 77 days. In the group of mallards released to White Oak Lake in October, the highest observed concentration of ^{137}Cs in the breast tissue was 278 Bq kg^{-1} after 61 days.

In the early years of the Oak Ridge Reservation, the Canada goose population was minimal. However, since 1989, the Canada goose has become established as a resident population in Oak Ridge and East Tennessee. The population has increased rapidly to the point that the geese are considered a nuisance. Geese are grazers, feeding mostly on terrestrial vegetation. Most of the resident geese use small lakes or pond areas as secure places to spend the night. Over a hundred geese have been observed spending the night on White Oak Lake and then flying off during the day to feeding areas. Because they feed elsewhere, these geese do not accumulate high concentrations of radionuclides from White Oak Lake. In areas such as White Oak Lake only one or two pairs of geese nest at a time because of the limited terrestrial feeding area near the lake, but these geese are more likely to accumulate high concentrations of radionuclides.

Table 14A.5 Concentrations of ^{137}Cs and ^{60}Co in mallard ducks from White Oak Lake.

Sample Size	Tissue Sampled	^{137}Cs concentration in Bq kg^{-1}	^{60}Co concentration in Bq kg^{-1}	Year	Reference
7	breast	140 ± 29		1987	Loar et al., 1992b
	Liver	59 ±27	9 (1 duck)		Loar et al., 1991
2	Breast	244 ± 14		1988-1989	Loar et al., 1991
1	Breast	167	63	1989-1990	Loar et al., 1991
1	Liver	170	3.7		
1[1]	Breast	356		1988	Loar et al., 1991
1[2]	Breast	278		1988	Loar et al., 1991

[1] 77 day experiment.
[2] 61 day experiment.

Table 14A.6 Concentrations of ^{137}Cs and ^{60}Co in American coots from White Oak Lake.

Sample Size	Tissue Sampled	^{137}Cs concentration in Bq kg^{-1}	^{60}Co concentration in Bq kg^{-1}	Year	Reference
3	breast	626 ± 107		1987	Loar et al., 1994a
	liver	333			
1	breast	252	3.7		Loar et al., 1992a

Table 14A.7 Concentrations of ^{137}Cs and ^{60}Co in Canada geese from the Oak Ridge Reservation.

Sample Size	Tissue Sampled	^{137}Cs concentration in Bq kg^{-1}	^{60}Co concentration in Bq kg^{-1}	Location	Reference
5	breast	1189		WOL	Waters, 1990
	liver	630			
2	breast	150,000		WOL	Loar et al., 1994b
	liver	15,000			
	breast	110,000			
	liver	24,000			
6	breast	100		Sewage Pond	Waters, 1990
2	breast	none detected		WOL	Waters, 1990
5	breast	1190±667		WOL	Loar et al., 1994a
6	liver	630±170			
M	breast	14 ± 3	149 ± 3	WOL	Loar et al., 1991
	liver	13 ± 3	2718 ± 85	HFIR Pond	
F	breasts	13 ± 3	45 ± 4	HFIR Pond	
J	leg	27 ± 7	319 ± 16	HFIR Pond	
	liver	4940 ± 83		HFIR Pond	
J	leg	26 ± 11	481 ± 22	HFIR Pond	
	liver	5060 ± 65		HFIR Pond	
J	leg	319± 12		HFIR Pond	
J	leg	46 ± 6	15.3 ± 0.17	HFIR Pond	
	liver	4150± 93		HFIR Pond	
1	breast	122		WOL	Loar et al., 1991
	liver	74			
3	breast	15		WOL	Loar et al., 1992a
2	breast	160		WOL	Ashwood et al., 1993
	liver	89			
10	breast	11 ± 0.4		WOL	Ashwood et al., 1994

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