Index

Run Date	Scenario	Description	Pages	File Name	Result (mrem)	
					Deterministic	Probabilistic
6/22/09	Country Club Worker	Response to RAI # 7. RESRAD file 02100903. Correction run made with 6 in. elevated zone top layer thickness (instead of 3 in).	Part I: 1-9 Part VI: 1-3, 5, 18, 23. 15 pp.	06220901	9.41E-02	8.12 ± 5.0 E-02
6/22/09	Country Club Worker	Re-evaluation of exposure to local elevated activity source. Occupancy fraction should not be the same as for exposure to the entire 600 m^2 surface source. This case is re-run using the assumption that occupancy corresponds to 10% of the 450 h/y occupancy. The OF is set = 0.0051. Surface source layer case run.	Part I: 1-9 Part VI: 1-3, 5, 18, 23. 15 pp.	06220902	9.41E-03	8.12 ± 5.0 E-03
6/22/09	Country Club Worker	Same problem as above with 1st subsurface layer, 12 in thick with 6 in. cover.	Part I: 1-9 Part VI: 1-3, 5, 18, 23. 15 pp.	06220903	1.825 E-03	2.53 ± 3.14 E-03
6/22/09	Country Club Worker	Same problem as above with 2nd subsurface layer, 12 in thick with 18 in. cover.	Part I: 1-9 Part VI: 1-3, 5, 18, 23. 15 pp.	06220904	2.35 E-05	6.97 ± 24.8 E-04

Notes

1. All dose results are in units of mrem/y per pCi/g.
2. The outdoor time fraction for the local elevated area source dose calculations is adjusted to account for the small size relative to the principal contaminated zone area.
3. Adjustments to parameter values for direct inhalation and ingestion pathways were not made to account for the reduced source area and were not turned off for subsurface layer sources – because the dose contributions from these pathways are negligible.

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary ... 2
Site-Specific Parameter Summary 3
Summary of Pathway Selections 7
Contaminated Zone and Total Dose Summary 8
Total Dose Components
Time = 0.000E+00 9
Time = 1.000E+00 10
Time = 3.000E+00 11
Time = 1.000E+03 12
Dose/Source Ratios Summed Over All Pathways 13
Single Radionuclide Soil Guidelines 13
Dose Per Nuclide Summed Over All Pathways 14
Soil Concentration Per Nuclide 14

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ba-137m (Source: FGR 12)	3.606E+00	3.606E+00	DCF1(1)
A-1	Cs-137 (Source: FGR 12)	7.510E-04	7.510E-04	DCF1(2)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(1)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(1)
D-34	Food transfer factors:			
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(1,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(1,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(1,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(1,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)

#For DCF1(xxx) only, factors are for infinite depth & area. See ETFG table in Ground Pathway of Detailed Report.
*Base Case means Default.Lib w/o Associate Nuclide contributions.

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	2.827E+01	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	1.520E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+03	1.000E+01	---	T(4)
R011	Times for calculations (yr)	not used	3.000E+01	---	T(5)
R011	Times for calculations (yr)	not used	1.000E+02	---	T(6)
R011	Times for calculations (yr)	not used	3.000E+02	---	T(7)
R011	Times for calculations (yr)	not used	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Cs-137	1.000E+00	0.000E+00	---	S1(1)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(1)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.522E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.500E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	2.700E+02	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	7.120E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	8.600E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	1.040E+00	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	3.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	not used	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	not used	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	not used	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	not used	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	not used	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	not used	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	not used	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	not used	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	not used	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	not used	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	not used	1	---	NS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	not used	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	4.600E+03	4.600E+03	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	not used	4.600E+03	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	not used	4.600E+03	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.714E-04	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R017	Inhalation rate (m**3/yr)	1.400E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	1.000E+00	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	0.000E+00	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	5.100E-02	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	1.830E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	not used	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	1	---	---	KYMAX

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	suppressed
4 -- meat ingestion	suppressed
5 -- milk ingestion	suppressed
6 -- aquatic foods	suppressed
7 -- drinking water	suppressed
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	active

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	28.27 square meters	Cs-137	1.000E+00
Thickness:	0.15 meters		
Cover Depth:	0.00 meters		

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 2.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+03
TDOSE(t):	9.410E-02	9.171E-02	8.684E-02	0.000E+00
M(t):	3.764E-03	3.668E-03	3.474E-03	0.000E+00

Maximum TDOSE(t): 9.410E-02 mrem/yr at t = 0.000E+00 years

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	9.409E-02	1.0000	2.054E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.304E-06	0.0000
Total	9.409E-02	1.0000	2.054E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.304E-06	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.410E-02	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.410E-02	1.0000

*Sum of all water independent and dependent pathways.

Table of Contents

Part VI: Uncertainty Analysis

RESRAD Uncertainty Analysis Results

Probabilistic Input 2
Total Dose 3
Total Risk 4
Dose vs Pathway: Ground External 5
Dose vs Pathway: Inhalation (w/o Radon) 6
Dose vs Pathway: Radon (Water Ind.) 7
Dose vs Pathway: Plant (Water Ind.) 8
Dose vs Pathway: Meat (Water Ind.) 9
Dose vs Pathway: Milk (Water Ind.) 10
Dose vs Pathway: Soil Ingestion 11
Dose vs Pathway: Water Ingestion 12
Dose vs Pathway: Fish Ingestion 13
Dose vs Pathway: Radon (Water Dep.) 14
Dose vs Pathway: Plant (Water Dep.) 15
Dose vs Pathway: Meat (Water Dep.) 16
Dose vs Pathway: Milk (Water Dep.) 17
Cumulative Probability Summary..... 18
Summary of dose at graphical times, reptition 1..... 19
Summary of dose at graphical times, reptition 2..... 20
Summary of dose at graphical times, reptition 3..... 21
Peak of the mean dose at graphical times..... 22
Correlation and Regression coefficients (if any)..... 23

Probabilistic Input

Number of Sample Runs: 300

Number	Name	Distribution	Parameters			
1	FOTD	NORMAL	.051	.025		
2	AREA	TRIANGULAR	10	28.3	42.5	
3	THICK0	NORMAL	.152	.076		
4	DENSCZ	TRUNCATED NORMAL	1.52	.23	.001	.999

Probabilistic Total Dose Summary

Nuclide (j)	Peak Time	Peak Dose	t= 0.00E+00	DOSE(j,t), mrem/yr 1.00E+00	3.00E+00	1.00E+03
Cs-137						
Min	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Max	0.00E+00	2.57E-01	2.57E-01	2.51E-01	2.39E-01	0.00E+00
Avg	0.00E+00	8.12E-02	8.12E-02	7.90E-02	7.48E-02	0.00E+00
Std	0.00E+00	5.00E-02	5.00E-02	4.88E-02	4.66E-02	0.00E+00
∑ALL						
Min	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Max	0.00E+00	2.57E-01	2.57E-01	2.51E-01	2.39E-01	0.00E+00
Avg	0.00E+00	8.12E-02	8.12E-02	7.90E-02	7.48E-02	0.00E+00
Std	0.00E+00	5.00E-02	5.00E-02	4.88E-02	4.66E-02	0.00E+00

∑ALL is total dose summed for all nuclides.

Probabilistic results summary : Country Club Worker for TBD 08-006 unit Cs-137

Dose AssessmeFile: C:\RESRAD_FAMILY\RESRAD\USERFILES\PBRF_OFF-SITE\06220901.RAD

Probabilistic Dose vs Pathway(i): Ground External

Nuclide (j)	DOSE(i,j,t), mrem/yr t= 0.00E+00	1.00E+00	3.00E+00	1.00E+03
Cs-137				
Min	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Max	2.57E-01	2.51E-01	2.39E-01	0.00E+00
Avg	8.12E-02	7.90E-02	7.48E-02	0.00E+00
Std	5.00E-02	4.88E-02	4.66E-02	0.00E+00
∑ALL				
Min	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Max	2.57E-01	2.51E-01	2.39E-01	0.00E+00
Avg	8.12E-02	7.90E-02	7.48E-02	0.00E+00
Std	5.00E-02	4.88E-02	4.66E-02	0.00E+00

∑ALL is total pathway dose summed for all nuclides.

Probabilistic results summary : Country Club Worker for TBD 08-006 unit Cs-137

Dose AssessmeFile: C:\RESRAD_FAMILY\RESRAD\USERFILES\PBRF_OFF-SITE\06220901.RAD

Cumulative Probability Summary for: Total Dose Over Pathways

Cumulative Probability	Dose(t), mrem/yr t= 0.00E+00	1.00E+00	3.00E+00	1.00E+03
0.025	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.050	1.47E-03	7.19E-04	1.51E-04	0.00E+00
0.075	1.05E-02	9.85E-03	8.83E-03	0.00E+00
0.100	1.78E-02	1.64E-02	1.41E-02	0.00E+00
0.125	2.18E-02	2.11E-02	1.90E-02	0.00E+00
0.150	2.50E-02	2.44E-02	2.29E-02	0.00E+00
0.175	2.97E-02	2.81E-02	2.54E-02	0.00E+00
0.200	3.56E-02	3.44E-02	3.21E-02	0.00E+00
0.225	3.94E-02	3.83E-02	3.65E-02	0.00E+00
0.250	4.33E-02	4.16E-02	3.94E-02	0.00E+00
0.275	4.75E-02	4.64E-02	4.36E-02	0.00E+00
0.300	5.13E-02	4.98E-02	4.70E-02	0.00E+00
0.325	5.57E-02	5.38E-02	5.05E-02	0.00E+00
0.350	5.94E-02	5.77E-02	5.44E-02	0.00E+00
0.375	6.36E-02	6.19E-02	5.80E-02	0.00E+00
0.400	6.48E-02	6.32E-02	5.95E-02	0.00E+00
0.425	6.99E-02	6.79E-02	6.42E-02	0.00E+00
0.450	7.34E-02	7.11E-02	6.68E-02	0.00E+00
0.475	7.66E-02	7.47E-02	7.06E-02	0.00E+00
0.500	7.97E-02	7.75E-02	7.39E-02	0.00E+00
0.525	8.14E-02	7.95E-02	7.57E-02	0.00E+00
0.550	8.39E-02	8.14E-02	7.71E-02	0.00E+00
0.575	8.78E-02	8.57E-02	8.11E-02	0.00E+00
0.600	9.01E-02	8.74E-02	8.28E-02	0.00E+00
0.625	9.50E-02	9.27E-02	8.83E-02	0.00E+00
0.650	9.89E-02	9.65E-02	9.07E-02	0.00E+00
0.675	1.01E-01	9.86E-02	9.39E-02	0.00E+00
0.700	1.05E-01	1.02E-01	9.61E-02	0.00E+00
0.725	1.10E-01	1.07E-01	1.01E-01	0.00E+00
0.750	1.14E-01	1.11E-01	1.05E-01	0.00E+00
0.775	1.19E-01	1.16E-01	1.10E-01	0.00E+00
0.800	1.22E-01	1.19E-01	1.13E-01	0.00E+00
0.825	1.27E-01	1.23E-01	1.16E-01	0.00E+00
0.850	1.30E-01	1.27E-01	1.21E-01	0.00E+00
0.875	1.36E-01	1.33E-01	1.26E-01	0.00E+00
0.900	1.45E-01	1.41E-01	1.34E-01	0.00E+00
0.925	1.57E-01	1.53E-01	1.45E-01	0.00E+00
0.950	1.65E-01	1.61E-01	1.53E-01	0.00E+00
0.975	1.95E-01	1.90E-01	1.81E-01	0.00E+00
1.000	2.57E-01	2.51E-01	2.39E-01	0.00E+00

RESRAD Regression and Correlation output 06/22/09 10:53 Page: Coef 1

Title : Country Club Worker for TBD 08-006 unit Cs-137 Dose Assessment 6 in Local Area S

Input File : C:\RESRAD_FAMILY\RESRAD\USERFILES\PBRF_OFF-SITE\06220901.RAD

Coefficients for peak of mean dose time Dose

Coefficient =	PCC		SRC		PRCC		SRRC	
Repetition =	1		1		1		1	
Description of Probabilistic Variable	Sig	Coeff	Sig	Coeff	Sig	Coeff	Sig	Coeff
Outdoor time fraction	1	0.89	1	0.74	1	0.87	1	0.73
Area of contaminated zone	3	0.44	3	0.19	3	0.41	3	0.19
Thickness of contaminated zone	2	0.80	2	0.52	2	0.76	2	0.50
Density of contaminated zone	4	0.21	4	0.08	4	0.14	4	0.06
R-SQUARE		0.85		0.85		0.82		0.82

-Rank is set to zero if the dose is zero or the correlation matrix is singular.

-R-SQUARE varies between 0 and 1 and is called the coefficient of determination; it provides a measure of the variation in the dependent variable (Dose) explained by regression on the independent variables.

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary ... 2
Site-Specific Parameter Summary 3
Summary of Pathway Selections 7
Contaminated Zone and Total Dose Summary 8
Total Dose Components
Time = 0.000E+00 9
Time = 1.000E+00 10
Time = 3.000E+00 11
Time = 1.000E+03 12
Dose/Source Ratios Summed Over All Pathways 13
Single Radionuclide Soil Guidelines 13
Dose Per Nuclide Summed Over All Pathways 14
Soil Concentration Per Nuclide 14

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ba-137m (Source: FGR 12)	3.606E+00	3.606E+00	DCF1(1)
A-1	Cs-137 (Source: FGR 12)	7.510E-04	7.510E-04	DCF1(2)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(1)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(1)
D-34	Food transfer factors:			
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(1,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(1,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(1,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(1,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)

#For DCF1(xxx) only, factors are for infinite depth & area. See ETFG table in Ground Pathway of Detailed Report.
*Base Case means Default.Lib w/o Associate Nuclide contributions.

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	2.827E+01	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	1.520E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+03	1.000E+01	---	T(4)
R011	Times for calculations (yr)	not used	3.000E+01	---	T(5)
R011	Times for calculations (yr)	not used	1.000E+02	---	T(6)
R011	Times for calculations (yr)	not used	3.000E+02	---	T(7)
R011	Times for calculations (yr)	not used	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Cs-137	1.000E+00	0.000E+00	---	S1(1)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(1)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.522E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.500E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	2.700E+02	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	7.120E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	8.600E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	1.040E+00	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	3.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	not used	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	not used	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	not used	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	not used	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	not used	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	not used	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	not used	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	not used	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	not used	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	not used	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	not used	1	---	NS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	not used	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	4.600E+03	4.600E+03	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	not used	4.600E+03	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	not used	4.600E+03	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.714E-04	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R017	Inhalation rate (m**3/yr)	1.400E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	1.000E+00	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	0.000E+00	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	5.100E-03	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	1.830E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	not used	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	1	---	---	KYMAX

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	suppressed
4 -- meat ingestion	suppressed
5 -- milk ingestion	suppressed
6 -- aquatic foods	suppressed
7 -- drinking water	suppressed
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	active

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	28.27 square meters	Cs-137	1.000E+00
Thickness:	0.15 meters		
Cover Depth:	0.00 meters		

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 2.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+03
TDOSE(t):	9.410E-03	9.171E-03	8.684E-03	0.000E+00
M(t):	3.764E-04	3.668E-04	3.474E-04	0.000E+00

Maximum TDOSE(t): 9.410E-03 mrem/yr at t = 0.000E+00 years

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	9.409E-03	1.0000	2.054E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.304E-07	0.0000
Total	9.409E-03	1.0000	2.054E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.304E-07	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.410E-03	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.410E-03	1.0000

*Sum of all water independent and dependent pathways.

Table of Contents

Part VI: Uncertainty Analysis

RESRAD Uncertainty Analysis Results

Probabilistic Input 2
Total Dose 3
Total Risk 4
Dose vs Pathway: Ground External 5
Dose vs Pathway: Inhalation (w/o Radon) 6
Dose vs Pathway: Radon (Water Ind.) 7
Dose vs Pathway: Plant (Water Ind.) 8
Dose vs Pathway: Meat (Water Ind.) 9
Dose vs Pathway: Milk (Water Ind.) 10
Dose vs Pathway: Soil Ingestion 11
Dose vs Pathway: Water Ingestion 12
Dose vs Pathway: Fish Ingestion 13
Dose vs Pathway: Radon (Water Dep.) 14
Dose vs Pathway: Plant (Water Dep.) 15
Dose vs Pathway: Meat (Water Dep.) 16
Dose vs Pathway: Milk (Water Dep.) 17
Cumulative Probability Summary..... 18
Summary of dose at graphical times, reptition 1..... 19
Summary of dose at graphical times, reptition 2..... 20
Summary of dose at graphical times, reptition 3..... 21
Peak of the mean dose at graphical times..... 22
Correlation and Regression coefficients (if any)..... 23

Probabilistic Input

Number of Sample Runs: 300

Number	Name	Distribution	Parameters			
1	FOTD	NORMAL	.0051	.0025		
2	AREA	TRIANGULAR	10	28.3	42.5	
3	THICK0	NORMAL	.152	.076		
4	DENSCZ	TRUNCATED NORMAL	1.52	.23	.001	.999

Probabilistic results summary : Country Club Worker for TBD 08-006 unit Cs-137
Dose AssessmeFile: C:\RESRAD_FAMILY\RESRAD\USERFILES\PBRF_OFF-SITE\06220902.RAD

Probabilistic Total Dose Summary

Nuclide (j)	Peak Time	Peak Dose	DOSE(j,t), mrem/yr t= 0.00E+00	1.00E+00	3.00E+00	1.00E+03
Cs-137						
Min	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Max	0.00E+00	2.57E-02	2.57E-02	2.51E-02	2.39E-02	0.00E+00
Avg	0.00E+00	8.12E-03	8.12E-03	7.90E-03	7.48E-03	0.00E+00
Std	0.00E+00	5.00E-03	5.00E-03	4.88E-03	4.66E-03	0.00E+00
∑ALL						
Min	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Max	0.00E+00	2.57E-02	2.57E-02	2.51E-02	2.39E-02	0.00E+00
Avg	0.00E+00	8.12E-03	8.12E-03	7.90E-03	7.48E-03	0.00E+00
Std	0.00E+00	5.00E-03	5.00E-03	4.88E-03	4.66E-03	0.00E+00

∑ALL is total dose summed for all nuclides.

Probabilistic results summary : Country Club Worker for TBD 08-006 unit Cs-137

Dose AssessmeFile: C:\RESRAD_FAMILY\RESRAD\USERFILES\PBRF_OFF-SITE\06220902.RAD

Probabilistic Dose vs Pathway(i): Ground External

Nuclide (j)	DOSE(i,j,t), mrem/yr t= 0.00E+00	1.00E+00	3.00E+00	1.00E+03
Cs-137				
Min	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Max	2.57E-02	2.51E-02	2.39E-02	0.00E+00
Avg	8.12E-03	7.90E-03	7.48E-03	0.00E+00
Std	5.00E-03	4.88E-03	4.66E-03	0.00E+00
∑ALL				
Min	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Max	2.57E-02	2.51E-02	2.39E-02	0.00E+00
Avg	8.12E-03	7.90E-03	7.48E-03	0.00E+00
Std	5.00E-03	4.88E-03	4.66E-03	0.00E+00

∑ALL is total pathway dose summed for all nuclides.

Probabilistic results summary : Country Club Worker for TBD 08-006 unit Cs-137
Dose AssessmeFile: C:\RESRAD_FAMILY\RESRAD\USERFILES\PBRF_OFF-SITE\06220902.RAD
Cumulative Probability Summary for: Total Dose Over Pathways

Cumulative Probability	Dose(t), mrem/yr t= 0.00E+00	1.00E+00	3.00E+00	1.00E+03
0.025	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.050	1.47E-04	7.19E-05	1.51E-05	0.00E+00
0.075	1.05E-03	9.85E-04	8.83E-04	0.00E+00
0.100	1.78E-03	1.64E-03	1.41E-03	0.00E+00
0.125	2.18E-03	2.11E-03	1.90E-03	0.00E+00
0.150	2.50E-03	2.44E-03	2.29E-03	0.00E+00
0.175	2.97E-03	2.81E-03	2.54E-03	0.00E+00
0.200	3.56E-03	3.44E-03	3.21E-03	0.00E+00
0.225	3.94E-03	3.83E-03	3.65E-03	0.00E+00
0.250	4.33E-03	4.16E-03	3.94E-03	0.00E+00
0.275	4.75E-03	4.64E-03	4.36E-03	0.00E+00
0.300	5.13E-03	4.98E-03	4.70E-03	0.00E+00
0.325	5.57E-03	5.38E-03	5.05E-03	0.00E+00
0.350	5.94E-03	5.77E-03	5.44E-03	0.00E+00
0.375	6.36E-03	6.19E-03	5.80E-03	0.00E+00
0.400	6.48E-03	6.32E-03	5.95E-03	0.00E+00
0.425	6.99E-03	6.79E-03	6.42E-03	0.00E+00
0.450	7.34E-03	7.11E-03	6.68E-03	0.00E+00
0.475	7.66E-03	7.47E-03	7.06E-03	0.00E+00
0.500	7.97E-03	7.75E-03	7.39E-03	0.00E+00
0.525	8.14E-03	7.95E-03	7.57E-03	0.00E+00
0.550	8.39E-03	8.14E-03	7.71E-03	0.00E+00
0.575	8.78E-03	8.57E-03	8.11E-03	0.00E+00
0.600	9.01E-03	8.74E-03	8.28E-03	0.00E+00
0.625	9.50E-03	9.27E-03	8.83E-03	0.00E+00
0.650	9.89E-03	9.65E-03	9.07E-03	0.00E+00
0.675	1.01E-02	9.86E-03	9.39E-03	0.00E+00
0.700	1.05E-02	1.02E-02	9.61E-03	0.00E+00
0.725	1.10E-02	1.07E-02	1.01E-02	0.00E+00
0.750	1.14E-02	1.11E-02	1.05E-02	0.00E+00
0.775	1.19E-02	1.16E-02	1.10E-02	0.00E+00
0.800	1.22E-02	1.19E-02	1.13E-02	0.00E+00
0.825	1.27E-02	1.23E-02	1.16E-02	0.00E+00
0.850	1.30E-02	1.27E-02	1.21E-02	0.00E+00
0.875	1.36E-02	1.33E-02	1.26E-02	0.00E+00
0.900	1.45E-02	1.41E-02	1.34E-02	0.00E+00
0.925	1.57E-02	1.53E-02	1.45E-02	0.00E+00
0.950	1.65E-02	1.61E-02	1.53E-02	0.00E+00
0.975	1.95E-02	1.90E-02	1.81E-02	0.00E+00
1.000	2.57E-02	2.51E-02	2.39E-02	0.00E+00

RESRAD Regression and Correlation output 06/22/09 14:34 Page: Coef 1

Title : Country Club Worker for TBD 08-006 unit Cs-137 Dose Assessment 12 in Local Area

Input File : C:\RESRAD_FAMILY\RESRAD\USERFILES\PBRF_OFF-SITE\06220902.RAD

Coefficients for peak of mean dose time Dose

Coefficient =	PCC		SRC		PRCC		SRRC	
Repetition =	1		1		1		1	
Description of Probabilistic Variable	Sig	Coeff	Sig	Coeff	Sig	Coeff	Sig	Coeff
Outdoor time fraction	1	0.89	1	0.74	1	0.87	1	0.73
Area of contaminated zone	3	0.44	3	0.19	3	0.41	3	0.19
Thickness of contaminated zone	2	0.80	2	0.52	2	0.76	2	0.50
Density of contaminated zone	4	0.21	4	0.08	4	0.14	4	0.06
R-SQUARE		0.85		0.85		0.82		0.82

-Rank is set to zero if the dose is zero or the correlation matrix is singular.

-R-SQUARE varies between 0 and 1 and is called the coefficient of determination; it provides a measure of the variation in the dependent variable (Dose) explained by regression on the independent variables.

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary ... 2
Site-Specific Parameter Summary 3
Summary of Pathway Selections 7
Contaminated Zone and Total Dose Summary 8
Total Dose Components
Time = 0.000E+00 9
Time = 1.000E+00 10
Time = 3.000E+00 11
Time = 1.000E+03 12
Dose/Source Ratios Summed Over All Pathways 13
Single Radionuclide Soil Guidelines 13
Dose Per Nuclide Summed Over All Pathways 14
Soil Concentration Per Nuclide 14

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ba-137m (Source: FGR 12)	3.606E+00	3.606E+00	DCF1(1)
A-1	Cs-137 (Source: FGR 12)	7.510E-04	7.510E-04	DCF1(2)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(1)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(1)
D-34	Food transfer factors:			
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(1,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(1,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(1,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(1,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)

#For DCF1(xxx) only, factors are for infinite depth & area. See ETFG table in Ground Pathway of Detailed Report.
*Base Case means Default.Lib w/o Associate Nuclide contributions.

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	2.827E+01	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	3.050E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+03	1.000E+01	---	T(4)
R011	Times for calculations (yr)	not used	3.000E+01	---	T(5)
R011	Times for calculations (yr)	not used	1.000E+02	---	T(6)
R011	Times for calculations (yr)	not used	3.000E+02	---	T(7)
R011	Times for calculations (yr)	not used	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Cs-137	1.000E+00	0.000E+00	---	S1(1)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(1)
R013	Cover depth (m)	1.500E-01	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	1.500E+00	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.522E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.500E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	2.700E+02	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	7.120E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	8.600E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	1.040E+00	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	3.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	not used	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	not used	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	not used	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	not used	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	not used	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	not used	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	not used	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	not used	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	not used	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	not used	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	not used	1	---	NS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	not used	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	4.600E+03	4.600E+03	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	not used	4.600E+03	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	not used	4.600E+03	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.845E-04	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R017	Inhalation rate (m**3/yr)	1.400E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	1.000E+00	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	0.000E+00	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	5.100E-03	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	1.830E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	not used	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	1	---	---	KYMAX

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	suppressed
4 -- meat ingestion	suppressed
5 -- milk ingestion	suppressed
6 -- aquatic foods	suppressed
7 -- drinking water	suppressed
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	active

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	28.27 square meters	Cs-137	1.000E+00
Thickness:	0.31 meters		
Cover Depth:	0.15 meters		

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 2.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+03
TDOSE(t):	1.825E-03	1.806E-03	1.769E-03	0.000E+00
M(t):	7.300E-05	7.225E-05	7.078E-05	0.000E+00

Maximum TDOSE(t): 1.825E-03 mrem/yr at t = 0.000E+00 years

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	1.825E-03	1.0000	6.820E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.330E-10	0.0000
Total	1.825E-03	1.0000	6.820E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.330E-10	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.825E-03	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.825E-03	1.0000

*Sum of all water independent and dependent pathways.

Table of Contents

Part VI: Uncertainty Analysis

RESRAD Uncertainty Analysis Results

Probabilistic Input 2
Total Dose 3
Total Risk 4
Dose vs Pathway: Ground External 5
Dose vs Pathway: Inhalation (w/o Radon) 6
Dose vs Pathway: Radon (Water Ind.) 7
Dose vs Pathway: Plant (Water Ind.) 8
Dose vs Pathway: Meat (Water Ind.) 9
Dose vs Pathway: Milk (Water Ind.) 10
Dose vs Pathway: Soil Ingestion 11
Dose vs Pathway: Water Ingestion 12
Dose vs Pathway: Fish Ingestion 13
Dose vs Pathway: Radon (Water Dep.) 14
Dose vs Pathway: Plant (Water Dep.) 15
Dose vs Pathway: Meat (Water Dep.) 16
Dose vs Pathway: Milk (Water Dep.) 17
Cumulative Probability Summary..... 18
Summary of dose at graphical times, reptition 1..... 19
Summary of dose at graphical times, reptition 2..... 20
Summary of dose at graphical times, reptition 3..... 21
Peak of the mean dose at graphical times..... 22
Correlation and Regression coefficients (if any)..... 23

Probabilistic Input

Number of Sample Runs: 300

Number	Name	Distribution	Parameters			
1	FOTD	NORMAL	.0051	.0025		
2	AREA	TRIANGULAR	10	28.3	42.5	
3	THICK0	NORMAL	.305	.152		
4	DENSCZ	TRUNCATED NORMAL	1.52	.23	.001	.999
5	COVER0	NORMAL	.15	.076		

Probabilistic Total Dose Summary

Nuclide (j)	Peak Time	Peak Dose	t= 0.00E+00	DOSE(j,t), mrem/yr 1.00E+00	3.00E+00	1.00E+03
Cs-137						
Min	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Max	0.00E+00	2.03E-02	2.03E-02	1.98E-02	1.89E-02	0.00E+00
Avg	0.00E+00	2.53E-03	2.53E-03	2.50E-03	2.43E-03	0.00E+00
Std	0.00E+00	3.14E-03	3.14E-03	3.08E-03	2.97E-03	0.00E+00
∑ALL						
Min	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Max	0.00E+00	2.03E-02	2.03E-02	1.98E-02	1.89E-02	0.00E+00
Avg	0.00E+00	2.53E-03	2.53E-03	2.50E-03	2.43E-03	0.00E+00
Std	0.00E+00	3.14E-03	3.14E-03	3.08E-03	2.97E-03	0.00E+00

∑ALL is total dose summed for all nuclides.

Probabilistic results summary : Country Club Worker for TBD 08-006 unit Cs-137

Dose AssessmeFile: C:\RESRAD_FAMILY\RESRAD\USERFILES\PBRF_OFF-SITE\06220903.RAD

Probabilistic Dose vs Pathway(i): Ground External

Nuclide (j)	DOSE(i,j,t), mrem/yr t= 0.00E+00	1.00E+00	3.00E+00	1.00E+03
Cs-137				
Min	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Max	2.03E-02	1.98E-02	1.89E-02	0.00E+00
Avg	2.53E-03	2.50E-03	2.43E-03	0.00E+00
Std	3.14E-03	3.08E-03	2.97E-03	0.00E+00
∑ALL				
Min	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Max	2.03E-02	1.98E-02	1.89E-02	0.00E+00
Avg	2.53E-03	2.50E-03	2.43E-03	0.00E+00
Std	3.14E-03	3.08E-03	2.97E-03	0.00E+00

∑ALL is total pathway dose summed for all nuclides.

Probabilistic results summary : Country Club Worker for TBD 08-006 unit Cs-137
Dose AssessmeFile: C:\RESRAD_FAMILY\RESRAD\USERFILES\PBRF_OFF-SITE\06220903.RAD
Cumulative Probability Summary for: Total Dose Over Pathways

Cumulative Probability	Dose(t), mrem/yr t= 0.00E+00	1.00E+00	3.00E+00	1.00E+03
0.025	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.050	5.70E-05	5.64E-05	5.54E-05	0.00E+00
0.075	1.46E-04	1.44E-04	1.42E-04	0.00E+00
0.100	2.16E-04	2.14E-04	2.10E-04	0.00E+00
0.125	2.71E-04	2.69E-04	2.64E-04	0.00E+00
0.150	3.53E-04	3.50E-04	3.44E-04	0.00E+00
0.175	4.25E-04	4.21E-04	4.13E-04	0.00E+00
0.200	4.62E-04	4.58E-04	4.50E-04	0.00E+00
0.225	5.23E-04	5.16E-04	5.03E-04	0.00E+00
0.250	5.77E-04	5.72E-04	5.62E-04	0.00E+00
0.275	6.25E-04	6.19E-04	6.08E-04	0.00E+00
0.300	6.52E-04	6.45E-04	6.31E-04	0.00E+00
0.325	6.99E-04	6.93E-04	6.80E-04	0.00E+00
0.350	7.63E-04	7.56E-04	7.41E-04	0.00E+00
0.375	8.59E-04	8.51E-04	8.35E-04	0.00E+00
0.400	9.59E-04	9.50E-04	9.31E-04	0.00E+00
0.425	1.04E-03	1.03E-03	1.01E-03	0.00E+00
0.450	1.14E-03	1.13E-03	1.11E-03	0.00E+00
0.475	1.30E-03	1.29E-03	1.26E-03	0.00E+00
0.500	1.34E-03	1.32E-03	1.30E-03	0.00E+00
0.525	1.47E-03	1.46E-03	1.43E-03	0.00E+00
0.550	1.53E-03	1.51E-03	1.48E-03	0.00E+00
0.575	1.68E-03	1.66E-03	1.63E-03	0.00E+00
0.600	1.77E-03	1.76E-03	1.73E-03	0.00E+00
0.625	2.09E-03	2.07E-03	2.04E-03	0.00E+00
0.650	2.34E-03	2.32E-03	2.27E-03	0.00E+00
0.675	2.52E-03	2.50E-03	2.45E-03	0.00E+00
0.700	2.89E-03	2.86E-03	2.80E-03	0.00E+00
0.725	3.06E-03	3.03E-03	2.96E-03	0.00E+00
0.750	3.26E-03	3.22E-03	3.15E-03	0.00E+00
0.775	3.69E-03	3.66E-03	3.58E-03	0.00E+00
0.800	4.00E-03	3.96E-03	3.88E-03	0.00E+00
0.825	4.53E-03	4.48E-03	4.38E-03	0.00E+00
0.850	4.97E-03	4.92E-03	4.83E-03	0.00E+00
0.875	5.63E-03	5.57E-03	5.46E-03	0.00E+00
0.900	6.27E-03	6.20E-03	6.08E-03	0.00E+00
0.925	6.99E-03	6.89E-03	6.71E-03	0.00E+00
0.950	8.75E-03	8.66E-03	8.47E-03	0.00E+00
0.975	1.22E-02	1.19E-02	1.12E-02	0.00E+00
1.000	2.03E-02	1.98E-02	1.89E-02	0.00E+00

RESRAD Regression and Correlation output 06/22/09 14:24 Page: Coef 1

Title : Country Club Worker for TBD 08-006 unit Cs-137 Dose Assessment 12 in Local Sourc

Input File : C:\RESRAD_FAMILY\RESRAD\USERFILES\PBRF_OFF-SITE\06220903.RAD

Coefficients for peak of mean dose time Dose

Coefficient =	PCC		SRC		PRCC		SRRC	
Repetition =	1		1		1		1	
Description of Probabilistic Variable	Sig	Coeff	Sig	Coeff	Sig	Coeff	Sig	Coeff
Outdoor time fraction	2	0.59	2	0.41	2	0.74	2	0.45
Area of contaminated zone	4	0.13	4	0.07	4	0.37	4	0.16
Thickness of contaminated zone	3	0.21	3	0.12	3	0.37	3	0.16
Density of contaminated zone	5	-0.08	5	-0.04	5	-0.18	5	-0.07
Cover depth	1	-0.78	1	-0.70	1	-0.88	1	-0.76
R-SQUARE		0.69		0.69		0.83		0.83

-Rank is set to zero if the dose is zero or the correlation matrix is singular.

-R-SQUARE varies between 0 and 1 and is called the coefficient of determination; it provides a measure of the variation in the dependent variable (Dose) explained by regression on the independent variables.

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary ... 2
Site-Specific Parameter Summary 3
Summary of Pathway Selections 7
Contaminated Zone and Total Dose Summary 8
Total Dose Components
Time = 0.000E+00 9
Time = 1.000E+00 10
Time = 3.000E+00 11
Time = 1.000E+03 12
Dose/Source Ratios Summed Over All Pathways 13
Single Radionuclide Soil Guidelines 13
Dose Per Nuclide Summed Over All Pathways 14
Soil Concentration Per Nuclide 14

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ba-137m (Source: FGR 12)	3.606E+00	3.606E+00	DCF1(1)
A-1	Cs-137 (Source: FGR 12)	7.510E-04	7.510E-04	DCF1(2)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(1)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(1)
D-34	Food transfer factors:			
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(1,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(1,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(1,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(1,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)

#For DCF1(xxx) only, factors are for infinite depth & area. See ETFG table in Ground Pathway of Detailed Report.
*Base Case means Default.Lib w/o Associate Nuclide contributions.

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	2.827E+01	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	3.050E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+03	1.000E+01	---	T(4)
R011	Times for calculations (yr)	not used	3.000E+01	---	T(5)
R011	Times for calculations (yr)	not used	1.000E+02	---	T(6)
R011	Times for calculations (yr)	not used	3.000E+02	---	T(7)
R011	Times for calculations (yr)	not used	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Cs-137	1.000E+00	0.000E+00	---	S1(1)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(1)
R013	Cover depth (m)	4.570E-01	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	1.500E+00	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.522E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.500E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	2.700E+02	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	7.120E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	8.600E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	1.040E+00	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	3.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	not used	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	not used	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	not used	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	not used	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	not used	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	not used	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	not used	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	not used	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	not used	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	not used	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	not used	1	---	NS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	not used	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	4.600E+03	4.600E+03	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	not used	4.600E+03	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	not used	4.600E+03	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.845E-04	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R017	Inhalation rate (m**3/yr)	1.400E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	1.000E+00	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	0.000E+00	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	5.100E-03	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	1.830E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	not used	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	1	---	---	KYMAX

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	suppressed
4 -- meat ingestion	suppressed
5 -- milk ingestion	suppressed
6 -- aquatic foods	suppressed
7 -- drinking water	suppressed
8 -- soil ingestion	active
9 -- radon	suppressed
Find peak pathway doses	active

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	28.27 square meters	Cs-137	1.000E+00
Thickness:	0.31 meters		
Cover Depth:	0.46 meters		

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 2.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+03
TDOSE(t):	2.350E-05	2.329E-05	2.286E-05	0.000E+00
M(t):	9.402E-07	9.314E-07	9.143E-07	0.000E+00

Maximum TDOSE(t): 2.350E-05 mrem/yr at t = 0.000E+00 years

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	2.350E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	2.350E-05	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.350E-05	1.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.350E-05	1.0000

*Sum of all water independent and dependent pathways.

Table of Contents

Part VI: Uncertainty Analysis

RESRAD Uncertainty Analysis Results

Probabilistic Input 2
Total Dose 3
Total Risk 4
Dose vs Pathway: Ground External 5
Dose vs Pathway: Inhalation (w/o Radon) 6
Dose vs Pathway: Radon (Water Ind.) 7
Dose vs Pathway: Plant (Water Ind.) 8
Dose vs Pathway: Meat (Water Ind.) 9
Dose vs Pathway: Milk (Water Ind.) 10
Dose vs Pathway: Soil Ingestion 11
Dose vs Pathway: Water Ingestion 12
Dose vs Pathway: Fish Ingestion 13
Dose vs Pathway: Radon (Water Dep.) 14
Dose vs Pathway: Plant (Water Dep.) 15
Dose vs Pathway: Meat (Water Dep.) 16
Dose vs Pathway: Milk (Water Dep.) 17
Cumulative Probability Summary..... 18
Summary of dose at graphical times, reptition 1..... 19
Summary of dose at graphical times, reptition 2..... 20
Summary of dose at graphical times, reptition 3..... 21
Peak of the mean dose at graphical times..... 22
Correlation and Regression coefficients (if any)..... 23

Probabilistic Input

Number of Sample Runs: 300

Number	Name	Distribution	Parameters			
1	FOTD	NORMAL	.0051	.0025		
2	AREA	TRIANGULAR	10	28.3	42.5	
3	THICK0	NORMAL	.305	.152		
4	DENSCZ	TRUNCATED NORMAL	1.52	.23	.001	.999
5	COVER0	NORMAL	.457	.228		

Probabilistic Total Dose Summary

Nuclide (j)	Peak Time	Peak Dose	t= 0.00E+00	DOSE(j,t), mrem/yr 1.00E+00	3.00E+00	1.00E+03
Cs-137						
Min	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Max	0.00E+00	2.03E-02	2.03E-02	1.98E-02	1.88E-02	1.24E-12
Avg	0.00E+00	6.97E-04	6.97E-04	6.85E-04	6.61E-04	9.34E-14
Std	0.00E+00	2.48E-03	2.48E-03	2.43E-03	2.33E-03	2.46E-13
∑ALL						
Min	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Max	0.00E+00	2.03E-02	2.03E-02	1.98E-02	1.88E-02	1.24E-12
Avg	0.00E+00	6.97E-04	6.97E-04	6.85E-04	6.61E-04	9.34E-14
Std	0.00E+00	2.48E-03	2.48E-03	2.43E-03	2.33E-03	2.46E-13

∑ALL is total dose summed for all nuclides.

Probabilistic results summary : Country Club Worker for TBD 08-006 unit Cs-137

Dose AssessmeFile: C:\RESRAD_FAMILY\RESRAD\USERFILES\PBRF_OFF-SITE\06220904.RAD

Probabilistic Dose vs Pathway(i): Ground External

Nuclide (j)	DOSE(i,j,t), mrem/yr t= 0.00E+00	1.00E+00	3.00E+00	1.00E+03
Cs-137				
Min	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Max	2.03E-02	1.98E-02	1.88E-02	1.24E-12
Avg	6.97E-04	6.85E-04	6.61E-04	9.34E-14
Std	2.48E-03	2.43E-03	2.33E-03	2.46E-13
∑ALL				
Min	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Max	2.03E-02	1.98E-02	1.88E-02	1.24E-12
Avg	6.97E-04	6.85E-04	6.61E-04	9.34E-14
Std	2.48E-03	2.43E-03	2.33E-03	2.46E-13

∑ALL is total pathway dose summed for all nuclides.

Probabilistic results summary : Country Club Worker for TBD 08-006 unit Cs-137
Dose AssessmeFile: C:\RESRAD_FAMILY\RESRAD\USERFILES\PBRF_OFF-SITE\06220904.RAD
Cumulative Probability Summary for: Total Dose Over Pathways

Cumulative Probability	Dose(t), mrem/yr t= 0.00E+00	1.00E+00	3.00E+00	1.00E+03
0.025	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.050	8.36E-09	8.28E-09	8.13E-09	0.00E+00
0.075	4.97E-08	4.92E-08	4.83E-08	0.00E+00
0.100	1.07E-07	1.06E-07	1.04E-07	0.00E+00
0.125	1.84E-07	1.82E-07	1.79E-07	0.00E+00
0.150	4.08E-07	4.05E-07	3.97E-07	0.00E+00
0.175	5.41E-07	5.36E-07	5.27E-07	0.00E+00
0.200	7.50E-07	7.43E-07	7.29E-07	0.00E+00
0.225	1.10E-06	1.08E-06	1.06E-06	0.00E+00
0.250	1.57E-06	1.56E-06	1.53E-06	0.00E+00
0.275	2.17E-06	2.15E-06	2.11E-06	0.00E+00
0.300	2.52E-06	2.50E-06	2.45E-06	0.00E+00
0.325	3.49E-06	3.45E-06	3.39E-06	0.00E+00
0.350	4.22E-06	4.19E-06	4.11E-06	0.00E+00
0.375	5.02E-06	4.97E-06	4.88E-06	0.00E+00
0.400	6.68E-06	6.62E-06	6.49E-06	0.00E+00
0.425	7.82E-06	7.75E-06	7.60E-06	0.00E+00
0.450	9.30E-06	9.21E-06	9.05E-06	0.00E+00
0.475	1.02E-05	1.01E-05	9.87E-06	0.00E+00
0.500	1.27E-05	1.26E-05	1.24E-05	0.00E+00
0.525	1.74E-05	1.73E-05	1.69E-05	0.00E+00
0.550	1.97E-05	1.95E-05	1.91E-05	0.00E+00
0.575	2.37E-05	2.35E-05	2.30E-05	0.00E+00
0.600	3.25E-05	3.22E-05	3.16E-05	0.00E+00
0.625	5.13E-05	5.08E-05	4.98E-05	0.00E+00
0.650	6.59E-05	6.53E-05	6.41E-05	0.00E+00
0.675	8.43E-05	8.35E-05	8.20E-05	0.00E+00
0.700	1.01E-04	9.98E-05	9.80E-05	0.00E+00
0.725	1.35E-04	1.33E-04	1.29E-04	0.00E+00
0.750	1.79E-04	1.77E-04	1.74E-04	0.00E+00
0.775	2.47E-04	2.45E-04	2.40E-04	0.00E+00
0.800	2.91E-04	2.89E-04	2.83E-04	0.00E+00
0.825	3.91E-04	3.87E-04	3.80E-04	5.16E-14
0.850	5.78E-04	5.73E-04	5.63E-04	1.72E-13
0.875	7.76E-04	7.68E-04	7.53E-04	3.17E-13
0.900	1.35E-03	1.34E-03	1.31E-03	3.88E-13
0.925	1.86E-03	1.84E-03	1.81E-03	4.95E-13
0.950	4.25E-03	4.21E-03	4.12E-03	8.20E-13
0.975	9.64E-03	9.50E-03	9.25E-03	9.77E-13
1.000	2.03E-02	1.98E-02	1.88E-02	1.24E-12

RESRAD Regression and Correlation output 06/22/09 15:10 Page: Coef 1

Title : Country Club Worker for TBD 08-006 unit Cs-137 Dose Assessment 6 in Local Area S

Input File : C:\RESRAD_FAMILY\RESRAD\USERFILES\PBRF_OFF-SITE\06220904.RAD

Coefficients for peak of mean dose time Dose

Coefficient =	PCC		SRC		PRCC		SRRC	
Repetition =	1		1		1		1	
Description of Probabilistic Variable	Sig	Coeff	Sig	Coeff	Sig	Coeff	Sig	Coeff
Outdoor time fraction	2	0.28	2	0.24	2	0.48	2	0.22
Area of contaminated zone	4	0.06	4	0.05	3	0.34	3	0.14
Thickness of contaminated zone	5	0.04	5	0.03	4	0.22	4	0.09
Density of contaminated zone	3	-0.07	3	-0.06	5	-0.14	5	-0.06
Cover depth	1	-0.51	1	-0.49	1	-0.91	1	-0.88
R-SQUARE		0.31		0.31		0.84		0.84

-Rank is set to zero if the dose is zero or the correlation matrix is singular.

-R-SQUARE varies between 0 and 1 and is called the coefficient of determination; it provides a measure of the variation in the dependent variable (Dose) explained by regression on the independent variables.

Summary : Country Club Worker for TBD 08-006 unit Cs-137 Dose Assessment 6 in Local Area
File : C:\RESRAD_FAMILY\RESRAD\USERFILES\PBRF_OFF-SITE\02100903.RAD

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	28.27 square meters	Cs-137	1.000E+00
Thickness:	0.08 meters		
Cover Depth:	0.00 meters		

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 2.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+03
TDOSE(t):	6.047E-02	5.845E-02	5.460E-02	0.000E+00
M(t):	2.419E-03	2.338E-03	2.184E-03	0.000E+00

Maximum TDOSE(t): 6.047E-02 mrem/yr at t = 0.000E+00 years

6-22-09
confirmatory run
report to verify
results reported
in TBD 08-006

Probabilistic Total Dose Summary

Nuclide (j)	Peak Time	Peak Dose	t= 0.00E+00	DOSE(j,t), mrem/yr 1.00E+00	3.00E+00	1.00E+03
Cs-137						
Min	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Max	0.00E+00	2.17E-01	2.17E-01	2.11E-01	1.99E-01	0.00E+00
Avg	0.00E+00	5.62E-02	5.62E-02	5.42E-02	5.06E-02	0.00E+00
Std	0.00E+00	3.87E-02	3.87E-02	3.76E-02	3.56E-02	0.00E+00
∑ALL						
Min	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Max	0.00E+00	2.17E-01	2.17E-01	2.11E-01	1.99E-01	0.00E+00
Avg	0.00E+00	5.62E-02	5.62E-02	5.42E-02	5.06E-02	0.00E+00
Std	0.00E+00	3.87E-02	3.87E-02	3.76E-02	3.56E-02	0.00E+00

∑ALL is total dose summed for all nuclides.

Table 20, Brookside Resident Dose from Unit Concentration

Source Term Component and Dose Pathway	Cs-137 (mrem/y per pCi/g)		Co-60 (mrem/y per pCi/g)	
	Dose	Uncertainty	Dose	Uncertainty
Cont. Zone layer 1, 6 in., Total	2.21E-01	1.21E-01	9.38E-01	5.24E-01
Cont. Zone layer 2, 9 in., Total	3.19E-02	1.69E-02	2.01E-01	1.08E-01
Cont. Zone layer 3, 9 in., Total	1.51E-02	4.56E-02	8.23E-02	2.06E-01
Elev. local Area layer 1; 6 in., Total	5.54E-03	3.92E-03	2.29E-02	1.66E-02
Elev. local Area layer 2; 6 in., Total	1.71E-03	2.02E-03	8.66E-03	8.83E-03
Elev. local Area layer 3; 6 in., Total	6.96E-04	1.64E-03	3.67E-03	7.06E-03
Total Dose from Unit Conc.	2.76E-01	1.30E-01	1.26E+00	5.74E-01

Table 21, Maintenance Worker Dose from Unit Concentration

Source Term Component and Dose Pathway	Cs-137 (mrem/y per pCi/g)		Co-60 (mrem/y per pCi/g)	
	Dose	Uncertainty	Dose	Uncertainty
Cont. Zone 3 in., Total	9.78E-02	6.20E-02	3.97E-01	2.57E-01
Elev. local Area layer 1; 6 in., Total	8.12E-03	5.00E-03	NA	NA
Elev. local Area layer 2; 6 in., Total	2.53E-03	3.14E-03	NA	NA
Elev. local Area layer 3; 6 in., Total	6.97E-04	2.48E-03	NA	NA
Total Dose from Unit Conc.	1.09E-01	6.23E-02	3.97E-01	2.57E-01

Table 27 shows the source term component concentrations and Table 28 shows the calculated doses for the Country Club Maintenance Worker scenario. The total scenario dose is 3.61 ± 2.23 E-01 mrem/y. The Cs-137 in the soil and sediments contributes 73% of the total dose (all source volumes) and the local elevated area source contributes 36%.

Table 27, Country Club Maintenance Worker Source Term Component Concentrations

Source Term Component	Cs-137 (pCi/g)		Co-60 (pCi/g)	
	Concentration	Uncertainty	Concentration	Uncertainty
Cont. Zone 3 in	1.38E+00	1.84E+00	2.45E-01	7.43E-02
Elev. local Area layer 1; 6 in	1.42E+01	8.90E-01	NA	NA
Elev. local Area layer 2; 12 in	4.70E+00	5.10E-01	NA	NA
Elev. local Area layer 3; 12 in	2.90E+00	3.45E-01	NA	NA

Table 28, Country Club Maintenance Worker Doses from Source Term Components and Total Dose

Source Term Component (1)	Cs-137 (mrem/y)		Co-60 (mrem/y)		Total (mrem/y)	
	Dose	Uncertainty	Dose	Uncertainty	Dose	Uncertainty
Cont. Zone 3 in	1.35E-01	1.99E-01	9.73E-02	6.95E-02	2.32E-01	2.11E-01
Elev. local Area layer 1; 6 in	1.15E-01	7.14E-02	NA	NA	1.15E-01	7.14E-02
Elev. local Area layer 2; 12 in	1.19E-02	1.48E-02	NA	NA	1.19E-02	1.48E-02
Elev. local Area layer 3; 12 in	2.02E-03	7.20E-03	NA	NA	2.02E-03	7.20E-03
Totals	2.64E-01	2.12E-01	9.73E-02	6.95E-02	3.61E-01	2.23E-01

Table 28 Note:

1. Only the direct exposure pathway is significant; the total dose is not broken down into pathway dose contributions

Table 30, Recreationist Doses from Source Term Components and Total Dose

Source Term Component (1)	Cs-137 (mrem/y)		Co-60 (mrem/y)		Total (mrem/y)	
	Dose	Uncertainty	Dose	Uncertainty	Dose	Uncertainty
Cont. Zone layer 1; 6 in.	3.28E-02	8.45E-02	2.92E-02	2.10E-02	6.21E-02	8.70E-02
Cont. Zone layer 2; 12 in.	5.69E-03	1.46E-02	NA	NA	5.69E-03	1.46E-02
Cont. Zone layer 3; 12 in.	7.39E-04	3.23E-03	NA	NA	7.39E-04	2.09E-02
Elev. local Area layer 1; 6 in.	4.14E-01	2.53E-01	NA	NA	4.14E-01	2.53E-01
Elev. local Area layer 2; 12 in.	9.72E-02	1.17E-01	NA	NA	9.72E-02	1.17E-01
Elev. local Area layer 3; 12 in.	2.74E-02	9.01E-02	NA	NA	2.74E-02	9.01E-02
Cont. Zone layer 1; 6 in. Co-60 fish	NA	NA	9.09E-04	3.92E-03	9.09E-04	3.92E-03
Cont. Zone 30 in. for Cs-137 Fish	2.65E-02	1.26E-01	NA	NA	2.65E-02	1.26E-01
Elev. local Area 30 in. for CS-137 Fish	1.23E-02	5.84E-02	NA	NA	1.23E-02	5.84E-02
Total	6.17E-01	3.35E-01	3.01E-02	2.10E-02	6.47E-01	3.37E-01
Total Fish	3.88E-02	1.39E-01	9.09E-04	3.92E-03	3.97E-02	1.39E-01

Tables 31 and 32 show the dose breakdown for the scenarios. Table 31 shows the percent contributions from each radionuclide and Table 32 shows the percent contributions from the source term elements. From the Table 31 results, it is calculated that on average, Cs-137 contributes 85% and Co-60 contributes 15% of the total dose to the scenario receptors. From the Table 32 results, it is calculated that on average the local area elevated activity sources contribute 67 % of the total dose whereas the principal contaminated zone sources contribute 33%.

Table 31, Scenario Dose Contributions from Cs-137 and Co-60

Scenario	Total Scenario Dose (mrem/y)	Cs-137 Dose (mrem/y)	Fraction of Total dose (%)	Co-60 Dose (mrem/y)	Fraction of Total dose (%)
Suburban Gardner	2.42 ± 1.28 E-01	2.22 ± 1.28 E-01	92	1.99 ± 1.0 E-02	8
Brookside Resident	9.24 ± 4.41 E-01	7.38 ±4.33 E-01	80	1.86 ± 0.83 E-01	20
CC maintenance Worker	3.61 ± 2.23 E-01	2.64 ± 2.12 E-01	73	9.73 ± 6.95 E-02	27
Recreationist	6.47 ± 3.37 E-01	6.17 ± 3.35 E-01	95	3.01 ± 2.10 E-02	5

Table 32, Scenario Dose Contributions from Source Term Elements

Scenario	Total Scenario Dose	Primary Contaminated Zone Source	Fraction of Total dose (%)	Local Elevated Activity Source	Fraction of Total dose (%)
Suburban Gardner	2.42 ± 1.28 E-01	5.73 ± 10.5 E-02	24	1.85 ± 0.74 E-01	76
Brookside Resident	9.24 ± 4.41 E-01	4.23 ± 3.47 E-01	46	5.02 ± 2.71 E-01	54
CC maintenance Worker	3.61 ± 2.23 E-01	2.32 ± 2.11 E-01	64	1.29 ± 1.16 E-01	36
Recreationist	6.47 ± 3.37 E-01	9.59 ± 15.5 E-02	15	5.51 ± 2.99 E-01	85

7.3 Age-Dependent Dose

In methods approved by the NRC for evaluating doses from residual contamination at decommissioned sites, the dose receptor is assumed to be an adult. The default parameters for RESRAD models and exposure scenarios are based on adults. Information on the releases to the Plum Brook has been provided by NASA to the public on several occasions and questions have been raised about doses and potential risks to children. What are the effects on the calculated doses if age-dependent values of critical parameters are used to calculate the doses? As a result, NASA has requested that a technical evaluation be performed to address this issue. An evaluation of age-dependent doses from Plum Brook sediments was conducted in 2008 [NASA 2008a]. This report is included as Attachment E and is summarized here.

The US EPA and NRC policy has been that use of an adult as the receptor for dose and risk assessments is generally acceptable and is protective of children [USEPA 1994, USNRC 2003]. Also, US Government-approved age-dependent dose factors were not available when this policy was established. And as a practical matter, no means existed to calculate doses to children using codes such as RESRAD. However, beginning in 1989 the International Commission on Radiological Protection (ICRP) issued age-dependent dose factors for assessment of doses to the public from intake of radionuclides, culminating in the issuance of ICRP Report No. 72 in 1996. [ICRP 1996]. The developers of RESRAD have incorporated ICRP-72 age-dependent dose factors in version 6.4 of the code released in December 2007 [USDOE 2008]. It is now possible, using RESRAD to calculate doses to individuals other than adults from exposure to Plum Brook sediments.

Doses to members of the public of various age groups who could come into contact with Plum Brook sediments were calculated (age-dependent doses). Three exposure scenarios were selected to examine the effects of age-dependent dose model parameters and to obtain a reasonable upper-bound estimate of the dose to a child. The highest calculated

- Identical results are obtained from measurements using an independent method - dose rates measured with microR meters. This comparison shows that measured dose rates are less than calculated dose rates at all locations except the Brookside Resident scenario location where measured and calculated dose rates are equivalent.

These results confirm that the dose assessment results are conservative.

7.5 Summary and Conclusions

The dose to members of the public from Plum Brook sediments contaminated with Cs-137 and Co-60 was calculated for four exposure scenarios. The scenarios represent conservative assumptions regarding a range of possible conditions whereby members of the public could receive radiation doses from the contaminated sediments. The dose to individuals exposed in the scenarios range from 0.24 to 0.92 mrem/y. The average of the doses to the four scenario receptors is 0.54 ± 0.30 mrem/y.

This result shows that the dose to an individual is well below the 25 mrem/y dose agreed by the principal stakeholders as being acceptable for Plum Brook areas impacted by contaminated sediments. This conclusion is further supported by measurements of radiation doses at locations on the Plum Brook selected to represent settings similar to those of the exposure scenarios. The measured doses are less than the calculated doses at three of the four locations and comparable to the calculated doses at the fourth location.

Additional perspective is provided by comparison with the dose to the public from Cs-137 fallout from atmospheric weapons testing that remains in the environment. The annual average dose to individuals in the northern hemisphere from fallout Cs-137 is reported to be about 0.5 mrem/y (with an estimated uncertainty of ± 100%). Thus, the calculated doses from exposure to Plum Brook sediments are indistinguishable from the "background" dose received from the fallout Cs-137 burden in the Plum Brook watershed.

Country Club Maintenance Worker - Calculated Doses
Original Result for TBD-08-006 (with 3 in thick local elevated area source)

Source Term Model Component	Pathway	RESRAD Cs-137 Prob Dose (mrem/y per pCi/g)	RESRAD Cs-137 Prob Dose uncert (mrem/y per pCi/g)	Source Term Cs-137 Conc. (pCi/g)	Source Term Cs-137 Conc. Uncert. (pCi/g)	Cs-137 Dose (mrem/y)	Cs-137 Dose Uncert. (mrem/y)	Co-60 Dose (mrem/y)	Co-60 Dose Uncert. (mrem/y)	Total Cs + Co Dose (mrem/y)	Total Cs + Co Uncertainty (mrem/y)		Dose	Uncert
Cont Zone 3 in	Total	9.78E-02	6.20E-02	1.38E+00	1.84E+00	1.35E-01	1.99E-01	9.73E-02	6.95E-02	2.32E-01	2.11E-01	cont zn =>	2.32E-01	2.11E-01
Elev local Area layer 1; 6 in	Total	5.62E-02	3.87E-02	1.42E+01	8.90E-01	7.98E-01	5.52E-01			7.98E-01	5.52E-01	elev area =>	9.37E-01	8.07E-01
Elev local Area layer 2; 12 in	Total	2.53E-02	3.14E-02	4.70E+00	5.10E-01	1.19E-01	1.48E-01			1.19E-01	1.48E-01	check sum =>	1.17E+00	8.34E-01
Elev local Area layer 3; 12 in	Total	6.97E-03	2.48E-02	2.90E+00	3.45E-01	2.02E-02	7.20E-02			2.02E-02	7.20E-02			
Total		1.86E-01	8.33E-02			1.07E+00	6.09E-01	9.73E-02	6.95E-02	1.17E+00	6.13E-01			

Country Club Maintenance Worker - Calculated Doses
Revised Result for TBD-08-006 (with 6 in thick local elevated area source)

Source Term Model Component	Pathway	RESRAD Cs-137 Prob Dose (mrem/y per pCi/g)	RESRAD Cs-137 Prob Dose uncert (mrem/y per pCi/g)	Source Term Cs-137 Conc. (pCi/g)	Source Term Cs-137 Conc. Uncert. (pCi/g)	Cs-137 Dose (mrem/y)	Cs-137 Dose Uncert. (mrem/y)	Co-60 Dose (mrem/y)	Co-60 Dose Uncert. (mrem/y)	Total Cs + Co Dose (mrem/y)	Total Cs + Co Uncertainty (mrem/y)		Dose	Uncert
Cont Zone 3 in	Total	9.78E-02	6.20E-02	1.38E+00	1.84E+00	1.35E-01	1.99E-01	9.73E-02	6.95E-02	2.32E-01	2.11E-01	cont zn =>	2.32E-01	2.11E-01
Elev local Area layer 1; 6 in	Total	8.12E-02	5.00E-02	1.42E+01	8.90E-01	1.15E+00	7.14E-01			1.15E+00	7.14E-01	elev area =>	1.29E+00	1.16E+00
Elev local Area layer 2; 12 in	Total	2.53E-02	3.14E-02	4.70E+00	5.10E-01	1.19E-01	1.48E-01			1.19E-01	1.48E-01	check sum =>	1.52E+00	1.18E+00
Elev local Area layer 3; 12 in	Total	6.97E-03	2.48E-02	2.90E+00	3.45E-01	2.02E-02	7.20E-02			2.02E-02	7.20E-02			
Total		2.11E-01	8.91E-02			1.43E+00	7.59E-01	9.73E-02	6.95E-02	1.52E+00	7.62E-01			