BNL- 65339 - Apps.
Informal Report

Risk Assessment and Optimization (ALARA) Analysis for the Environmental Remediation of Brookhaven National Laboratory's Hazardous Waste Management Facility

Appendices

January 1998

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[a]Work performed under Contract No. DE-AC-02-98CH10886 with the U.S. Department of Energy.

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Appendix A

RESRAD Pathways/Parameters
for
Hazardous Waste Management Facility
(HWMF)
Soil Cleanup Guidelines,
Soil to Water Screening Levels,
and
Dose to Visitors at the Open Space

RESRAD Pathways/Parameters for Hazardous Waste Management Facility (HWMF) Soil Cleanup Guidelines, Soil-to-Water Screening Levels and Dose to Open-Space Visitors

Pathway	Undeveloped Open-Space Scenario Soil Cleanup Guidelines (Maximum Exposed Individual)	Resident Scenario Soil to Water Screening Guidelines (Maximum Exposed Individual)	Undeveloped Open-Space Scenario Visitor Dose Topsoil (0-1 ft) (Average Individual)	Undeveloped Open-Space Scenario Visitor Dose At Depth (1-12 ft) (Average Individual)
External gamma exposure	Yes	No	Yes	Yes
Inhalation of dust	Yes	No	Yes	Yes
Ingestion of plant foods	Yes	No	Yes	Yes
Ingestion of meat	Yes	No	Yes	Yes
Ingestion of milk	No	No	No	No
Ingestion of fish	No	No	No	No
Ingestion of water	No	Yes	No	No
Ingestion of soil	Yes	No	Yes	Yes
Inhalation of Radon/Thoron	Yes	No	Yes	Yes

Parameters	Undeveloped Open-Space Scenario Soil Cleanup Guidelines (Maximum Exposed Individual)	Resident Scenario Soil to Water Screening Guidelines (Maximum Exposed Individual)	Open-Space Scenario Visitor Dose - Topsoil (0-1 ft) (Average Individual)	Open-Space Scenario Visitor Dose - Soil At Depth (1-12 ft) (Average Individual)	Source of Parameter Data
Area of contaminated zone (m^2) **Site-Specific Value**	19,400	20,000	19,400	6,800	CDM 1996 Meinhold 1997
Thickness of contaminated zone (m) **Site -Specific Value**	3.66	2	0.3048	3.35	CDM 1996 Meinhold 1997
Length parallel to aquifer flow (m) **Site -Specific Value**	161.5	250	161.5	64	CDM 1996 Meinhold 1997
Basic radiation dose limit (mrem/yr)	15/75	15	15	15	USNRC& USEPA Proposed Rules
Time since placement of radioactive material (yr)	0	0	0	0	ANL 1993b p.130
Cover depth (m) **Site -Specific Value**	0	0	0	0.3048	ANL 1995
Density of cover material (g/cm^3) **Site -Specific Value**	NA	NA	NA	1.66	ANL 1995

Cover depth erosion rate (m/yr) **Site -Specific Value**	NA	NA	NA	0.001	ANL 1993b p.78
Density of contaminated zone (g/cm^3) **Site - Specific Value**	1.66	1.66	1.66	1.66	CDM 1991
Contaminated zone erosion rate (m/yr) **Site - Specific Value**	0.001	0.001	0.001	0.001	ANL 1993 p.78
Contaminated zone total porosity **Site -Specific Value**	0.33	0.33	0.33	0.33	Warren 1968
Contaminated zone effective porosity **Site - Specific Value**	0.24	0.24	0.24	0.24	Warren 1968
Contaminated zone hydraulic conductivity (m/yr) **Site -Specific Value**	5000	5000	5000	5000	Warren 1968 USGS 1992 CDM 1995b
Contaminated zone b parameter	4.9	4.9	5.3	5.3	RESRAD calc. ANL 1993b p.75
Evapotranspiration coefficients	0.46	0.46	0.46	0.46	ANL 1995
Precipitation (m/yr)	1.23	1.23	1.23	1.23	Nagle 1975 & 1978
Irrigation (m/yr)	0	0.26	0	0	Meinhold 1997
Irrigation mode	NA	Overhead	NA	NA	ANL 1995

Runoff coefficient	0.2	0.2	0.2	0.2	ANL 1995
Watershed area from nearby stream or pond	10^6	10^6	10^6	10^6	ANL 1993b p.83
Accuracy for water/soil computations	0.001	0.001	0.001	0.001	ANL 1995
Density of saturated zone (g/cm^3) **Site - Specific Value**	1.66	1.66	1.66	1.66	ANL 1995 CDM 1991
Saturated zone total porosity	0.33	0.33	0.33	0.33	ANL 1995 Warren 1968
Saturated zone effective porosity	0.24	0.24	0.24	0.24	ANL 1995 Warren 1968
Saturated zone hydraulic conductivity (m/yr) **Site - Specific Value**	20,000	20,000	20,000	20,000	ANL 1995 CDM 1995b
Saturated zone hydraulic gradient **Site -Specific Value**	0.0048	0.001	0.0048	0.0048	ANL 1995 CDM 1995b
Saturated zone b parameter	4.9	4.9	5.3	5.3	RESRAD calc. ANL 1993b p.75
Water table drop rate (m/yr) **Site -Specific Value**	0.001	0.001	0.001	0.001	ANL 1995 ANL 1993b p. 85
Well pump intake depth (m below water table)	18	18	18	18	Local Knowledge

Model: Nondispersion (ND) or Mass-Balance (MB)	NA	ND	NA	NA	ANL 1993a App E ANL 1995
Well pumping rate (m^3/yr)	250	250	250	250	ANL 1995
Number of Uncontaminated unsaturated zone strata **Site - Specific Value**	0	1	1	0	ANL 1995 SAIC 1992
Unsat. zone 1, thickness (m) **Site -Specific Value**	NA	8.6	3.35	NA	CDM 1996 Meinhold 1997
Unsat. zone 1, soil density (g/cm^3) **Site - Specific Value**	NA	1.66	1.66	NA	ANL 1995 CDM 1991
Unsat. zone 1, total porosity **Site -Specific Value**	NA	0.33	0.33	NA	ANL 1995 Warren 1968
Unsat. zone 1, effective porosity **Site -Specific Value**	NA	0.24	0.24	NA	ANL 1995 Warren 1968
Unsat. zone 1, soil-specific b parameter	NA	4.9	4.9	NA	RESRAD calc. ANL 1993b p.75
Unsaturated zone 1, hydraulic conductivity (m/yr) **Site -Specific Value**	NA	5,000	5,000	NA	Warren 1968 USGS 1992 CDM 1995b

Exposure Frequency (d/yr) (not used as input value)	300 d/yr @ 1 hr/d	350	3 d/yr	3 d/yr	Meinhold 1997
Daily inhalation rate (m^3/d) (not used as input value)	20	20	118	57.8	Meinhold 1997
Annual inhalation rate (m^3/y)	20,000	7,300	15,000	15,000	Meinhold 1997
Daily drinking rate (L/d) (not used as input value)	NA	2*	NA	NA	Meinhold 1997
Annual drinking rate (^{l}/y)	NA	700*	NA	NA	Meinhold 1997
Mass loading for inhalation (g/m^3)	0.00001	0.0001	0.00001	0.00001	Meinhold 1997 ANL 1993b p.110
Dilution length for airborne dust, inhalation (m)	3	3	3	3	ANL 1995
Exposure duration (yr)	30	30	30	30	ANL 1995 EPA1991b Meinhold 1997
Shielding factor, inhalation	1.0	0.4	1.0	1.0	ANL 1993b p. 112 Meinhold 1997
Shielding factor, external gamma	1.0	0.8	1.0	1.0	ANL 1993b p. 129 Meinhold 1997

Fraction of time spent indoors	0.0	0.50	0.0	0.0	Cohen 1994 EPA 1991b Meinhold 1997
Fraction of time spent outdoors	0.073	0.25	0.0014	0.0014	Cohen 1994 EPA 1991b Meinhold 1997
Shape factor, external gamma	1.0	1.0	1.0	1.0	ANL 1993b p. 131
Fruits, vegetables and grain consumption (kg /yr)	160	NA	160	160	Meinhold 1997
Leafy vegetable consumption (kg/yr)	0	NA	0	0	Meinhold 1997
Meat ingestion rate (kg/yr)	63	NA	51.1	51.1	Meinhold 1997
Soil ingestion rate (g/yr)	36.5	NA	18	18	BNL 1996
Household water fraction contaminated	0	1	0	0	Meinhold 1997
Livestock water fraction contaminated	0	NA	0	0	Meinhold 1997
Irrigation water fraction contaminated	0	1	0	0	Meinhold 1997
Contaminated fraction of plants	0.006	0.2	0.0003	0.0003	Meinhold 1997

Contaminated fraction of meat	0.14	NA	0.02	0.02	Meinhold 1997
Livestock fodder intake for meat (kg/d)	1.36	NA	1.36	1.36	ANL 1993a p.181
Livestock water intake for meat (l/d)	50	NA	50	50	ANL 1995
Livestock intake for soil (kg/d)	0.01	NA	0.01	0.01	Meinhold 1997
Mass loading for foliar deposition (g/m^3)	0.00001	0.0001	0.00001	0.00001	Meinhold 1997 ANL 1993b p.110
Depth of soil mixing layer (m)	0.15	0.15	0.15	0.15	ANL 1995
Depth of roots (m)	0.9	NA	0.9	0.9	ANL 1993b p. 113
Household fractional usage from groundwater	0	1	0	0	Meinhold 1997
Irrigation fractional usage from groundwater	0	1	0	0	Meinhold 1997
Livestock fractional usage from groundwater	0	NA	0	0	Meinhold 1997
Storage times for contaminated foodstuffs					
Fruits, non-leafy veg. & grains (d)	14	NA	14	14	ANL 1995
Leafy vegetables (d)	1	NA	1	1	ANL 1995
Meat (d)	20	NA	20	20	ANL 1995

Water well (d)	NA	1	NA	NA	ANL 1995
Water surface (d)	NA	NA	NA	NA	ANL 1995
Livestock fodder (d)	0	NA	0	0	ANL 1995
Thickness of material (m) **Site -Specific Values**					
in foundation	NA	0.15	NA	NA	ANL 1993b p.52
in contaminated zone soil	0	0	0	0	ANL 1993b p.52
Density of material (g/cm3) **Site -Specific Values**					
in the foundation	NA	2.4	NA	NA	ANL 1995
in the contaminated soil	NA	NA	NA	NA	ANL 1995
Total porosity of material **Site -Specific Values**					
in the foundation	NA	0.1	NA	NA	ANL 1993b p.44
in the contaminated soil	NA	NA	NA	NA	ANL 1993b p.44
Volumetric water content **Site -Specific Values**					
in the foundation	NA	0.03	NA	NA	RESRAD calc. ANL 1993b p.47

in the contaminated soil	NA	NA	NA	NA	RESRAD calc. ANL 1993b p.47
Diffusion coefficient for radon gas (m/sec)**Site - Specific Values**					
in the foundation	NA	3E-7	NA	NA	ANL 1993b p.52
in the contaminated soil	NA	NA	NA	NA	ANL 1993b p.52
Contamination zone radon diffusion coefficient	2E-6	2E-6	2E-6	2E-6	ANL 1993b p.52
Radon vertical dimension of mixing	2	2	2	2	ANL 1993b p.87
Average annual wind speed (m/sec)	6.23	6.23	6.23	6.23	Nagle 1975
Average building air exchange rate (1/hr)	NA	0.5	NA	NA	ANL 1993b p.89
Height of the building (room) (m)	NA	2.5	NA	NA	ANL 1993b p.91
Building interior area factor	NA	0	NA	NA	ANL 1993b p.92
Building depth below ground surface(m)	NA	1	NA	NA	ANL 1993b p.95
Emanating power of Rn-222 gas	0.25	0.25	0.25	0.25	ANL 1993b p.58
Emanating power of Rn-220 gas	0.15	0.15	0.15	0.15	ANL 1993b p.58

Distribution Coefficients Used

Radionuclide	Distribution Coefficient K_d (cm^3/g)	Source of Data
Cesium-137	4.4 E+01	Fuhrmann 1996
Radium-226	1.3 E+02	Fuhrmann 1996
Strontium-90	3.0 E+00	Fuhrmann 1995
Uranium-234	1.7 E+01	Fuhrmann 1995
Uranium-235	1.7 E+01	Fuhrmann 1995
Uranium-238	1.7 E+01	Fuhrmann 1995

Appendix B

Hazardous Waste Management Facility (HWMF) Soil Cleanup Guidelines for Open Space Scenario at 50 Years and 15 mrem/yr: RESRAD Printouts

Summary : HWMP Soil Cleanup Guidelines: Open Space, @ 50 y and 15 mrem/y
File : HWMFOSP.DAT

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Total Dose Components
Time = 0.000E+00 15
Time = 1.000E+00 16
Time = 3.000E+00 17
Time = 1.000E+01 18
Time = 3.000E+01 19
Time = 5.000E+01 20
Time = 1.000E+02 21
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Dose Conversion Factor (and Related) Parameter Summary
File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.720E+00	6.720E+00	DCF2(1)
B-1	Am-241	4.440E-01	4.440E-01	DCF2(2)
B-1	Co-60	2.190E-04	2.190E-04	DCF2(3)
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(4)
B-1	Np-237+D	5.400E-01	5.400E-01	DCF2(5)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(6)
B-1	Pb-210+D	2.320E-02	2.320E-02	DCF2(7)
B-1	Pu-238	3.920E-01	3.920E-01	DCF2(8)
B-1	Pu-239	4.290E-01	4.290E-01	DCF2(9)
B-1	Pu-240	4.290E-01	4.290E-01	DCF2(10)
B-1	Ra-226+D	8.600E-03	8.600E-03	DCF2(11)
B-1	Ra-228+D	5.080E-03	5.080E-03	DCF2(12)
B-1	Sr-90+D	1.310E-03	1.310E-03	DCF2(13)
B-1	Th-228+D	3.450E-01	3.450E-01	DCF2(14)
B-1	Th-229+D	2.160E+00	2.160E+00	DCF2(15)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(16)
B-1	Th-232	1.640E+00	1.640E+00	DCF2(17)
B-1	U-233	1.350E-01	1.350E-01	DCF2(18)
B-1	U-234	1.320E-01	1.320E-01	DCF2(19)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(20)
B-1	U-236	1.250E-01	1.250E-01	DCF2(21)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(22)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.480E-02	DCF3(1)
D-1	Am-241	3.640E-03	3.640E-03	DCF3(2)
D-1	Co-60	2.690E-05	2.690E-05	DCF3(3)
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(4)
D-1	Np-237+D	4.440E-03	4.440E-03	DCF3(5)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(6)
D-1	Pb-210+D	7.270E-03	7.270E-03	DCF3(7)
D-1	Pu-238	3.200E-03	3.200E-03	DCF3(8)
D-1	Pu-239	3.540E-03	3.540E-03	DCF3(9)
D-1	Pu-240	3.540E-03	3.540E-03	DCF3(10)
D-1	Ra-226+D	1.330E-03	1.330E-03	DCF3(11)
D-1	Ra-228+D	1.440E-03	1.440E-03	DCF3(12)
D-1	Sr-90+D	1.530E-04	1.530E-04	DCF3(13)
D-1	Th-228+D	8.080E-04	8.080E-04	DCF3(14)
D-1	Th-229+D	4.030E-03	4.030E-03	DCF3(15)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(16)
D-1	Th-232	2.730E-03	2.730E-03	DCF3(17)
D-1	U-233	2.890E-04	2.890E-04	DCF3(18)
D-1	U-234	2.830E-04	2.830E-04	DCF3(19)
D-1	U-235+D	2.670E-04	2.670E-04	DCF3(20)
D-1	U-236	2.690E-04	2.690E-04	DCF3(21)
D-1	U-238+D	2.690E-04	2.690E-04	DCF3(22)

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
D-34				
D-34	Am-241 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(2,1)
D-34	Am-241 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-05	5.000E-05	RTF(2,2)
D-34	Am-241 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-06	2.000E-06	RTF(2,3)
D-34				
D-34	Co-60 , plant/soil concentration ratio, dimensionless	8.000E-02	8.000E-02	RTF(3,1)
D-34	Co-60 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-02	2.000E-02	RTF(3,2)
D-34	Co-60 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(3,3)
D-34				
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(4,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(4,3)
D-34				
D-34	Np-237+D , plant/soil concentration ratio, dimensionless	2.000E-02	2.000E-02	RTF(5,1)
D-34	Np-237+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,2)
D-34	Np-237+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(5,3)
D-34				
D-34	Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(6,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(6,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(6,3)
D-34				
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(7,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(7,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(7,3)
D-34				
D-34	Pu-238 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(8,1)
D-34	Pu-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(8,2)
D-34	Pu-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(8,3)
D-34				
D-34	Pu-239 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(9,1)
D-34	Pu-239 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(9,2)
D-34	Pu-239 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(9,3)
D-34				
D-34	Pu-240 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(10,1)
D-34	Pu-240 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(10,2)
D-34	Pu-240 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(10,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(11,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(11,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(11,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(12,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(12,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(12,3)
D-34				

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
D-34	Sr-90+D , plant/soil concentration ratio, dimensionless	3.000E-01	3.000E-01	RTF(13,1)
D-34	Sr-90+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-03	8.000E-03	RTF(13,2)
D-34	Sr-90+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(13,3)
D-34				
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(14,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(14,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(14,3)
D-34				
D-34	Th-229+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(15,1)
D-34	Th-229+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(15,2)
D-34	Th-229+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(15,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(16,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(16,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(16,3)
D-34				
D-34	Th-232 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(17,1)
D-34	Th-232 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(17,2)
D-34	Th-232 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(17,3)
D-34				
D-34	U-233 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(18,1)
D-34	U-233 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(18,2)
D-34	U-233 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(18,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(19,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(19,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(19,3)
D-34				
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(20,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(20,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(20,3)
D-34				
D-34	U-236 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(21,1)
D-34	U-236 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(21,2)
D-34	U-236 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(21,3)
D-34				
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(22,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(22,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(22,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
D-5				
D-5	Am-241 , fish	3.000E+01	3.000E+01	BIOFAC(2,1)
D-5	Am-241 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(2,2)
D-5				
D-5	Co-60 , fish	3.000E+02	3.000E+02	BIOFAC(3,1)
D-5	Co-60 , crustacea and mollusks	2.000E+02	2.000E+02	BIOFAC(3,2)
D-5				

Dose Conversion Factor (and Related) Parameter Summary (continued)
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Menu	Parameter	Current Value	Default	Parameter Name
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(4,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(4,2)
D-5				
D-5	Np-237+D , fish	3.000E+01	3.000E+01	BIOFAC(5,1)
D-5	Np-237+D , crustacea and mollusks	4.000E+02	4.000E+02	BIOFAC(5,2)
D-5				
D-5	Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(6,1)
D-5	Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(6,2)
D-5				
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(7,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(7,2)
D-5				
D-5	Pu-238 , fish	3.000E+01	3.000E+01	BIOFAC(8,1)
D-5	Pu-238 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(8,2)
D-5				
D-5	Pu-239 , fish	3.000E+01	3.000E+01	BIOFAC(9,1)
D-5	Pu-239 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(9,2)
D-5				
D-5	Pu-240 , fish	3.000E+01	3.000E+01	BIOFAC(10,1)
D-5	Pu-240 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(10,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(11,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(11,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(12,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(12,2)
D-5				
D-5	Sr-90+D , fish	6.000E+01	6.000E+01	BIOFAC(13,1)
D-5	Sr-90+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(13,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(14,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(14,2)
D-5				
D-5	Th-229+D , fish	1.000E+02	1.000E+02	BIOFAC(15,1)
D-5	Th-229+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(15,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(16,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(16,2)
D-5				
D-5	Th-232 , fish	1.000E+02	1.000E+02	BIOFAC(17,1)
D-5	Th-232 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(17,2)
D-5				
D-5	U-233 , fish	1.000E+01	1.000E+01	BIOFAC(18,1)
D-5	U-233 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(18,2)
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(19,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(19,2)
D-5				
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(20,1)
D-5	U-235+D , crustacea and mollusks	00E+01	6.000E+01	BIOFAC(20,2)

Dose Conversion Factor (and Related) Parameter Summary (continued)
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Menu	Parameter	Current Value	Default	Parameter Name
D-5	U-236 , fish	1.000E+01	1.000E+01	BIOFAC(21,1)
D-5	U-236 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(21,2)
D-5				
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(22,1)
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(22,2)

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)	1.932E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	3.660E+00	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.615E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	1.500E+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+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	5.000E+01	1.000E+02	---	T(6)
R011	Times for calculations (yr)	1.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	3.000E+02	1.000E+03	---	T(8)
R011	Times for calculations (yr)	5.000E+02	0.000E+00	---	T(9)
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Am-241	1.000E+00	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Co-60	1.000E+00	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Cs-137	1.000E+00	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Pu-238	1.000E+00	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): Pu-239	1.000E+00	0.000E+00	---	S1(9)
R012	Initial principal radionuclide (pCi/g): Pu-240	1.000E+00	0.000E+00	---	S1(10)
R012	Initial principal radionuclide (pCi/g): Ra-226	1.000E+00	0.000E+00	---	S1(11)
R012	Initial principal radionuclide (pCi/g): Sr-90	1.000E+00	0.000E+00	---	S1(13)
R012	Initial principal radionuclide (pCi/g): U-234	1.000E+00	0.000E+00	---	S1(19)
R012	Initial principal radionuclide (pCi/g): U-235	1.000E+00	0.000E+00	---	S1(20)
R012	Initial principal radionuclide (pCi/g): U-238	1.000E+00	0.000E+00	---	S1(22)
R012	Concentration in groundwater (pCi/L): Am-241	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Co-60	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): Pu-238	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): Pu-239	not used	0.000E+00	---	W1(9)
R012	Concentration in groundwater (pCi/L): Pu-240	not used	0.000E+00	---	W1(10)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(11)
R012	Concentration in groundwater (pCi/L): Sr-90	not used	0.000E+00	---	W1(13)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(19)
R012	Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	---	W1(20)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(22)
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)	1.660E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	3.300E-01	4.000E-01	---	TPCZ
R013	Contaminated zone effective porosity	2.400E-01	2.000E-01	---	EPCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	5.000E+03	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	4.900E+00	5.300E+00	---	BCZ
R013	Humidity in air (g/cm**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	4.600E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.230E+00	1.000E+00	---	PRECIP

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R013	Irrigation (m/yr)	2.600E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.660E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	3.300E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.400E-01	2.000E-01	---	EPSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.000E+04	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	4.800E-03	2.000E-02	---	HGWT
R014	Saturated zone b parameter	4.900E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.800E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	0	1	---	NS
R016	Distribution coefficients for Am-241				
R016	Contaminated zone (cm**3/g)	1.900E+03	2.000E+01	---	DCNUCC(2)
R016	Saturated zone (cm**3/g)	1.900E+03	2.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.819E-05	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Co-60				
R016	Contaminated zone (cm**3/g)	6.000E+01	1.000E+03	---	DCNUCC(3)
R016	Saturated zone (cm**3/g)	6.000E+01	1.000E+03	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.840E-03	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	4.400E+01	1.000E+03	---	DCNUCC(4)
R016	Saturated zone (cm**3/g)	4.400E+01	1.000E+03	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.507E-03	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for Pu-238				
R016	Contaminated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCC(8)
R016	Saturated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.010E-04	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for Pu-239				
R016	Contaminated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCC(9)
R016	Saturated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.010E-04	ALEACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Pu-240				
R016	Contaminated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCC(10)
R016	Saturated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCS(10)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.010E-04	ALEACH(10)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(10)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	1.300E+02	7.000E+01	---	DCNUCC(11)
R016	Saturated zone (cm**3/g)	1.300E+02	7.000E+01	---	DCNUCS(11)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.499E-04	ALEACH(11)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(11)
R016	Distribution coefficients for Sr-90				
R016	Contaminated zone (cm**3/g)	3.000E+00	3.000E+01	---	DCNUCC(13)
R016	Saturated zone (cm**3/g)	3.000E+00	3.000E+01	---	DCNUCS(13)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.568E-02	ALEACH(13)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(13)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCC(19)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCS(19)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.466E-03	ALEACH(19)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(19)
R016	Distribution coefficients for U-235				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCC(20)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCS(20)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.466E-03	ALEACH(20)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(20)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCC(22)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCS(22)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.466E-03	ALEACH(22)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(22)
R016	Distribution coefficients for daughter Ac-227				
R016	Contaminated zone (cm**3/g)	4.500E+02	2.000E+01	---	DCNUCC(1)
R016	Saturated zone (cm**3/g)	4.500E+02	2.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.457E-04	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for daughter Np-237				
R016	Contaminated zone (cm**3/g)	5.000E+00	-1.000E+00	---	DCNUCC(5)
R016	Saturated zone (cm**3/g)	5.000E+00	-1.000E+00	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.168E-02	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter Pa-231				
R016	Contaminated zone (cm**3/g)	5.500E+02	5.000E+01	---	DCNUCC(6)
R016	Saturated zone (cm**3/g)	5.500E+02	5.000E+01	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.010E-04	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	2.700E+02	1.000E+02	---	DCNUCC(7)
R016	Saturated zone (cm**3/g)	2.700E+02	1.000E+02	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.094E-04	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for daughter Ra-228				
R016	Contaminated zone (cm**3/g)	1.300E+02	7.000E+01	---	DCNUCC(12)
R016	Saturated zone (cm**3/g)	1.300E+02	7.000E+01	---	DCNUCS(12)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.499E-04	ALEACH(12)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(12)
R016	Distribution coefficients for daughter Th-228				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(14)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(14)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.455E-05	ALEACH(14)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(14)
R016	Distribution coefficients for daughter Th-229				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(15)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(15)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.455E-05	ALEACH(15)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(15)
R016	Distribution coefficients for daughter Th-230				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(16)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(16)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.455E-05	ALEACH(16)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(16)
R016	Distribution coefficients for daughter Th-232				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(17)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(17)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.455E-05	ALEACH(17)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(17)
R016	Distribution coefficients for daughter U-233				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCC(18)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCS(18)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.466E-03	ALEACH(18)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(18)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter U-236				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCC(21)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCS(21)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.466E-03	ALEACH(21)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(21)
R017	Inhalation rate (m**3/yr)	2.000E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-05	2.000E-04	---	MLINH
R017	Dilution length for airborne dust, inhalation (m)	3.000E+00	3.000E+00	---	LM
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	1.000E+00	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	1.000E+00	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)	7.300E-02	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	1 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)
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)	1.600E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	0.000E+00	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	6.300E+01	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)	3.650E+01	3.650E+01	---	SOIL

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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	0.000E+00	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	0.000E+00	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	0.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	6.000E-03	-1	---	FPLANT
R018	Contamination fraction of meat	1.400E-01	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	1.360E+00	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)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	1.000E-02	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-05	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	0.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	0.000E+00	1.000E+00	---	FGWIR
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	not used	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	not used	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	not used	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	0.000E+00	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR
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

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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	2.000E-06	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	2.000E+00	2.000E+00	---	HMIX
R021	Average annual wind speed (m/sec)	6.230E+00	2.000E+00	---	WIND
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	code computed (time dependent)	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	2.500E-01	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	1.500E-01	1.500E-01	---	EMANA(2)

Summary of Pathway Selections

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

Contaminated Zone Dimensions	
Area:	19315.00 square meters
Thickness:	3.66 meters
Cover Depth:	0.00 meters

Initial Soil Concentrations, pCi/g	
Am-241	1.000E+00
Co-60	1.000E+00
Cs-137	1.000E+00
Pu-238	1.000E+00
Pu-239	1.000E+00
Pu-240	1.000E+00
Ra-226	1.000E+00
Sr-90	1.000E+00
U-234	1.000E+00
U-235	1.000E+00
U-238	1.000E+00

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 15 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+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
TDOSE(t):	2.394E+00	2.246E+00	2.000E+00	1.497E+00	1.126E+00	1.041E+00	9.307E-01	6.919E-01	5.350E-01	2.916E-01
M(t):	1.596E-01	1.497E-01	1.334E-01	9.981E-02	7.505E-02	6.939E-02	6.205E-02	4.613E-02	3.567E-02	1.944E-02

Maximum TDOSE(t): 2.394E+00 mrem/yr at t = 0.000E+00 years

Summary : HWMP Soil Cleanup Guidelines: Open Space, @ 50 y and 15 mrem/y

File : HWMPOSP.DAT

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 5.000E+01 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.
Am-241	2.865E-03	0.0028	5.840E-03	0.0056	0.000E+00	0.0000	3.218E-03	0.0031	1.680E-05	0.0000	0.000E+00	0.0000	8.926E-03	0.0086
Co-60	1.426E-03	0.0014	3.981E-09	0.0000	0.000E+00	0.0000	2.615E-06	0.0000	7.120E-07	0.0000	0.000E+00	0.0000	9.118E-08	0.0000
Cs-137	6.528E-02	0.0627	1.267E-07	0.0000	0.000E+00	0.0000	5.330E-04	0.0005	2.365E-04	0.0002	0.000E+00	0.0000	3.702E-05	0.0000
Pu-238	7.296E-06	0.0000	3.737E-03	0.0036	4.096E-14	0.0000	2.049E-03	0.0020	2.138E-05	0.0000	0.000E+00	0.0000	5.687E-03	0.0055
Pu-239	2.057E-05	0.0000	6.061E-03	0.0058	0.000E+00	0.0000	3.361E-03	0.0032	3.508E-05	0.0000	0.000E+00	0.0000	9.325E-03	0.0090
Pu-240	1.047E-05	0.0000	6.038E-03	0.0058	2.585E-18	0.0000	3.348E-03	0.0032	3.494E-05	0.0000	0.000E+00	0.0000	9.289E-03	0.0089
Ra-226	7.278E-01	0.6992	3.646E-04	0.0004	2.029E-04	0.0002	1.006E-01	0.0967	1.624E-03	0.0016	0.000E+00	0.0000	1.789E-02	0.0172
Sr-90	9.176E-05	0.0001	9.566E-07	0.0000	0.000E+00	0.0000	2.249E-03	0.0022	2.303E-04	0.0002	0.000E+00	0.0000	2.083E-05	0.0000
U-234	2.406E-05	0.0000	1.367E-03	0.0013	9.282E-10	0.0000	4.921E-04	0.0005	8.239E-06	0.0000	0.000E+00	0.0000	5.463E-04	0.0005
U-235	3.843E-02	0.0369	1.333E-03	0.0013	0.000E+00	0.0000	5.721E-04	0.0005	1.772E-05	0.0000	0.000E+00	0.0000	5.587E-04	0.0005
U-238	6.878E-03	0.0066	1.221E-03	0.0012	4.178E-14	0.0000	4.674E-04	0.0004	7.827E-06	0.0000	0.000E+00	0.0000	5.188E-04	0.0005
Total	8.428E-01	0.8097	2.596E-02	0.0249	2.029E-04	0.0002	1.169E-01	0.1123	2.233E-03	0.0021	0.000E+00	0.0000	5.280E-02	0.0507

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 5.000E+01 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.
Am-241	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	2.086E-02	0.0200
Co-60	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	1.429E-03	0.0014
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	6.609E-02	0.0635
Pu-238	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	1.150E-02	0.0110
Pu-239	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	1.880E-02	0.0181
Pu-240	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	1.872E-02	0.0180
Ra-226	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	8.485E-01	0.8151
Sr-90	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	2.593E-03	0.0025
U-234	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	2.438E-03	0.0023
U-235	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	4.091E-02	0.0393
U-238	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	9.093E-03	0.0087
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	1.041E+00	1.0000

*Sum of all water independent and dependent pathways.

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Branch Fraction	DSR(j,t) (mrem/yr)/(pCi/g) t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
U-238	U-238	1.000E+00	1.256E-02	1.248E-02	1.232E-02	1.178E-02	1.035E-02	9.093E-03	6.581E-03	1.806E-03	4.954E-04	1.954E-05
U-238	U-234	1.000E+00	0.000E+00	9.539E-09	2.810E-08	8.936E-08	2.354E-07	3.447E-07	4.989E-07	4.105E-07	1.877E-07	1.479E-08
U-238	Th-230	1.000E+00	0.000E+00	8.692E-14	7.675E-13	8.245E-12	6.805E-11	1.736E-10	5.644E-10	2.360E-09	3.385E-09	3.940E-09
U-238	Ra-226	1.000E+00	0.000E+00	1.527E-15	4.092E-14	1.478E-12	3.719E-11	1.606E-10	1.082E-09	1.533E-08	3.980E-08	9.613E-08
U-238	Pb-210	1.000E+00	0.000E+00	1.902E-18	1.191E-16	1.252E-14	8.254E-13	5.356E-12	5.788E-11	1.331E-09	3.877E-09	1.012E-08
U-238	ΣDSR(j)		1.256E-02	1.248E-02	1.232E-02	1.178E-02	1.035E-02	9.093E-03	6.581E-03	1.806E-03	4.957E-04	1.966E-05

Branch Fraction is the cumulative factor for the j'th principal radionuclide daughter: CUMBRF(j) = BRF(1)*BRF(2)* ... BRF(j).
The DSR includes contributions from associated (half-life ≤ 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 15 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
Am-241	6.616E+02	6.627E+02	6.649E+02	6.727E+02	6.954E+02	7.189E+02	7.812E+02	1.089E+03	1.519E+03	3.486E+03
Co-60	1.335E+01	1.525E+01	1.992E+01	5.065E+01	7.291E+02	1.049E+04	8.250E+06	*1.131E+15	*1.131E+15	*1.131E+15
Cs-137	6.307E+01	6.471E+01	6.811E+01	8.148E+01	1.360E+02	2.270E+02	8.168E+02	1.370E+05	2.298E+07	8.376E+12
Pu-238	8.698E+02	8.769E+02	8.912E+02	9.432E+02	1.109E+03	1.304E+03	1.955E+03	9.881E+03	4.992E+04	2.816E+06
Pu-239	7.886E+02	7.888E+02	7.892E+02	7.905E+02	7.941E+02	7.978E+02	8.070E+02	8.449E+02	8.847E+02	9.924E+02
Pu-240	7.891E+02	7.893E+02	7.898E+02	7.915E+02	7.964E+02	8.013E+02	8.137E+02	8.652E+02	9.200E+02	1.073E+03
Ra-226	1.804E+01	1.800E+01	1.793E+01	1.775E+01	1.756E+01	1.768E+01	1.852E+01	2.382E+01	3.079E+01	5.848E+01
Sr-90	2.955E+02	3.137E+02	3.533E+02	5.357E+02	1.760E+03	5.784E+03	1.132E+05	1.661E+10	*1.365E+14	*1.365E+14
U-234	4.464E+03	4.493E+03	4.552E+03	4.762E+03	5.415E+03	6.153E+03	8.440E+03	2.633E+04	5.145E+04	5.157E+04
U-235	2.673E+02	2.690E+02	2.725E+02	2.849E+02	3.234E+02	3.667E+02	4.998E+02	1.609E+03	4.161E+03	1.074E+04
U-238	1.194E+03	1.202E+03	1.217E+03	1.274E+03	1.449E+03	1.650E+03	2.279E+03	8.305E+03	3.026E+04	*3.360E+05

*At specific activity limit

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	DOSE(j,t), mrem/yr /pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
Am-241	Am-241	1.000E+00	2.267E-02	2.263E-02	2.256E-02	2.230E-02	2.157E-02	2.086E-02	1.920E-02	1.377E-02	9.876E-03	4.302E-03
Np-237	Am-241	1.000E+00	0.000E+00	5.861E-08	1.717E-07	5.281E-07	1.271E-06	1.722E-06	2.168E-06	1.793E-06	1.289E-06	5.615E-07
U-233	Am-241	1.000E+00	0.000E+00	2.762E-15	2.257E-14	2.276E-13	1.677E-12	3.866E-12	1.001E-11	2.160E-11	1.979E-11	9.677E-12
Th-229	Am-241	1.000E+00	0.000E+00	3.472E-18	9.256E-17	3.250E-15	7.594E-14	3.060E-13	1.768E-12	1.647E-11	3.373E-11	6.112E-11
Co-60	Co-60	1.000E+00	1.124E+00	9.834E-01	7.532E-01	2.962E-01	2.057E-02	1.429E-03	1.818E-06	4.761E-18	1.244E-29	0.000E+00
Cs-137	Cs-137	1.000E+00	2.378E-01	2.318E-01	2.202E-01	1.841E-01	1.103E-01	6.609E-02	1.836E-02	1.095E-04	6.526E-07	1.791E-12
Pu-238	Pu-238	1.000E+00	1.724E-02	1.711E-02	1.683E-02	1.590E-02	1.352E-02	1.150E-02	7.671E-03	1.518E-03	3.003E-04	5.229E-06
U-234	Pu-238	1.000E+00	0.000E+00	9.486E-09	2.799E-08	8.859E-08	2.297E-07	3.310E-07	4.602E-07	3.245E-07	1.282E-07	7.281E-09
U-234	U-234	1.000E+00	3.360E-03	3.338E-03	3.295E-03	3.149E-03	2.767E-03	2.431E-03	1.759E-03	4.825E-04	1.323E-04	5.210E-06
U-234	U-238	1.000E+00	0.000E+00	9.539E-09	2.810E-08	8.936E-08	2.354E-07	3.447E-07	4.989E-07	4.105E-07	1.877E-07	1.479E-08
U-234	ΣDOSE(j):		3.360E-03	3.338E-03	3.295E-03	3.150E-03	2.768E-03	2.432E-03	1.760E-03	4.832E-04	1.326E-04	5.232E-06
Th-230	Pu-238	1.000E+00	0.000E+00	8.686E-14	7.663E-13	8.201E-12	6.697E-11	1.691E-10	5.364E-10	2.074E-09	2.831E-09	3.158E-09
Th-230	U-234	1.000E+00	0.000E+00	6.091E-08	1.806E-07	5.875E-07	1.653E-06	2.588E-06	4.455E-06	7.960E-06	8.863E-06	9.021E-06
Th-230	U-238	1.000E+00	0.000E+00	8.692E-14	7.675E-13	8.245E-12	6.805E-11	1.736E-10	5.644E-10	2.360E-09	3.385E-09	3.940E-09
Th-230	ΣDOSE(j):		0.000E+00	6.091E-08	1.806E-07	5.875E-07	1.653E-06	2.588E-06	4.456E-06	7.964E-06	8.869E-06	9.028E-06
Ra-226	Pu-238	1.000E+00	0.000E+00	1.526E-15	4.087E-14	1.472E-12	3.675E-11	1.574E-10	1.041E-09	1.390E-08	3.460E-08	7.922E-08
Ra-226	Ra-226	1.000E+00	8.313E-01	8.303E-01	8.281E-01	8.207E-01	7.999E-01	7.797E-01	7.312E-01	5.657E-01	4.377E-01	2.304E-01
Ra-226	U-234	1.000E+00	0.000E+00	1.617E-09	1.448E-08	1.580E-07	1.351E-06	3.567E-06	1.262E-05	7.253E-05	1.366E-04	2.501E-04
Ra-226	U-238	1.000E+00	0.000E+00	1.527E-15	4.092E-14	1.478E-12	3.719E-11	1.606E-10	1.082E-09	1.533E-08	3.980E-08	9.613E-08
Ra-226	ΣDOSE(j):		8.313E-01	8.303E-01	8.281E-01	8.207E-01	7.999E-01	7.797E-01	7.312E-01	5.658E-01	4.378E-01	2.307E-01
Pb-210	Pu-238	1.000E+00	0.000E+00	1.902E-18	1.190E-16	1.247E-14	8.173E-13	5.268E-12	5.600E-11	1.215E-09	3.387E-09	8.357E-09
Pb-210	Ra-226	1.000E+00	0.000E+00	3.124E-03	8.425E-03	2.445E-02	5.406E-02	6.879E-02	7.869E-02	6.398E-02	4.951E-02	2.607E-02
Pb-210	U-234	1.000E+00	0.000E+00	2.483E-12	5.415E-11	1.735E-09	3.807E-08	1.476E-07	7.972E-07	6.746E-06	1.377E-05	2.656E-05
Pb-210	U-238	1.000E+00	0.000E+00	1.902E-18	1.191E-16	1.252E-14	8.254E-13	5.356E-12	5.788E-11	1.331E-09	3.877E-09	1.012E-08
Pb-210	ΣDOSE(j):		0.000E+00	3.124E-03	8.425E-03	2.445E-02	5.406E-02	6.879E-02	7.870E-02	6.399E-02	4.952E-02	2.609E-02
Pu-239	Pu-239	1.000E+00	1.902E-02	1.902E-02	1.901E-02	1.898E-02	1.889E-02	1.880E-02	1.859E-02	1.775E-02	1.696E-02	1.511E-02
U-235	Pu-239	1.000E+00	0.000E+00	5.509E-11	1.641E-10	5.345E-10	1.502E-09	2.347E-09	4.018E-09	6.997E-09	7.550E-09	7.028E-09
U-235	U-235	1.000E+00	5.611E-02	5.575E-02	5.503E-02	5.260E-02	4.622E-02	4.061E-02	2.939E-02	8.064E-03	2.213E-03	8.725E-05
U-235	ΣDOSE(j):		5.611E-02	5.575E-02	5.503E-02	5.260E-02	4.622E-02	4.061E-02	2.939E-02	8.064E-03	2.213E-03	8.726E-05
Pa-231	Pu-239	1.000E+00	0.000E+00	1.815E-15	1.614E-14	1.760E-13	1.513E-12	4.020E-12	1.444E-11	8.859E-11	1.786E-10	3.864E-10
Pa-231	U-235	1.000E+00	0.000E+00	3.662E-06	1.087E-05	3.536E-05	9.931E-05	1.552E-04	2.658E-04	4.633E-04	5.005E-04	4.677E-04
Pa-231	ΣDOSE(j):		0.000E+00	3.662E-06	1.087E-05	3.536E-05	9.931E-05	1.552E-04	2.658E-04	4.633E-04	5.006E-04	4.677E-04
Ac-227	Pu-239	1.000E+00	0.000E+00	3.585E-17	9.179E-16	3.145E-14	7.051E-13	2.752E-12	1.505E-11	1.349E-10	2.942E-10	6.701E-10
Ac-227	U-235	1.000E+00	0.000E+00	1.071E-07	9.180E-07	9.267E-06	6.542E-05	1.453E-04	3.546E-04	7.975E-04	8.913E-04	8.418E-04
Ac-227	ΣDOSE(j):		0.000E+00	1.071E-07	9.180E-07	9.267E-06	6.542E-05	1.453E-04	3.546E-04	7.975E-04	8.913E-04	8.418E-04

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	DOSE(j,t), mrem/yr/pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
Pu-240	Pu-240	1.000E+00	1.901E-02	1.900E-02	1.899E-02	1.895E-02	1.884E-02	1.872E-02	1.843E-02	1.734E-02	1.630E-02	1.398E-02
U-236	Pu-240	1.000E+00	0.000E+00	9.397E-11	2.794E-10	9.091E-10	2.551E-09	3.983E-09	6.806E-09	1.172E-08	1.249E-08	1.120E-08
Th-232	Pu-240	1.000E+00	0.000E+00	2.433E-20	2.180E-19	2.384E-18	2.053E-17	5.458E-17	1.965E-16	1.216E-15	2.477E-15	5.509E-15
Ra-228	Pu-240	1.000E+00	0.000E+00	1.348E-20	3.418E-19	1.035E-17	1.746E-16	5.642E-16	2.383E-15	1.644E-14	3.415E-14	7.696E-14
Th-228	Pu-240	1.000E+00	0.000E+00	1.731E-21	1.166E-19	8.229E-18	2.129E-16	7.566E-16	3.418E-15	2.454E-14	5.133E-14	1.162E-13
Sr-90	Sr-90	1.000E+00	5.075E-02	4.782E-02	4.246E-02	2.800E-02	8.521E-03	2.593E-03	1.325E-04	9.033E-10	6.158E-15	7.468E-28
U-238	U-238	1.000E+00	1.256E-02	1.248E-02	1.232E-02	1.178E-02	1.035E-02	9.093E-03	6.581E-03	1.806E-03	4.954E-04	1.954E-05

BRF(i) is the branch fraction of the parent nuclide.

Appendix C

Hazardous Waste Management Facility (HWMF) Soil Volumes and Radionuclide Concentrations

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Soil Volumes, Areas, and Lengths Parallel to the Aquifer Flow vs. Depth Intervals C-15

Soil Bore Concentrations (pCi/g) for the Various Depth Intervals

Cs 137 Soil Bore Concentration vs. Depth Interval

Cs 137 Concentration*	Cs 137	Cs 137	Cs 137	Cs 137
Soil Bore I.D. No.**	Conc.: 0-1 ft Interval	Conc.: 1-4 ft Interval	Conc.: 4-8 ft Interval	Conc.: 8-12 ft Inter
	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)
SB16	14			
SB17	5.1			
SB18	21			
SB19	30			
SB20	92			
SB21	63			
SB22	324			
SB23	130			
SB24	540			
SB25	2300	82	80	
SB26	160			
SB27	23000	1000	350	131
SB29	500			
SB30	13			
SB31	33			
SB32	1300	1000	1900	110
SB33	320	280	99	
SB34	270			
SB35	44000	2.2	1400	1700
SB36	36000	330	6700	
SB37	810000	190	4700	6400
SB38	230000	7.2	27000	
SB39	38000	310	840	230
SB40	515000	2800	18000	1500
SB41	480			
SB42	1.2			
SB44	1800			
SB45	780			
SB46	70			
SB48	140			
SB50	62000	120		
SB51	9.4			
SB52	130	0.56	11	
SB55	1000			
SB56	6700			
Arithmetic Average	50720	510	5553	1678
* OU I FS Vol. 2 Appendix F				
** Soil bore results at locations within 67 pCi/g contour.				
If no result is reported, the detected concentration was				
below the critical detection level.				

Sr 90 Soil Bore Concentrations vs. Depth Interval

Sr 90 Concentration*	Sr 90	Sr 90	Sr 90	Sr 90
Soil Bore I.D. No.**	Conc.: 0-1 ft Interval	Conc.: 1-4 ft Interval	Conc.: 4-8 ft Interval	Conc.: 8-12 ft Inter
	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)
SB16	6			
SB17	5.1			
SB18	1.6			
SB19	1.6			
SB20	2.3			
SB21	40			
SB22	1.8			
SB23	1.2			
SB24	4.9			
SB25	26	0.04	1.1	
SB26	1.3			
SB27	210	12	0.51	0.054
SB29	62			
SB30	1.5			
SB31	1.3			
SB32	30	31	62	18
SB33	4.1	16	8.3	
SB34	6.1			
SB35	190	1	5.9	5.1
SB36	230	4.44	6.3	
SB37	1300	1.8	5.2	57
SB38	820	0.14	120	
SB39	260	6.9	5.8	2.1
SB40	410	5.1	92	1.2
SB41	45			
SB42	0.66			
SB44	19			
SB45	17			
SB46	4.7			
SB48	13			
SB50	120	2.3		
SB51	1.15			
SB52	1.8	2.7	0.16	
SB55	8.8			
SB56	90			
Arithmetic Average	112	7	28	14
* OU I FS Vol. 2 Appendix F				
** Soil bore results at locations within 67 pCi/g contour for Cs137.				
If no result is reported, the detected concentration was				
below the critical detection level.				

U 235 Soil Bore Concentrations vs. Depth Interval

U 235 Concentration*	U 235	U 235	U 235	U 235
Soil Bore I.D. No.**	Conc.: 0-1 ft Interval	Conc.: 1-4 ft Interval	Conc.: 4-8 ft Interval	Conc.: 8-12 ft Inter
(det=detected>MDC)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)
SB16 det A	0.093			
SB17	0.78 U			
SB18	0.95 U			
SB19	2 U			
SB20	1.6 U			
SB21	0.84 U			
SB22 det A	0.034			
SB23	1.5 U			
SB24	2.7 U			
SB25	12 U	1.3 U	1.2 U	
SB26	1.6 U			
SB27	30 U	9 U	2.3 U	1.5 U
SB29	4.5 U			
SB30	0.75 U			
SB31	1.1 U			
SB32	4.5 U	4.9 U	8.2 U	2 U
SB33 det A & B	0.068	0.24	1.8 U	
SB34	2.1 U			
SB35	28 U	0.83 U	13 U	12 U
SB36 det A	0.28	0.84 U	4.7 U	
SB37	770 U	2 .0U	16 U	20 U
SB38	120 U	0.7 U	33 U	
SB39	21 U	2.6 U	3.5 U	2.1 U
SB40	400 U	14 U	34 U	3.6 U
SB41	2.9 U			
SB42	0.44 U			
SB44 det A	0.13			
SB45 det A	0.053			
SB46	1.3 U			
SB48	1.6 U			
SB50	68 U	1.5 U		
SB51	0.86 U			
SB52	1.4 U	1.5 U	0.78 U	
SB55	5.1 U			
SB56	45 U			
Max. Detectable Conc.	0.28	0.24		
* OU I FS Vol. 2 Appendix F				
** Soil bore results at locations within 67 pCi/g contour for Cs137.				
U = undetected at critical level i.e., 2 times measurement error.				

Am 241 Soil Bore Concentrations vs. Depth Interval

Am 241 Concentration*	Am 241	Am 241	Am 241	Am 241
Soil Bore I.D. No.**	Conc.: 0-1 ft Interval	Conc.: 1-4 ft Interval	Conc.: 4-8 ft Interval	Conc.: 8-12 ft Inter
(det=detected >MDC)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)
SB16				
SB17	0.63 U			
SB18	0.86 U			
SB19	7 U			
SB20	1.3 U			
SB21 det A	0.79			
SB22				
SB23	1.5 U			
SB24	0.78 U			
SB25	10 U	1 U	0.99 U	
SB26	0.43 U			
SB27	25 U	7 U	1.9 U	1.3 U
SB29	3.7 U			
SB30	0.21 U			
SB31	0.96 U			
SB32	4.3 U	4 U	6.5 U	1.7 U
SB33 det A	0.26			
SB34	2.1 U			
SB35	7.5 U	0.65 U	48 U	10 U
SB36 det A	4.5	0.88 U	18 U	
SB37	190 U	1.7 U	3.7 U	4.9 U
SB38	31 U	0.62 U	28 U	
SB39	5.8 U	2.1 U	2.9 U	1.8 U
SB40	100 U	11 U	27 U	3.1 U
SB41	2.8 U			
SB42	0.51 U			
SB44 det A	0.27			
SB45 det A	0.44			
SB46	1.5 U			
SB48	0.47 U			
SB50	57 U	1.2 U		
SB51	0.79 U			
SB52	1.4 U	5 U	0.64 U	
SB55	4.1 U			
SB56	172 U			
Max. Detectable Conc.	4.5			
* OU I FS Vol. 2 Appendix F				
** Soil Bore results at locations within 67 pCi/g Contour for Cs137				
U = undetected at critical level i.e., 2 times measurement error				

Volume Weighted Arithmetic and Geometric Average Concentrations

Volume-Weighted Arithmetic & Geometric Concentrations and Associated Sr 90 /Cs137 Ratios

Volume Weighted Averages	Vol.: 0-1 ft Interval	Vol.: 1-4 ft Interval	Vol.: 4-8 ft Interval	Vol.: 8-12 ft Interval	TOTAL VOLUME	
Volume vs. Depth Interval *	(CY)	(CY)	(CY)	(CY)	(CY)	
Depth Interval Total Volume	7600	8110	9830	5260	30800	
	Concentration (pCi/g)	Concentration (pCi/g)	Concentration (pCi/g)	Concentration (pCi/g)		
Cs 137 Geometric Average Conc.	608.48	164.43	1003.81	614.97		
Sr 90 Geometric Average Conc.	14.31	2.50	6.25	2.99		
Cs 137 Arithmetic Average Conc.	50721	510	5553	1678		
Sr 90 Arithmetic Average Conc.	112.5	6.95	27.93	13.92		
Weighted Geometric Avg. Conc.	Vol.: 0-1 ft Interval	Vol.: 1-4 ft Interval	Vol.: 4-8 ft Interval	Vol.: 8-12 ft Interval	Vol.: 0-12 ft Interval	
Radionuclide	Weighted Geometric Avg. Conc.	Weighted Geometric Avg. Conc.	Weighted Geometric Avg. Conc.	Weighted Geometric Avg. Conc.	Weighted Geometric Avg. Conc.	
	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	
Cesium 137	150	43	320	105	619	Geometric Average
Strontium 90	3.53	0.66	2.00	0.51	6.69	Sr 90/Cs137 Ratio
Sr 90/Cs 137	0.0235	0.0152	0.0062	0.0049		0.0108
Weighted Arithmetic Avg. Conc.	Vol.: 0-1 ft Interval	Vol.: 1-4 ft Interval	Vol.: 4-8 ft Interval	Vol.: 8-12 ft Interval	Vol.: 0-12 ft Interval	
Radionuclide	Weighted Arithmetic Avg. Conc.	Weighted Arithmetic Avg. Conc.	Weighted Arithmetic Avg. Conc.	Weighted Arithmetic Avg. Conc.	Weighted Arithmetic Avg. Conc.	
	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	
Cesium 137	12516	147	1772	287	14721	Arithmetic Average
Strontium 90	27.76	1.83	8.92	2.38	40.89	Sr 90/Cs137 Ratio
Sr 90/Cs 137	0.0022	0.0125	0.0050	0.0083		0.0028

Cs 137 & Sr 90 Arithmetic Average Concentration vs. Depth Interval

Cs 137 Concentration*	Cs 137	Cs 137	Cs 137	Cs 137			
Soil Bore I.D. No.**	Conc.: 0-1 ft Interval	Conc.: 1-4 ft Interval	Conc.: 4-8 ft Interval	Conc.: 8-12 ft Interval			
	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)			
SB16	14						
SB17	5.1						
SB18	21						
SB19	30						
SB20	92						
SB21	63						
SB22	324						
SB23	130						
SB24	540						
SB25	2300	82	80				
SB26	160						
SB27	23000	1000	350	131			
SB29	500						
SB30	13						
SB31	33						
SB32	1300	1000	1900	110			
SB33	320	280	99				
SB34	270						
SB35	44000	2.2	1400	1700			
SB36	35000	330	6700				
SB37	810000	190	4700	6400			
SB38	230000	7.2	27000				
SB39	38000	310	840	230			
SB40	515000	2800	18000	1500			
SB41	480						
SB42	1.2						
SB44	1800						
SB45	780						
SB46	70						
SB48	140						
SB50	62000	120					
SB51	9 4						
SB52	130	0.56	11				
SB55	1000						
SB56	6700						
Arithmetic Average	50720	510	5553	1678			
* OU I FS Vol. 2 Appendix F							
** Soil bore results at locations within 67 pCi/g contour.							
If no result is reported, the detected concentration was							
below the critical detection level.							
Cs137 0-1 ft		*Cs137 1-4 ft*		*Cs137 4-8 ft*		*Cs137 8-12 ft*	
Mean	50720.73	Mean	510 16	Mean	5552 73	Mean	1678.50
Standard Error	27398.26	Standard Error	135 39	Standard Error	1499 75	Standard Error	671 14
Median	324.00	Median	235 00	Median	1400 00	Median	865 00
Mode	130 00	Mode	0 00	Mode	0 00	Mode	0 00
Standard Deviation	162090 31	Standard Deviation	800.99	Standard Deviation	8872 62	Standard Deviation	2419 83
Variance	26273268202 73	Variance	641589.22	Variance	78723384 02	Variance	5855597 50
Kurtosis	16 04	Kurtosis	20 39	Kurtosis	15.34	Kurtosis	9 62
Skewness	3 96	Skewness	4.29	Skewness	3 87	Skewness	3 02
Range	809998 80	Range	2800 00	Range	27000 00	Range	6400 00
Minimum	1.20	Minimum	0.56	Minimum	11 00	Minimum	110 00
Maximum	810000 00	Maximum	2800 00	Maximum	27000 00	Maximum	6400 00
Sum	1775225 70	Sum	6121.96	Sum	61080 00	Sum	10071.00
Count	35 00	Count	12 00	Count	11	Count	6 00

Sr 90 Concentration*	Sr 90	Sr 90	Sr 90	Sr 90			
Soil Bore I.D. No.**	Conc.: 0-1 ft Interval	Conc.: 1-4 ft Interval	Conc.: 4-8 ft Interval	Conc.: 8-12 ft Interval			
	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)			
SB16	6						
SB17	5 1						
SB18	1.6						
SB19	1 6						
SB20	2.3						
SB21	40						
SB22	1 8						
SB23	1.2						
SB24	4.9						
SB25	26	0.04	1.1				
SB26	1 3						
SB27	210	12	0.51	0.054			
SB29	62						
SB30	1 5						
SB31	1 3						
SB32	30	31	62	18			
SB33	4.1	16	8 3				
SB34	6 1						
SB35	190	1	5.9	5.1			
SB36	230	4.44	6 3				
SB37	1300	1 8	5.2	57			
SB38	820	0.14	120				
SB39	260	6.9	5 8	2 1			
SB40	410	5.1	92	1.2			
SB41	45						
SB42	0 66						
SB44	19						
SB45	17						
SB46	4 7						
SB48	13						
SB50	120	2.3					
SB51	1 15						
SB52	1.8	2.7	0.16				
SB55	8 8						
SB56	90						
Arithmetic Average	112	7	28	14			
* OU I FS Vol. 2 Appendix F							
** Soil bore results at locations within 67 pCi/g contour for Cs137.							
If no result is reported, the detected concentration was							
below the critical detection level							
Sr90 0-1 ft Stats		*Sr90 1-4 ft Stats*		*Sr90 4-8 ft Stats*		*Sr90 8-12 ft Stats*	
Mean	112 51	Mean	6.95	Mean	27.93	Mean	13 91
Standard Error	44.16	Standard Error	1.52	Standard Error	8 74	Standard Error	6.13
Median	8 80	Median	3.57	Median	5.90	Median	3 60
Mode	1 30	Mode	0.00	Mode	0 00	Mode	0 00
Standard Deviation	261.26	Standard Deviation	9.00	Standard Deviation	42 81	Standard Deviation	22.11
Variance	68257.89	Variance	81.02	Variance	1833 04	Variance	488.82
Kurtosis	13.67	Kurtosis	14.63	Kurtosis	6 62	Kurtosis	9.94
Skewness	3.56	Skewness	3.63	Skewness	2 72	Skewness	3.10
Range	1299.34	Range	31.00	Range	120 00	Range	57.00
Minimum	0.66	Minimum	0 04	Minimum	0 16	Minimum	0.05
Maximum	1300.00	Maximum	31.00	Maximum	120 00	Maximum	57.00
Sum	3937.91	Sum	83 42	Sum	307.27	Sum	83 45
Count	35 00	Count	12 00	Count	11.00	Count	6 00

If no results are listed the detected concentrations were reported as below the critical level, i.e., undetected.

Cs 137 & Sr 90 Geometric Average Concentration vs. Depth Interval

Cs 137 Concentration*	Cs 137	Ln Cs 137	Cs 137	Ln Cs 137	Cs 137	Ln Cs 137	Cs 137	Ln Cs 137
Soil Bore I.D. No.**	Conc.: 0-1 ft Interval	Conc.: 0-1 ft Interval	Conc.: 1-4 ft Interval	Conc.: 1-4 ft Interval	Conc.: 4-8 ft Interval	Conc.: 4-8 ft Interval	Conc.: 8-12 ft Interval	Conc.: 8-12 ft Interval
	(pCi/g)		(pCi/g)		(pCi/g)		(pCi/g)	
SB16	14	2.6391						
SB17	5.1	1.6292						
SB18	21	3.0445						
SB19	30	3.4012						
SB20	92	4.5218						
SB21	63	4.1431						
SB22	324	5.7807						
SB23	130	4.8675						
SB24	540	6.2916						
SB25	2300	7.7407	82	4.4067	80	4.3820		
SB26	160	5.0752						
SB27	23000	10.0432	1000	6 9078	350	5.8579	131	4.8752
SB29	500	6.2146						
SB30	13	2.5649						
SB31	33	3.4965						
SB32	1300	7.1701	1000	6.9078	1900	7.5496	110	4.7005
SB33	320	5.7683	280	5.6348	99	4.5951		
SB34	270	5.5984						
SB35	44000	10.6919	2.2	0.7885	1400	7.2442	1700	7.4384
SB36	36000	10.4913	330	5.7991	6700	8.8099		
SB37	810000	13.6048	190	5.2470	4700	8.4553	6400	8.7641
SB38	230000	12.3458	7.2	1.9741	27000	10.2036		
SB39	38000	10 5453	310	5.7366	840	6.7334	230	5 4381
SB40	515000	13.1519	2800	7.9374	18000	9.7981	1500	7.3132
SB41	480	6.1738						
SB42	1.2	0.1823						
SB44	1800	7.4955						
SB45	780	6.6593						
SB46	70	4.2485						
SB48	140	4.9416						
SB50	62000	11.0349	120	4.7875				
SB51	9.4	2.2407						
SB52	130	4.8675	0.56		11	2.3979		
SB55	1000	6.9078						
SB56	6700	8.8099						
* OU1 FS Vol. 2 Appendix F								
** Soil bore results at locations within 67 pCi/g contour.								
	Cs 137 0-1ft Ln Stats		*Cs 137 1-4ft Ln Stats*		*Cs 137 4-8ft Ln Stats*		*Cs 137 8-12ft Ln Stats*	
	Geometric Mean	6.4110	Geometric Mean	5.1025	Geometric Mean	6.9116	Geometric Mean	6.4216
	Standard Error	0.5719	Standard Error	0.4509	Standard Error	0.4956	Standard Error	0.4580
	Median	5.7807	Median	5.6348	Median	7.2442	Median	6.3756
	Mode	4.8675	Mode	0.0000	Mode	0.0000	Mode	0.0000
	Standard Deviation	3.3837	Standard Deviation	2.1149	Standard Deviation	2.4280	Standard Deviation	1.6515
	Variance	11.4492	Variance	4.4727	Variance	5.8954	Variance	2.7274
	Kurtosis	-0.4266	Kurtosis	-1.5557	Kurtosis	-1.3216	Kurtosis	-1.6346
	Skewness	0.4854	Skewness	0.5212	Skewness	0.6365	Skewness	0.4880
	Range	13.4225	Range	7.9374	Range	10.2036	Range	8.7641
	Minimum	0.1823	Minimum	0 7885	Minimum	2.3979	Minimum	4.7005
	Maximum	13.6048	Maximum	7.9374	Maximum	10.2036	Maximum	8.7641
	Sum	224.3837	Sum	56.1271	Sum	76.0271	Sum	38.5294
	Count	35.0000	Count	11.0000	Count	11.0000	Count	6.0000

Sr 90 Concentration*	Sr 90	Ln Sr 90	Sr 90	Ln Sr 90	Sr 90	Ln Sr 90	Sr 90	Ln Sr 90
Soil Bore I.D. No.**	Conc.: 0-1 ft Interval	Conc.: 0-1 ft Interval	Conc.: 1-4 ft Interval	Conc.: 1-4 ft Interval	Conc.: 4-8 ft Interval	Conc.: 4-8 ft Interval	Conc.: 8-12 ft Interval	Conc.: 8-12 ft Interval
	(pCi/g)		(pCi/g)		(pCi/g)		(pCi/g)	
SB16	6	1.7918						
SB17	5.1	1.6292						
SB18	1.6	0.4700						
SB19	1.6	0.4700						
SB20	2.3	0.8329						
SB21	40	3.6889						
SB22	1.8	0.5878						
SB23	1.2	0.1823						
SB24	4.9	1.5892						
SB25	26	3.2581	0.04	-3.2189	1.1	0.0953		
SB26	1.3	0.2624						
SB27	210	5.3471	12	2.4849	0.51	-0.6733	0.054	-2.9188
SB29	62	4.1271						
SB30	1.5	0.4055						
SB31	1.3	0.2624						
SB32	30	3.4012	31	3 4340	62	4.1271	18	2.8904
SB33	4.1	1.4110	16	2.7726	8.3	2.1163		
SB34	6.1	1.8083						
SB35	190	5.2470	1	0.0000	5.9	1.7750	5.1	1.6292
SB36	230	5.4381	4.44	1.4907	6.3	1.8405		
SB37	1300	7.1701	1.8	0.5878	5.2	1.6487	57	4.0431
SB38	820	6.7093	0.14	-1.9661	120	4.7875		
SB39	260	5.5607	6.9	1.9315	5.8	1.7579	2.1	0.7419
SB40	410	6.0162	5.1	1.6292	92	4.5218	1.2	0.1823
SB41	45	3.8067						
SB42	0.66	-0.4155						
SB44	19	2.9444						
SB45	17	2.8332						
SB46	4.7	1.5476						
SB48	13	2.5649						
SB50	120	4.7875	2.3	0.8329				
SB51	1.15	0.1398						
SB52	1.8	0.5878	2.7	0 9933	0.16	-1.8326		
SB55	8.8	2.1748						
SB56	90	4.4998						
* OU1 FS Vol. 2 Appendix F								
** Soil bore results at locations within 67 pCi/g contour for Cs137.								
	Sr 90 0-1ft Ln Stats		*Sr 90 1-4ft Ln Stats*		*Sr 90 4-8ft Ln Stats*		*Sr 90 8-12ft Ln Stats*	
	Geometric Mean	2.6611	Geometric Mean	0.9143	Geometric Mean	1.8331	Geometric Mean	1.0947
	Standard Error	0.3647	Standard Error	0.3916	Standard Error	0.4286	Standard Error	0.6710
	Median	2.1748	Median	1.2420	Median	1.7750	Median	1.1856
	Mode	0.2624	Mode	0.0000	Mode	0.0000	Mode	0.0000
	Standard Deviation	2.1576	Standard Deviation	1.9184	Standard Deviation	2.0996	Standard Deviation	2.4194
	Variance	4.6553	Variance	3.6802	Variance	4.4083	Variance	5.8536
	Kurtosis	-0.9571	Kurtosis	1.6108	Kurtosis	1.0123	Kurtosis	2.0122
	Skewness	0.4627	Skewness	-0.2027	Skewness	1.2378	Skewness	0.3906
	Range	7.5856	Range	6.6529	Range	6.6201	Range	6.9618
	Minimum	-0.4155	Minimum	-3.2189	Minimum	-1.8326	Minimum	-2.9188
	Maximum	7.1701	Maximum	3.4340	Maximum	4.7875	Maximum	4.0431
	Sum	93.1374	Sum	10.9719	Sum	20.1641	Sum	6.5682
	Count	35.0000	Count	12.0000	Count	11.0000	Count	6.0000

Cs 137 & Sr 90 Arithmetic Average Concentration vs. Derived Concentration Guideline Limit

Vol-Weighted Arithmetic Avg Conc.				
vs. Soil Cleanup Goal/Limit				
Avg Conc Excav. @ 100 mrem/yr				
Radionuclide	Cs 137 Conc @ Midpoint	Volume in Conc. Range	Vol-Weighted Arithmetic Avg Conc.	
Cesium 137 Conc. Range	(pCi/g)	(CY)	(pCi/g)	
1500 to 2800 pCi/g	2150	2020	543	
2,800 to 5,600 pCi/g	4200	3200	1680	
5,600 to 30,000 pCi/g	17800	1980	4406	
over 30,000 pCi/g	420000	800	42000	Cs 137 Concentration: Arithmetic
	Total Volume	8000	48628	< Vol-Weighted Avg @ 100 mrem
				Sr 90 Concentration: Arithmetic
Strontium 90			136	< Vol-Weighted Avg @ 100 mrem
Vol-Weighted Arithmetic Avg				
Avg Conc Excav. @ 75 mrem/yr				
Radionuclide	Cs 137 Conc @ Midpoint	Volume in Conc. Range	Vol-Weighted Arithmetic Avg Conc.	
Cesium 137 Conc. Range	(pCi/g)	(CY)	(pCi/g)	
1135 to 1500 pCi/g	1318	990	145	
1500 to 2800 pCi/g	2150	2020	483	
2,800 to 5,600 pCi/g	4200	3200	1495	
5,600 to 30,000 pCi/g	17800	1980	3920	
over 30,000 pCi/g	420000	800	37375	Cs 137 Concentration: Arithmetic
	Total Volume	8990	43418	< Vol-Weighted Avg @ 75 mrem
				Sr 90 Concentration: Arithmetic
Strontium 90			122	< Vol-Weighted Avg @ 75 mrem
Vol-Weighted Arithmetic Avg				
Avg Conc Excav. @ 25 mrem/yr				
Radionuclide	Cs 137 Conc @ Midpoint	Volume in Conc. Range	Vol-Weighted Arithmetic Avg Conc.	
Cesium 137 Conc. Range	(pCi/g)	(CY)	(pCi/g)	
378 to 1135 pCi/g	756	11210	420	
1135 to 1500 pCi/g	1318	990	65	
1500 to 2800 pCi/g	2150	2020	215	
2,800 to 5,600 pCi/g	4200	3200	665	
5,600 to 30,000 pCi/g	17800	1980	1745	
over 30,000 pCi/g	420000	800	16634	Cs 137 Concentration: Arithmetic
	Total Volume	20200	19743	< Vol-Weighted Avg @ 25 mrem
				Sr 90 Concentration: Arithmetic
Strontium 90			55	< Vol-Weighted Avg @ 25 mrem
Vol-Weighted Arithmatic Avg				
Avg Conc Excav. @ 15 mrem/yr				
Radionuclide	Cs 137 Conc @ Midpoint	Volume in Conc. Range	Vol-Weighted Arithmetic Avg Conc.	
Cesium 137 Conc. Range	(pCi/g)	(CY)	(pCi/g)	
227 to 378 pCi/g	302	5550	65	
378 to 1135 pCi/g	756	11210	329	
1135 to 1500 pCi/g	1318	990	51	
1500 to 2800 pCi/g	2150	2020	169	
2,800 to 5,600 pCi/g	4200	3200	522	
5,600 to 30,000 pCi/g	17800	1980	1369	
over 30,000 pCi/g	420000	800	13049	Cs 137 Concentration: Arithmetic
	Total Volume	25750	15553	< Vol-Weighted Avg @ 15 mrem
				Sr 90 Concentration: Arithmetic
Strontium 90			44	< Vol-Weighted Avg @ 15 mrem
Vol-Weighted Arithmetic Avg				
Avg Conc Excav. @ 1 mrem/yr				
Radionuclide	Cs 137 Conc @ Midpoint	Volume in Conc. Range	Vol-Weighted Arithmetic Avg Conc.	
Cesium 137 Conc. Range	(pCi/g)	(CY)	(pCi/g)	
15 to 227 pCi/g	121	52542	81	
227 to 378 pCi/g	302	5550	21	
378 to 1135 pCi/g	756	11210	108	
1135 to 1500 pCi/g	1318	990	17	
1500 to 2800 pCi/g	2150	2020	55	
2,800 to 5,600 pCi/g	4200	3200	172	
5,600 to 30,000 pCi/g	17800	1980	450	
over 30,000 pCi/g	420000	800	4292	Cs 137 Concentration: Arithmetic
	Total Volume	78292	5196	< Vol-Weighted Avg @ 1 mrem
				Sr 90 Concentration: Arithmetic
Strontium 90			15	< Vol-Weighted Avg @ 1 mrem

Cs 137 & Sr 90 Geometric Average Concentration vs. Derived Concentration Guideline Limit

Vol Weighted Geometric Avg					
vs. Soil Cleanup Goal/Limit					
Avg Conc Excav. @ 100 mrem/yr					
Radionuclide	Cs 137 Conc @ Midpoint	Ln Cs 137 Conc @ Midpoint	Volume in Conc. Range	Ln Vol-Weighted Avg Conc.	
Cesium 137 Conc. Range	(pCi/g)	(pCi/g)	(CY)	(pCi/g)	
1500 to 2800 pCi/g	2150	7.67	2020	1.94	
2,800 to 5,600 pCi/g	4200	8.34	3200	3.34	
5,600 to 30,000 pCi/g	17800	9.79	1980	2.42	
over 30,000 pCi/g	420000	12.95	800	1.29	Cs 137 Concentration: Geometric
		Total Volume >	8000	8036	< Vol-Weighted Avg @ 100 mrem
					Sr 90 Concentration: Geometric
Strontium 90				87	< Vol-Weighted Avg @ 100 mrem
Vol-Weighted Geometric Avg					
Avg Conc Excav. @ 75 mrem/yr					
Radionuclide	Cs 137 Conc @ Midpoint	Ln Cs 137 Conc @ Midpoint	Volume in Conc. Range	Ln Vol-Weighted Avg Conc.	
Cesium 137 Conc. Range	(pCi/g)	(pCi/g)	(CY)	(pCi/g)	
1135 to 1500 pCi/g	1318	7.18	990	0.79	
1500 to 2800 pCi/g	2150	7.67	2020	1.72	
2,800 to 5,600 pCi/g	4200	8.34	3200	2.97	
5,600 to 30,000 pCi/g	17800	9.79	1980	2.16	
over 30,000 pCi/g	420000	12.95	800	1.15	Cs 137 Concentration: Geometric
		Total Volume >	8990	6585	< Vol-Weighted Avg @ 75 mrem
					Sr 90 Concentration: Geometric
Strontium 90				71	< Vol-Weighted Avg @ 75 mrem
Vol-Weighted Geometric Avg					
Avg Conc Excav. @ 25 mrem/yr					
Radionuclide	Cs 137 Conc @ Midpoint	Ln Cs 137 Conc @ Midpoint	Volume in Conc. Range	Ln Vol-Weighted Avg Conc.	
Cesium 137 Conc. Range	(pCi/g)	(pCi/g)	(CY)	(pCi/g)	
378 to 1135 pCi/g	756	6.63	11210	3.68	
1135 to 1500 pCi/g	1318	7.18	990	0.35	
1500 to 2800 pCi/g	2150	7.67	2020	0.77	
2,800 to 5,600 pCi/g	4200	8.34	3200	1.32	
5,600 to 30,000 pCi/g	17800	9.79	1980	0.96	
over 30,000 pCi/g	420000	12.95	800	0.51	Cs 137 Concentration: Geometric
		Total Volume >	20200	1981	< Vol-Weighted Avg @ 25 mrem
					Sr 90 Concentration: Geometric
Strontium 90				21	< Vol-Weighted Avg @ 25 mrem
Vol-Weighted Geometric Avg					
Avg Conc Excav. @ 15 mrem/yr					
Radionuclide	Cs 137 Conc @ Midpoint	Ln Cs 137 Conc @ Midpoint	Volume in Conc. Range	Ln Vol-Weighted Avg Conc.	
Cesium 137 Conc. Range	(pCi/g)	(pCi/g)	(CY)	(pCi/g)	
227 to 378 pCi/g	302	5.71	5550	1.23	
378 to 1135 pCi/g	756	6.63	11210	2.89	
1135 to 1500 pCi/g	1318	7.18	990	0.28	
1500 to 2800 pCi/g	2150	7.67	2020	0.60	
2,800 to 5,600 pCi/g	4200	8.34	3200	1.04	
5,600 to 30,000 pCi/g	17800	9.79	1980	0.75	
over 30,000 pCi/g	420000	12.95	800	0.40	Cs 137 Concentration: Geometric
		Total Volume >	25750	1321	< Vol-Weighted Avg @ 15 mrem
					Sr 90 Concentration: Geometric
Strontium 90				14	< Vol-Weighted Avg @ 15 mrem
Vol-Weighted Geometric Avg					
Avg Conc Excav. @ 1 mrem/yr					
Radionuclide	Cs 137 Conc @ Midpoint	Ln Cs 137 Conc @ Midpoint	Volume in Conc. Range	Ln Vol-Weighted Avg Conc.	
Cesium 137 Conc. Range	(pCi/g)	(pCi/g)	(CY)	(pCi/g)	
15 to 227 pCi/g	121	4.80	52542	3.22	
227 to 378 pCi/g	302	5.71	5550	0.40	
378 to 1135 pCi/g	756	6.63	11210	0.95	
1135 to 1500 pCi/g	1318	7.18	990	0.09	
1500 to 2800 pCi/g	2150	7.67	2020	0.20	
2,800 to 5,600 pCi/g	4200	8.34	3200	0.34	
5,600 to 30,000 pCi/g	17800	9.79	1980	0.25	
over 30,000 pCi/g	420000	12.95	800	0.13	Cs 137 Concentration: Geometric
		Total Volume >	78292	266	< Vol-Weighted Avg @ 1 mrem
					Sr 90 Concentration: Geometric
Strontium 90				3	< Vol-Weighted Avg @ 1 mrem

Soil Volumes, Areas, and Lengths Parallel to the Aquifer Flow vs. Depth Intervals

HWMF Soil Volumes and Areas vs. Depth Interval

Differential Volumes vs. Cs 137 Derived Concentration Guideline Limit Interval							
Soil Cleanup Limit/Goals (mrem/yr)	Strontium 90 DCGL (pCi/g)	Cesium 137 DCGL (pCi/g)	Concentration @ DCGL Upper Limit (pCi/g)	Concentration @ DCGL Lower Limit (pCi/g)	Cummulative Volume @ DCGL Upper Limit * (CY)	Cummulative Volume @ DCGL Lower Limit (CY)	Total Cesium-137 Differential Volume (CY)
100	38556	1513	810000	1513	188	8000	7812
75	28920	1135	1513	1135	8000	8990	990
25	9636	378	1135	378	8990	20200	11210
15	5784	227	378	227	20200	25750	5550
1	386	15	227	15	25750	78292	52542
* Volume for Cs 137 > 810000pCi/g	= 352792(Conc.)-0.554	Volume for Cs 137 15 pCi/g	= 352792(Conc.)-0.554			TOTAL VOLUME >	78103
Cs 137 Volumes vs. Depth Interval * Soil Concentration Interval	Interval A Surface Area: 0-1 ft (SY)	Interval A Vol.: 0-1 ft (CY)	Interval B Vol.: 1-4 ft (CY)	Interval C Vol.: 4-8 ft (CY)	Interval D Vol.: 8-12 ft (CY)	Total Vol.: 0-12 ft (CY)	
67 to 600 pCi/g	10600	3530	5330	6120	3810	18790	
600 to 2,800 pCi/g	5750	1920	1590	2120	400	6030	
2,800 to 5,600 pCi/g	1860	620	690	840	1050	3200	
5,600 to 30,000 pCi/g	2190	730	500	750	0	1980	
over 30,000 pCi/g	2400	800	0	0	0	800	
Total Interval Surface Area or Vol.	22800	7600	8110	9830	5260	30800	< TOTAL VOLUME
*BNL's OU I FS Appendix F Table F-3							
Cs 137 Surface Area vs. Depth Interval *	Interval A Surface Area: 0-1 ft (SY)	Interval B Vol.: 1-4 ft (SY)	Interval C Vol.: 4-8 ft (SY)	Interval D Vol.: 8-12 ft (SY)			
Total Interval Contaminated Area	22800	8131	7387	3961			
*BNL's OU I FS Appendix F Table F-3							
Length of Parallell to Direction of Aquifer Flow*	Interval A Length: 0-1 ft (Feet)	Interval B Length: 1-4 ft (Feet)	Interval C Length: 4-8 ft (Feet)	Interval D Length: 8-12 ft (Feet)			
Depth Interval Length of Paralell	530	200	220	210			
* Lengths scaled from Fig. A5 to 8 in BNL's OU I FS Appendix A							

Cumulative Volume vs Concentration
HWMF Cs 137 in Soil

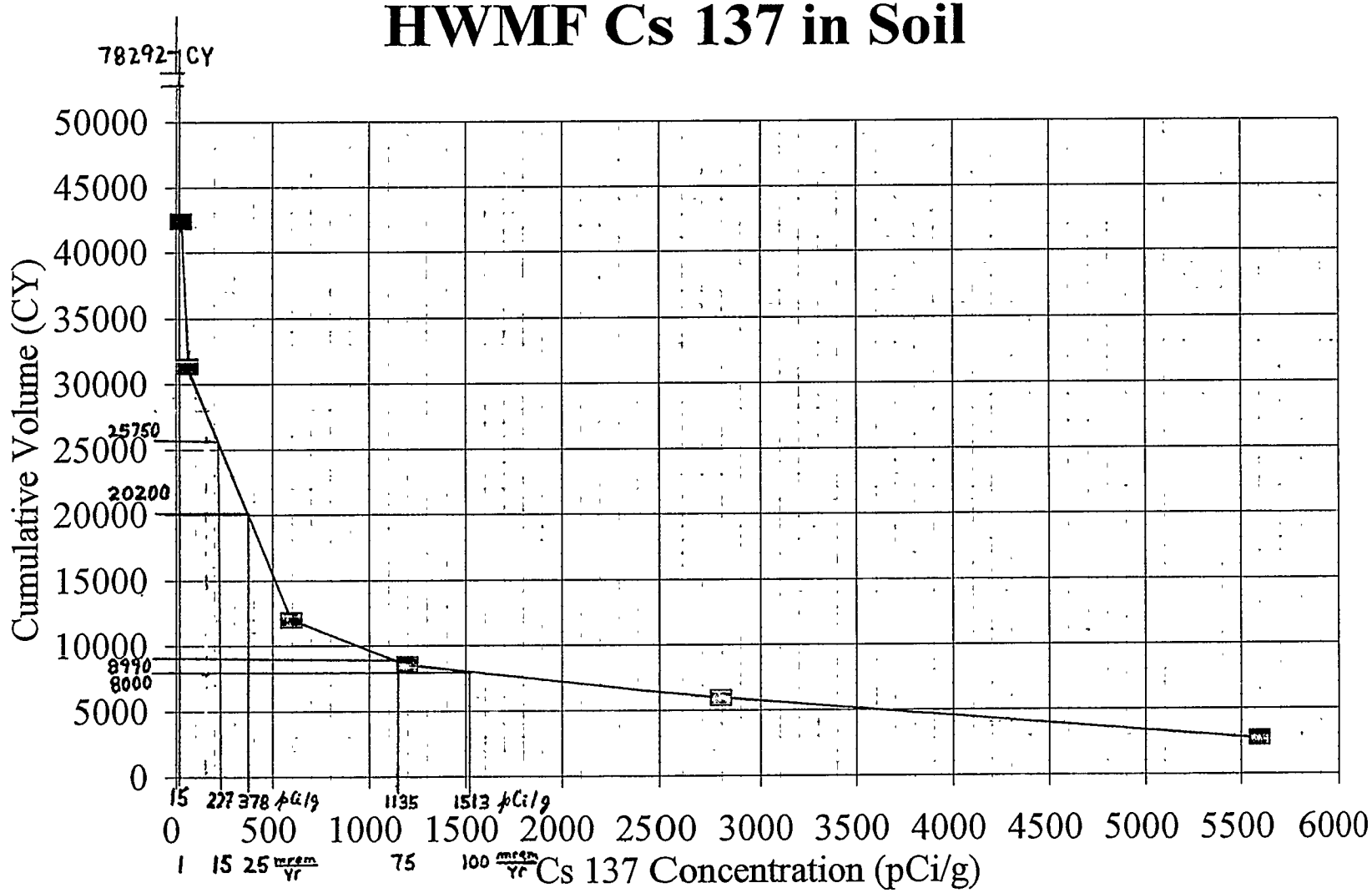
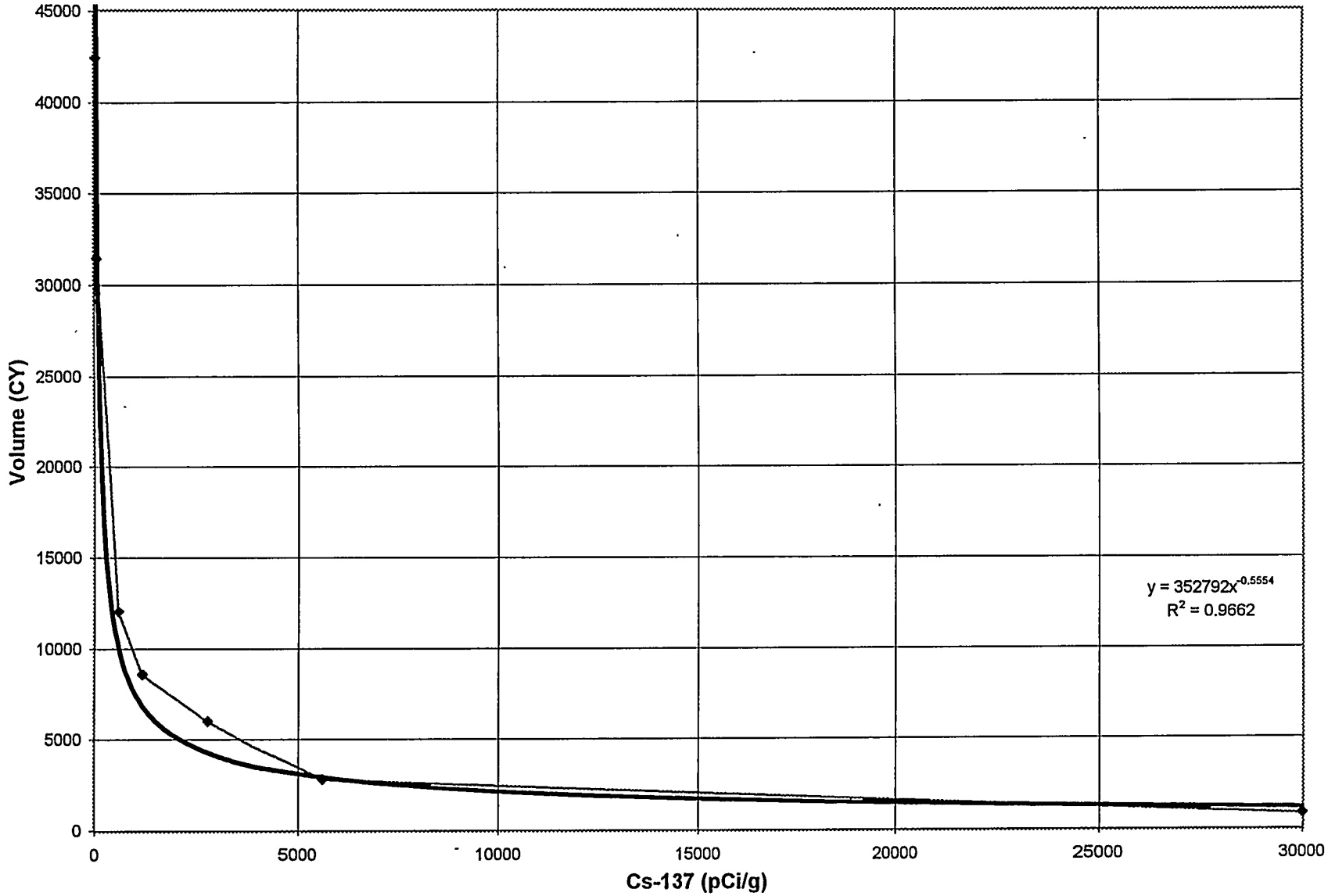
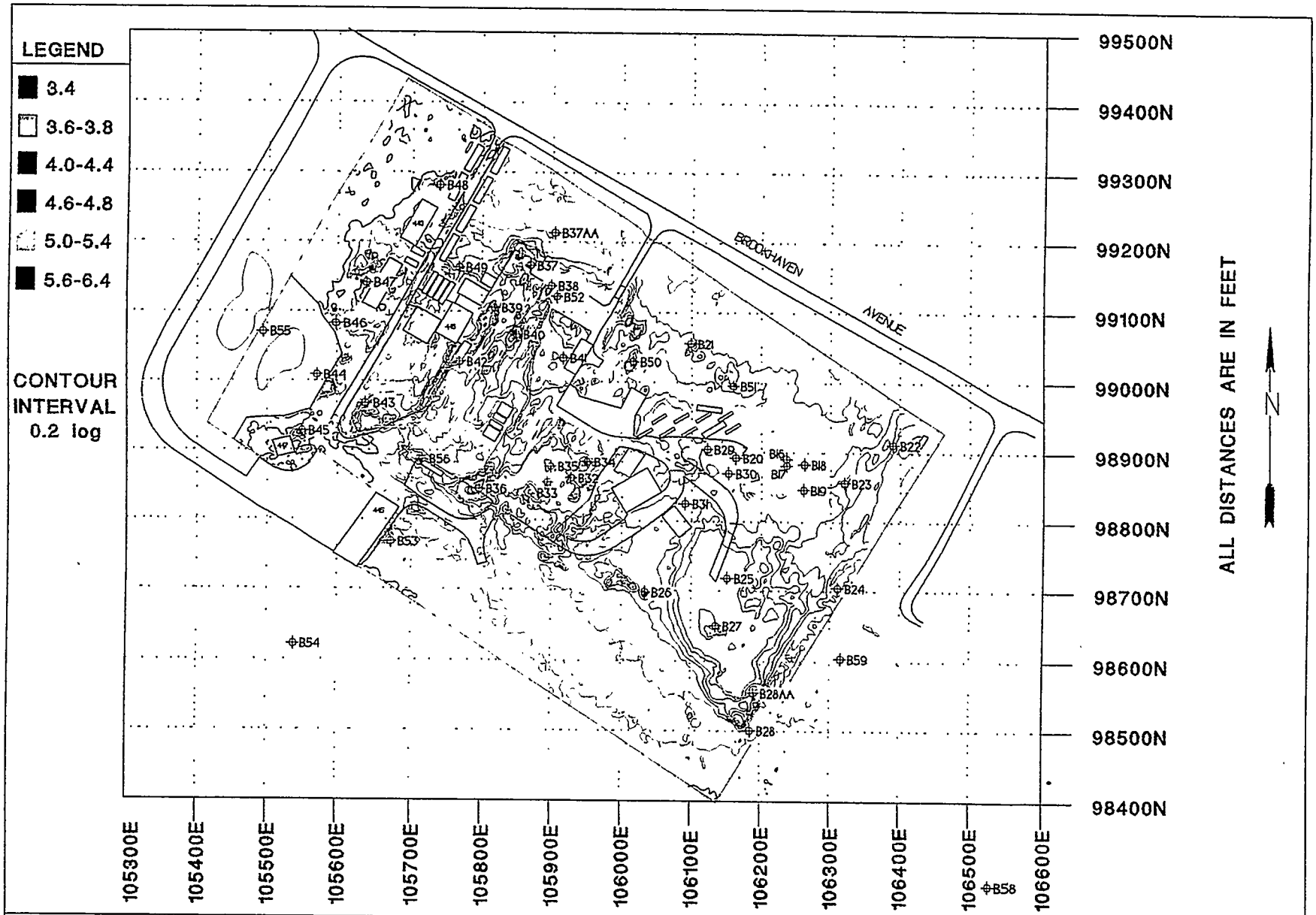


EXHIBIT 1 - power curve
Total Volume of Contaminated Soil in HWMF Vs. Cs-137 Level
(excludes debris & mixed waste)





BNL - HAZARDOUS WASTE MANAGEMENT FACILITY
USRADS SURVEY RESULTS-NaI PROBE (SHIELDED)

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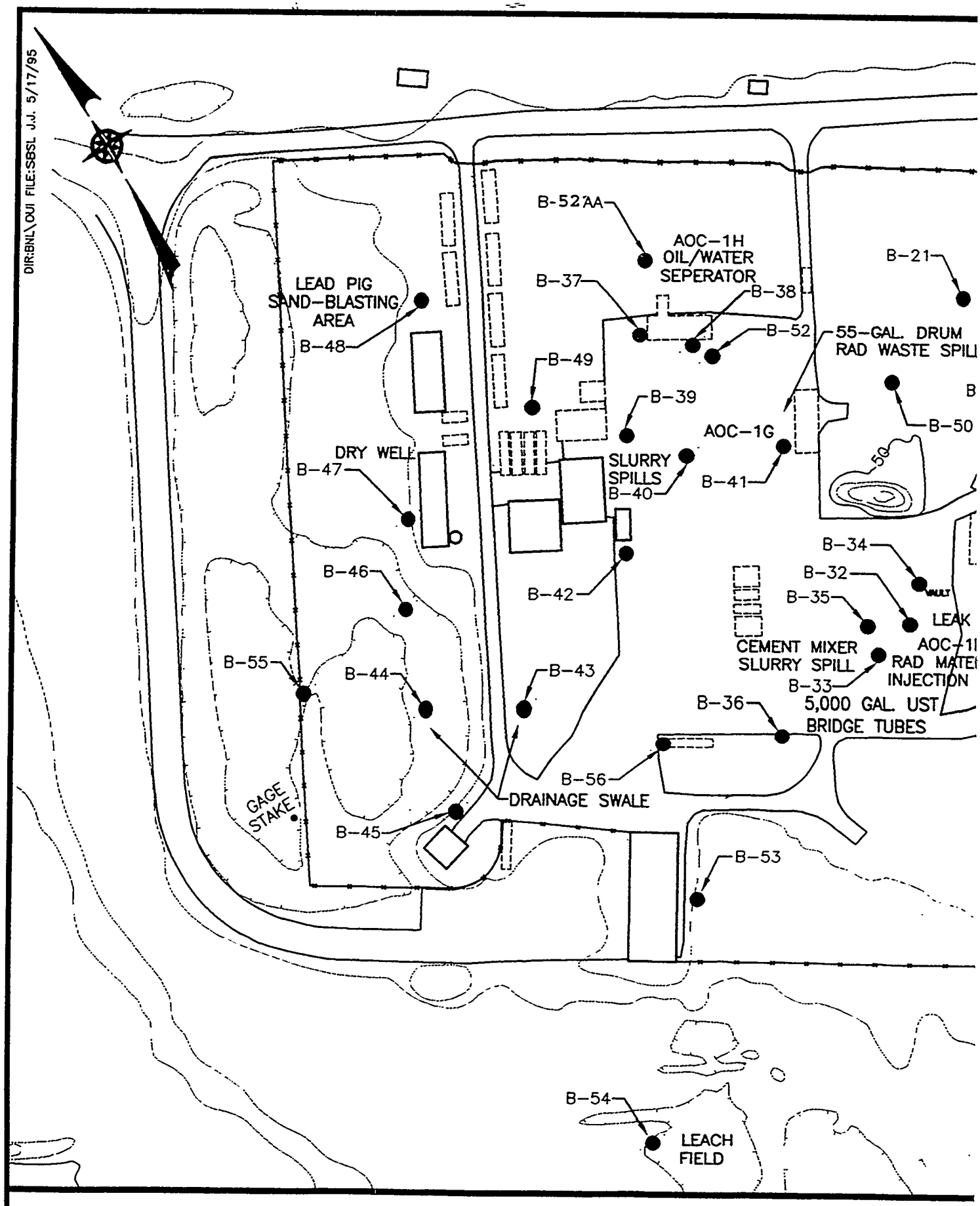
Oak Ridge, Tennessee 37830 (423)481-2511



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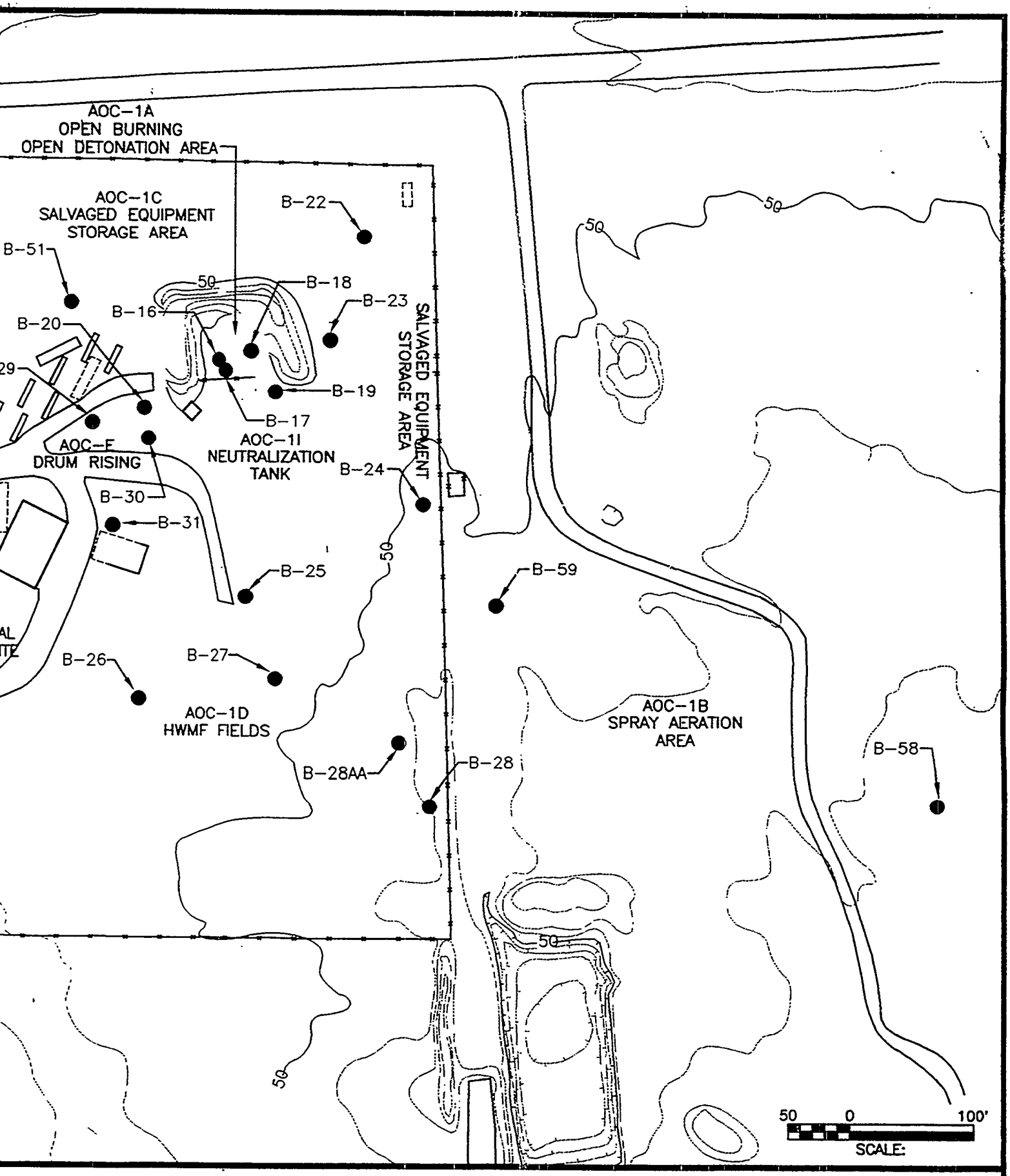
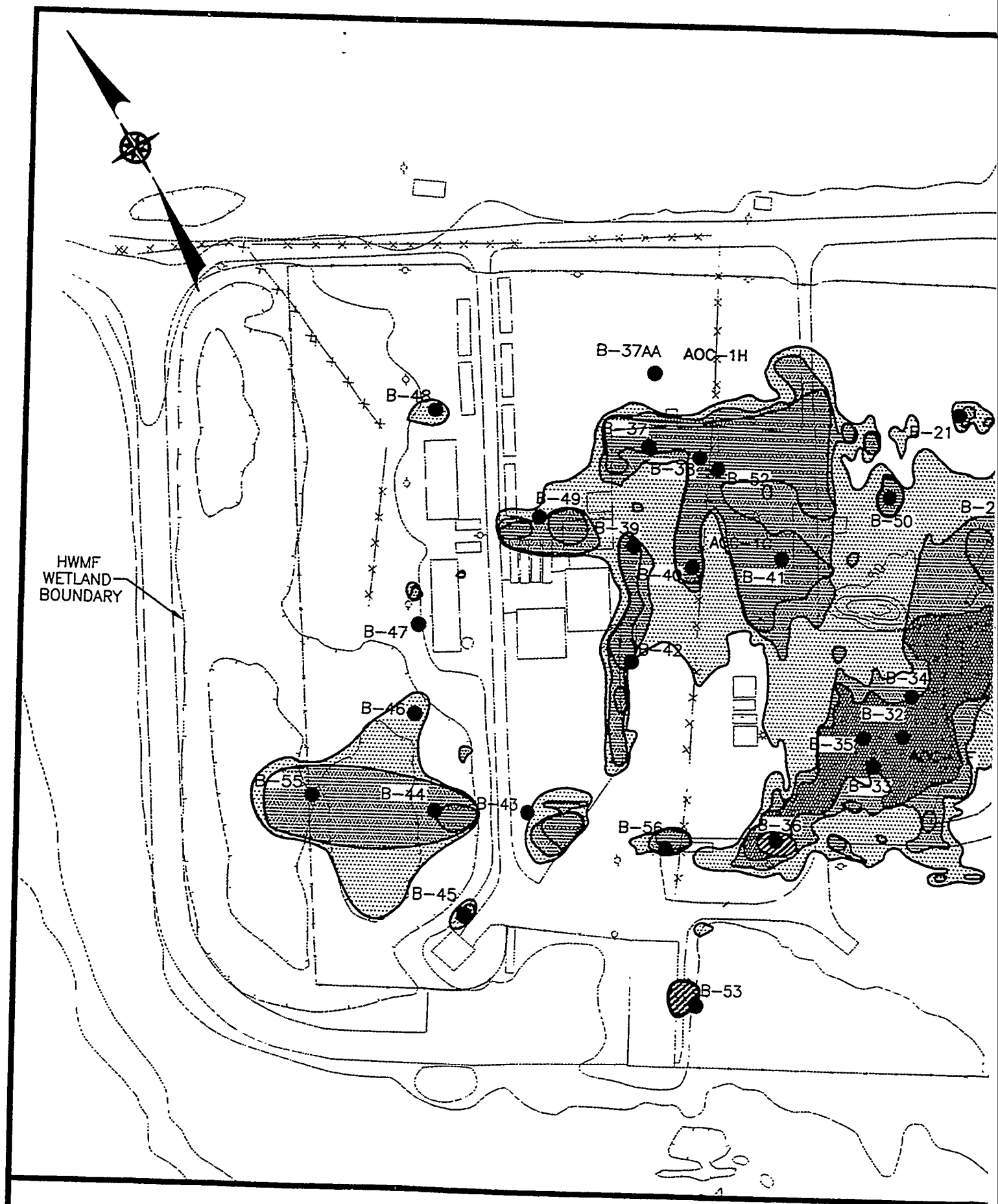


FIGURE 2-1

SOIL BORING SAMPLING LOCATIONS: HWMF

OUI/VI RI/RA

Brookhaven National Laboratory, Upton, New York



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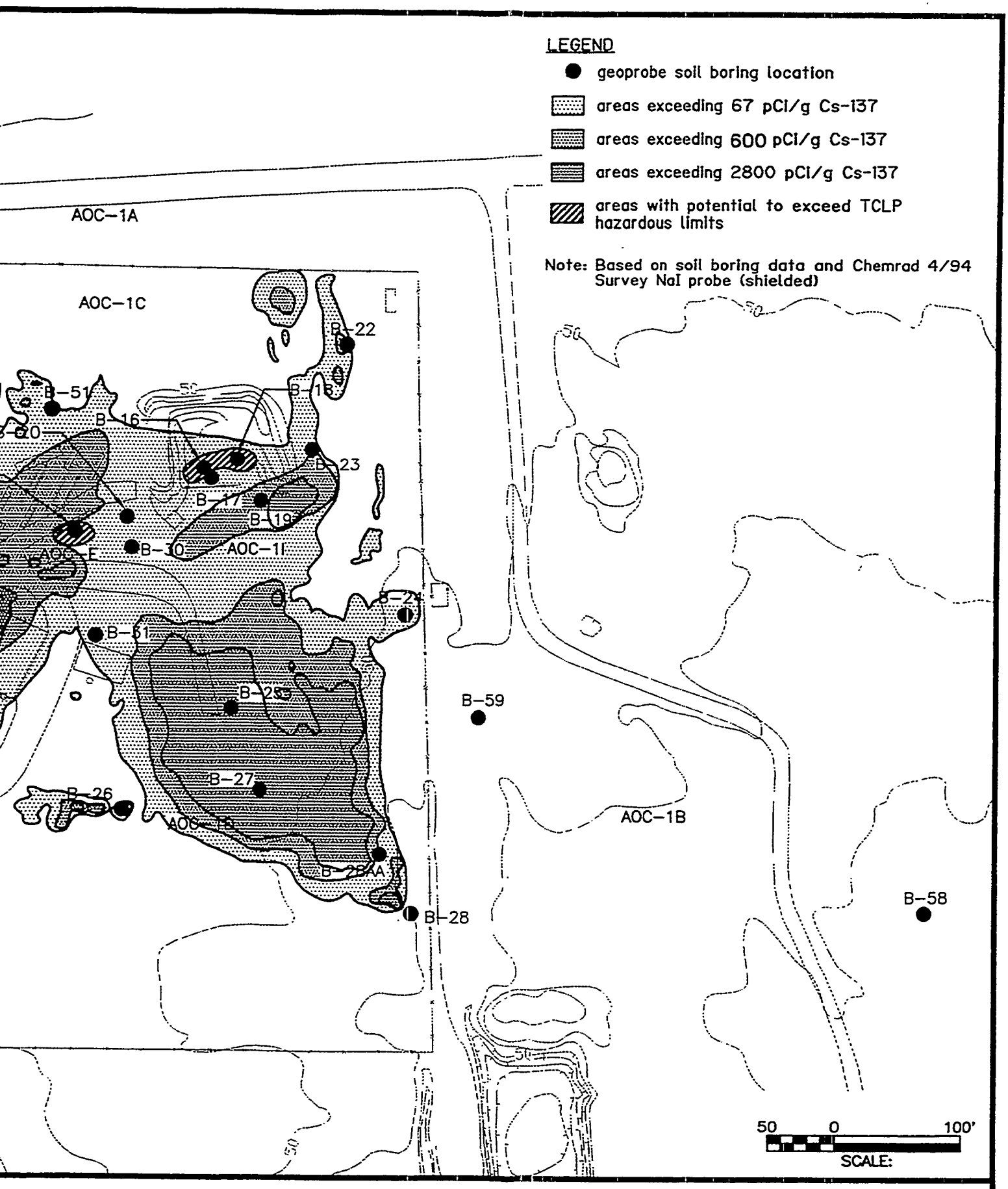
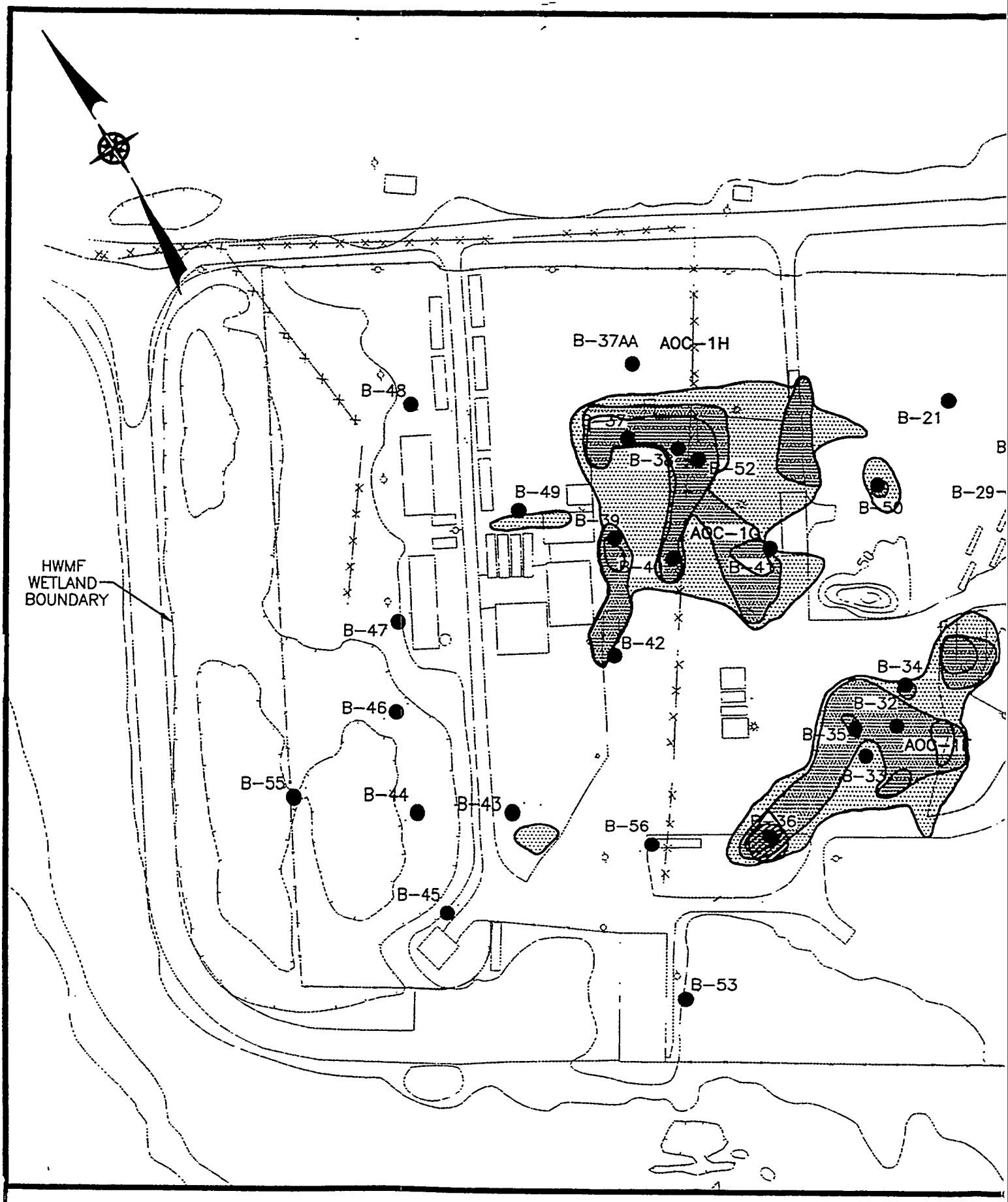


FIGURE A-5

HWMF – ESTIMATED AREA OF CONTAMINATED SOILS
"A" HORIZON (0–0.5ft bgs)

OUI FS

Brookhaven National Laboratory, Upton, New York



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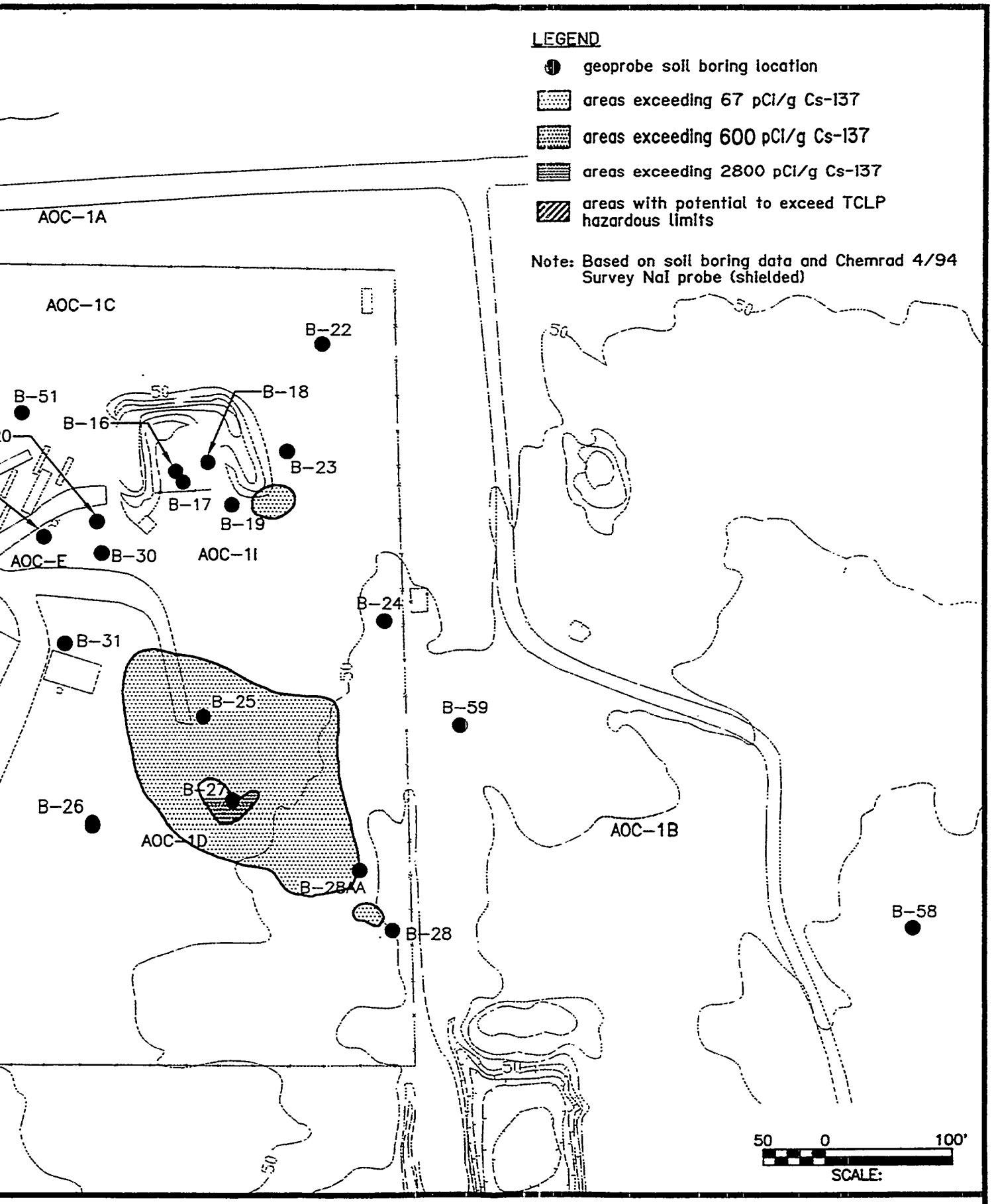
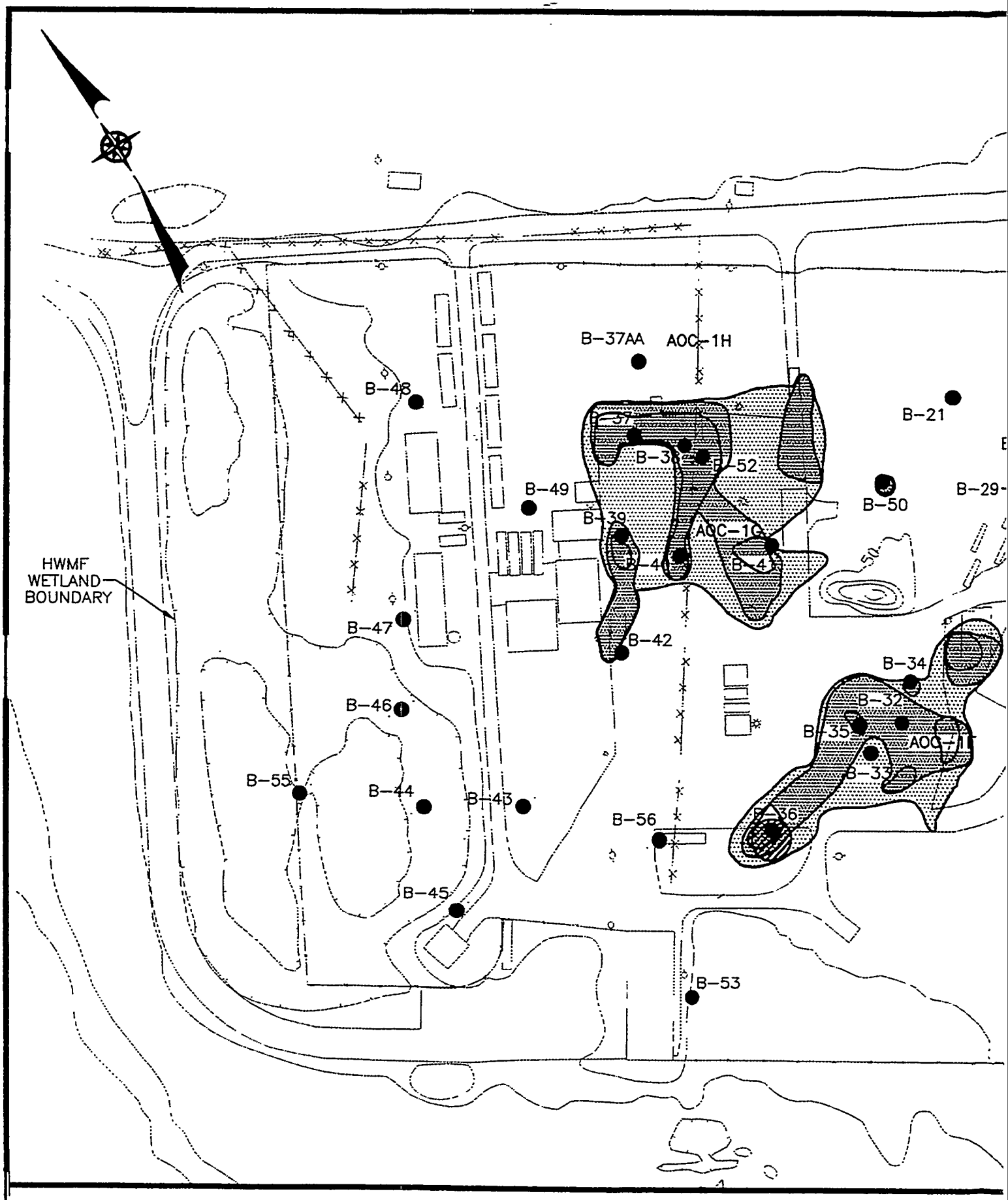


FIGURE A-6

HWMF – ESTIMATED AREA OF CONTAMINATED SOILS "B" HORIZON (1–3ft bgs)

OU1 FS

Brookhaven National Laboratory, Upton, New York



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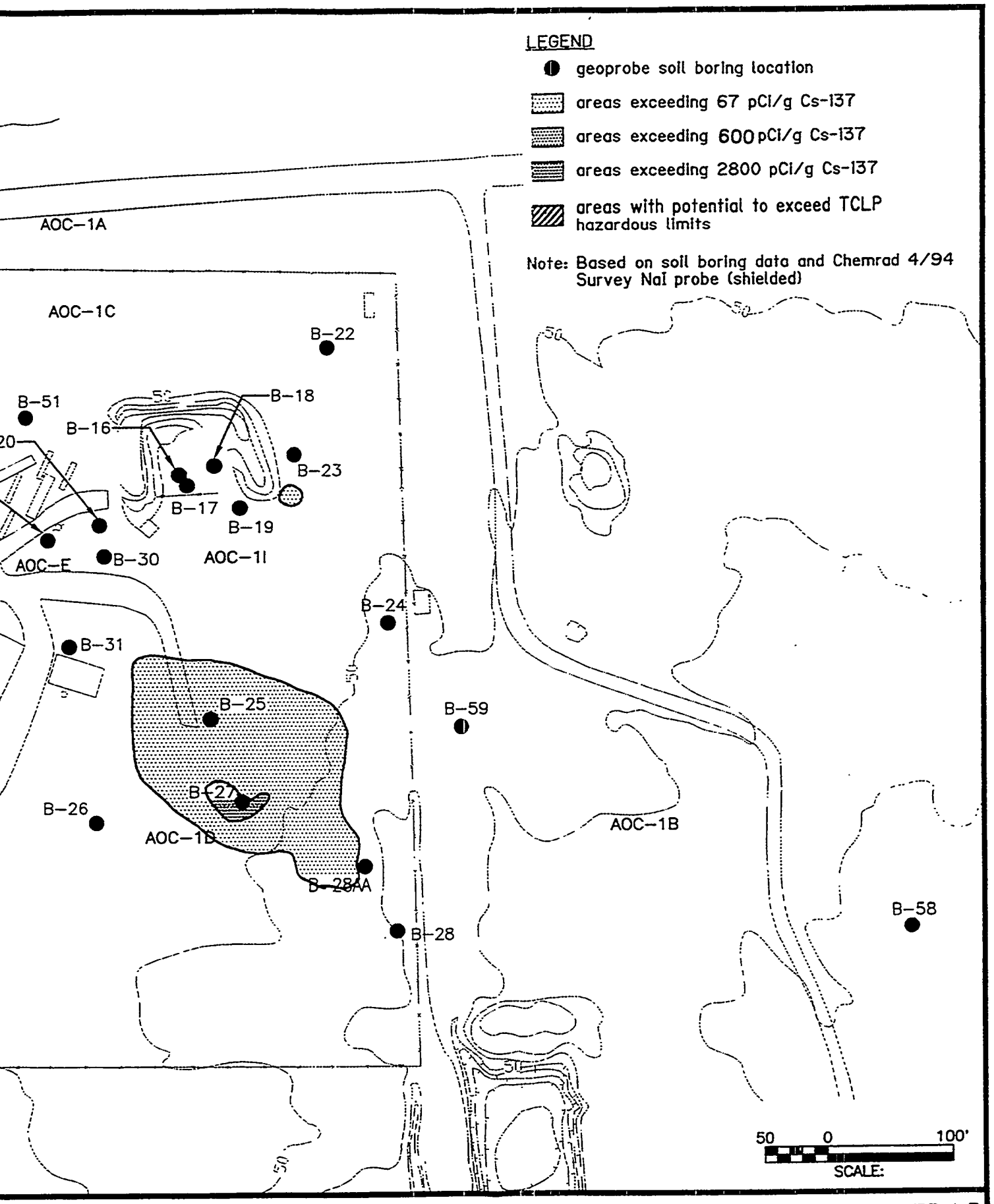
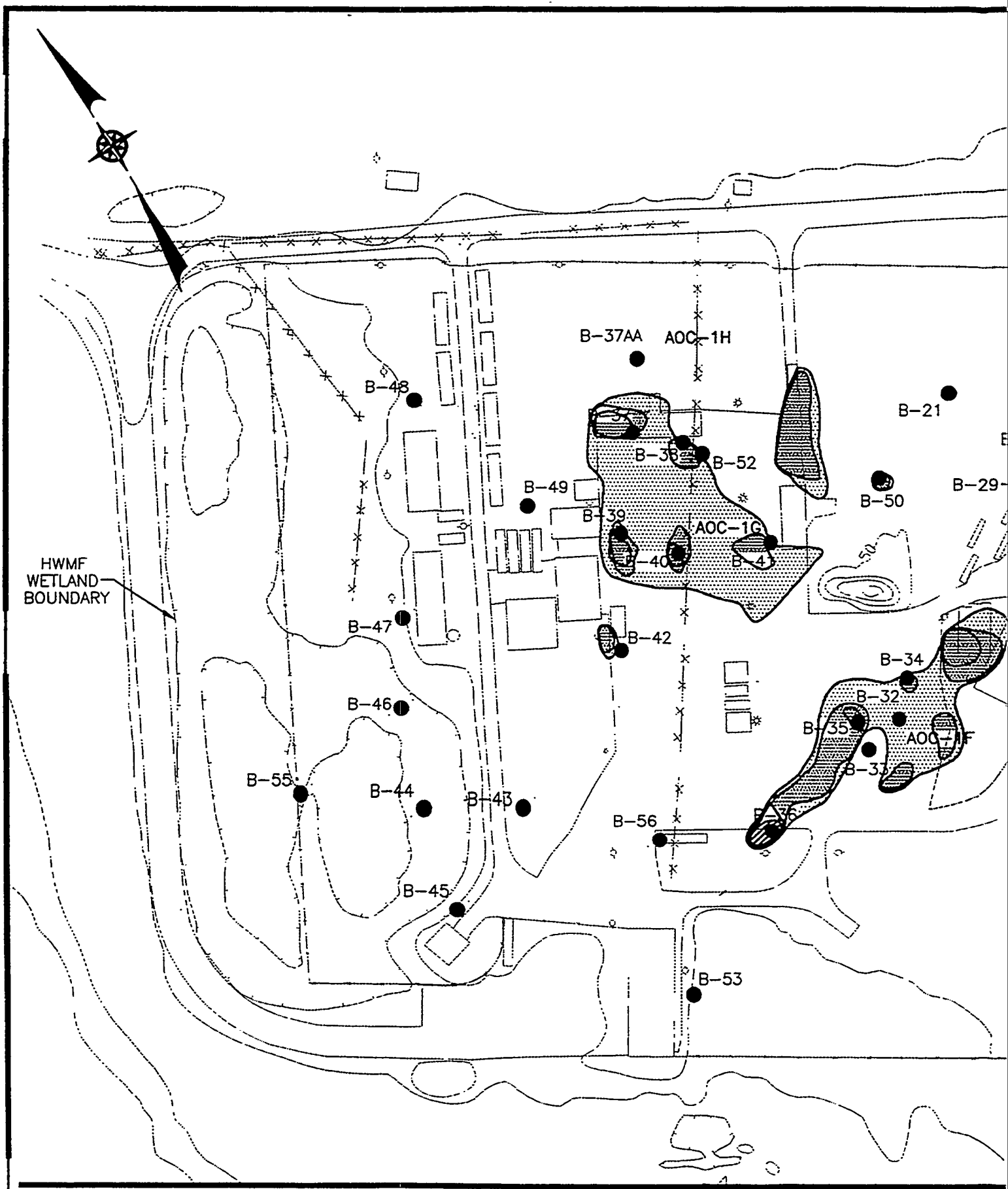


FIGURE A-7

HWMF – ESTIMATED AREA OF CONTAMINATED SOILS "C" HORIZON (4–6ft bgs)

OUI FS

Brookhaven National Laboratory, Upton, New York



CDM FEDERAL PROGRAMS CORPORATION
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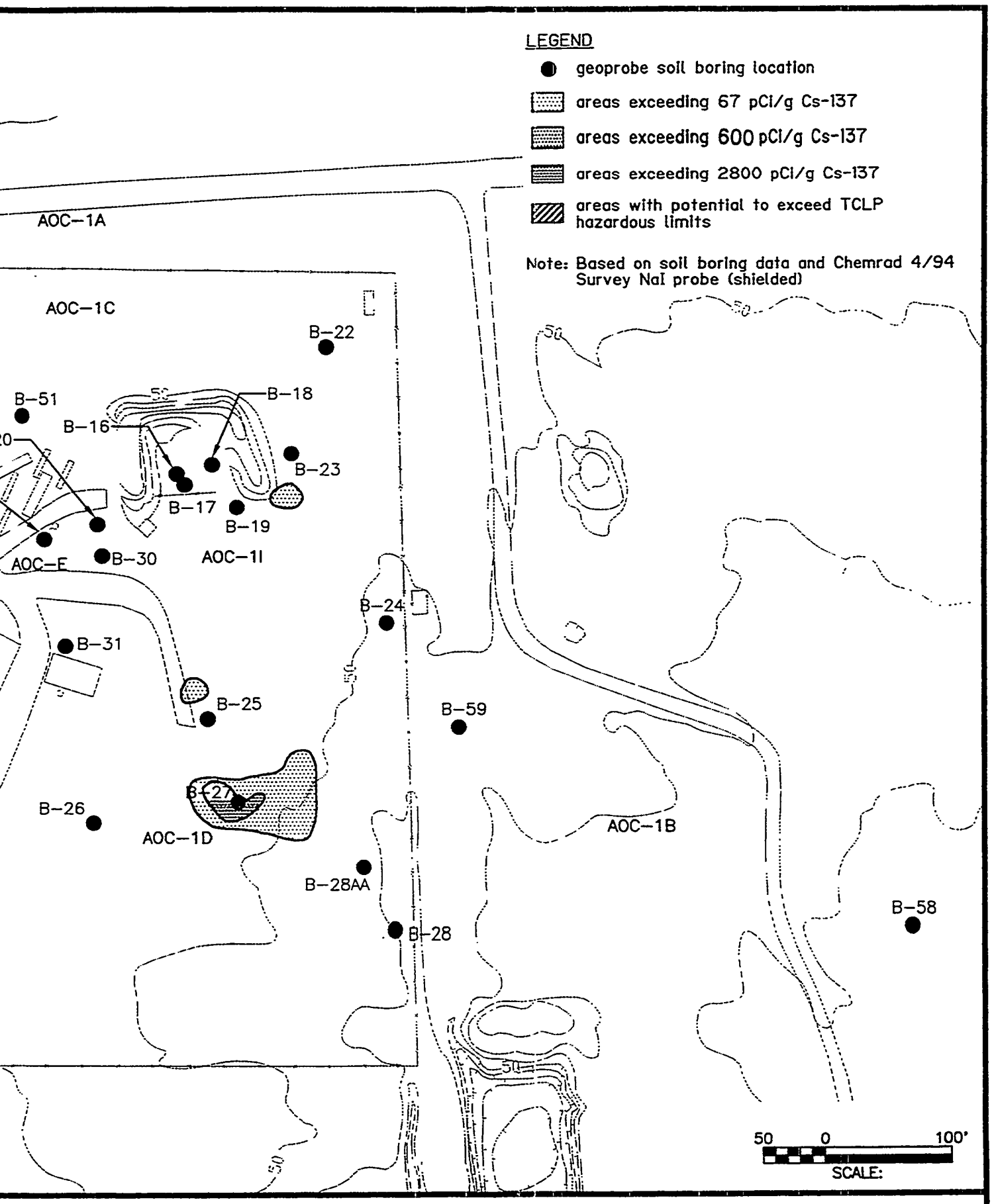

FIGURE A-8

HWMF – ESTIMATED AREA OF CONTAMINATED SOILS "D" HORIZON (8–10ft bgs)

OUI FS

Brookhaven National Laboratory, Upton, New York

Appendix D

Dose to Workers from Environmental Remediation

Contents Page

Present Workers: Dose Savings Associated with Initial Radiological Conditions and those after Remediation. D-1

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Present Workers: Dose Savings Associated with Initial Radiological Conditions and Those after Remediation

Present Worker Dose Savings: Without and With Remediation										File: WRKDOSE wb3
Present Worker without Remediation	**Dose/ Exposure Factor**	**Exposure Rate**	**Sampling Time**	**Integrated Decay Factor**	**No. Persons Exposed**	**Sampling Frequency**	**Conv. Factor**	**Collective Dose**		
	(mrem/mR)	(mR)	(Hr)	dimensionless	(Persons)	(Samples / Year)	(rem/mrem)	(Person-rem)		
Dose for MW 88-03	0.913	0 400	1	37.630	2	4	0.001	0 110		
Dose for MW 88-04	0 913	0.300	1	37.630	2	4	0.001	0.082		
Dose for MW 88-24	0.913	15.000	1	37.630	2	4	0.001	4.123		
							Total >	4.315		
Present Worker with Remediation	**Dose/ Exposure Factor**	**Exposure Rate**	**Sampling Time**	**Integrated Decay Factor**	**No. Persons Exposed**	**Sampling Frequency**	**Conv. Factor**	**Collective Dose**	**Collective Dose**	**Collective Dose**
	(mrem/mR)	(mR)	(Hr)	dimensionless	(Persons)	(Samples / Year)	(rem/mrem)	1998 - 2076	1996-1997	1996- 2076
Dose to 1 mrem for 3 MWs	1.000	0.003	1	35 680	2	12	0.001	0 003	0 224	0 227
Dose to 15 mrem for 3 MWs	1.000	0.050	1	35 680	2	12	0.001	0.043	0 224	0 267
Dose to 25mrem for 3 MWs	1.000	0.100	1	35.680	2	12	0.001	0.086	0 224	0.310
Dose to 75 mrem for 3 MWs	1.000	0 250	1	35 680	2	12	0 001	0.214	0 224	0 438
Dose to 100 mrem for 3 MWs	1.000	0.330	1	35,680	2	12	0 001	0 283	0 224	0 507
Present Worker without Remediation	**Dose/ Exposure Factor**	**Exposure Rate**	**Sampling Time**	**Decay Factor @ 1 Yr**	**No. Persons Exposed**	**Sampling Frequency**	**Conv. Factor**	**Collective Dose**		
Annual Collective Dose for 1996 or 1997	(mrem/mR)	(mR)	(Hr)	dimensionless	(Persons)	(Samples / Year)	(rem/mrem)	(Person-rem)		
Dose for MW 88-03	0.913	0 40	1	0.978	2	4	0.001	0.003		
Dose for MW 88-04	0.913	0.30	1	0.978	2	4	0 001	0.002		
Dose for MW 88-24	0.913	15.00	1	0.978	2	4	0.001	0.107		
							Total >	0 112		
Present Worker Collective Dose Savings	**Worker Dose w/o Remediation**	**Worker Dose w Remediation**	**Worker Dose Averted**							
	(Person-rem)	(Person-rem)	(Person-rem)							
Dose to 1 mrem for 3 MWs	4 32	0 23	4.09							
Dose to 15 mrem for 3 MWs	4.32	0.27	4.05							
Dose to 25mrem for 3 MWs	4.32	0.31	4.01							
Dose to 75 mrem for 3 MWs	4.32	0.44	3 88							
Dose to 100 mrem for 3 MWs	4.32	0.51	3 81							

Remediation Workers: Collective Doses to Remediate to the Various Risk-Based Remediation Goals using Arithmetic Averages

Dose to Workers from Environmental Remediation to 100 mrem/yr:											
Volume-Weighted Arithmetic Average Concentrations											File: WRKDOSE.wb3
Dose from Inhalation	Arithmetic Avg.										
Cleanup to 100 mrem/yr	RSC	DCF inh	IR	Excavate & Package	Soil Volume	DL	Conversion Factor	Inhalation Dose w/o Resp.	Respirator PF	Inhalation Dose with Resp.	
Radionuclide	(pCi/g)	(mrem/pCi)	(m3/hr)	(Person hr/ m3)	(m3)	(g/m3)	rem/mrem	(person-rem)		(person-rem)	
Strontium-90	136	1.310E-03	1.2	1.62	6117	0.0004	0.001	8.474E-04	0.1	8.47E-05	
Cesium-137	48628	3.190E-05	1.2	1.62	6117	0.0004	0.001	7.378E-03	0.1	7.38E-04	
								8.23E-03		8.23E-04	Total Inhalation Dose (Person-rem)
External Dose	Arithmetic Avg.		Soil Density								
Cleanup to 100 mrem/yr	RSC	DCF ext	Correction	Excavate & Package	Soil Volume	Time Conversion	Conversion Factor	External Dose			
Radionuclide	(pCi/g)	(mrem/yr per pCi/g)	dimensionless	(Person hr/ m3)	(m3)	yr/person hr	rem/mrem	(person-rem)			
Strontium-90	136	0.000E+00	0.98	1.62	6117	0.000114	0.001	0.000E+00			
Cesium-137	48628	3.605E+00	0.98	1.62	6117	0.000114	0.001	1.909E+02			
								1.909E+02	Total External Dose (Person-rem)		

Dose to Workers from Environmental Remediation to 75 mrem/yr:											
Volume-Weighted Arithmetic Average Concentrations											File: WRKDOSE.wb3
Dose from Inhalation	Arithmetic Avg.										
Cleanup to 75 mrem/yr	RSC	DCF inh	IR	Excavate & Package	Soil Volume	DL	Conversion Factor	Inhalation Dose w/o Resp.	Respirator PF	Inhalation Dose with Resp.	
Radionuclide	(pCi/g)	(mrem/pCi)	(m3/hr)	(Person hr/ m3)	(m3)	(g/m3)	rem/mrem	(person-rem)		(person-rem)	
Strontium-90	122	1.310E-03	1.2	1.62	6874	0 0004	0.001	8.542E-04	0.1	8.54E-05	
Cesium-137	43418	3.190E-05	1.2	1.62	6874	0 0004	0.001	7.403E-03	0.1	7.40E-04	
								8.26E-03		8.26E-04	Total Inhalation Dose (Person-rem)
External Dose	Arithmetic Avg.		Soil Density								
Cleanup to 75 mrem/yr	RSC	DCF ext	Correction	Excavate & Package	Soil Volume	Time Conversion	Conversion Factor	External Dose			
Radionuclide	(pCi/g)	(mrem/yr per pCi/g)	dimensionless	(Person hr/ m3)	(m3)	yr/person hr	rem/mrem	(person-rem)			
Strontium-90	122	0.000E+00	0.96	1.62	6874	0 000114	0.001	0.000E+00			
Cesium-137	43418	3.605E+00	0.96	1.62	6874	0.000114	0.001	1.915E+02			
								1.916E+02	Total External Dose (Person-rem)		

Dose to Workers from Environmental Remediation to 25 mrem/yr:											
Volume-Weighted Arithmetic Average Concentrations											File: WRKDOSE.wb3
Dose from Inhalation	Arithmetic Avg.										
Cleanup to 25 mrem/yr	RSC	DCF inh	IR	Excavate & Package	Soil Volume	DL	Conversion Factor	Inhalation Dose w/o Resp.	Respirator PF	Inhalation Dose with Resp.	
Radionuclide	(pCi/g)	(mrem/pCi)	(m3/hr)	(Person hr/ m3)	(m3)	(g/m3)	rem/mrem	(person-rem)		(person-rem)	
Strontium-90	55	1.310E-03	1.2	1.62	15445	0.0004	0.001	8.653E-04	0.1	8.65E-05	
Cesium-137	19743	3.190E-05	1.2	1.62	15445	0.0004	0.001	7.564E-03	0.1	7.56E-04	
								8.43E-03		8.43E-04	Total Inhalation Dose (Person-rem)
External Dose	Arithmetic Avg.		Soil Density								
Cleanup to 25 mrem/yr	RSC	DCF ext	Correction	Excavate & Package	Soil Volume	Time Conversion	Conversion Factor	External Dose			
Radionuclide	(pCi/g)	(mrem/yr per pCi/g)	dimensionless	(Person hr/ m3)	(m3)	yr/person hr	rem/mrem	(person-rem)			
Strontium-90	55	0.000E+00	0.96	1.62	15445	0.000114	0.001	0.000E+00			
Cesium-137	19743	3.605E+00	0.96	1.62	15445	0.000114	0.001	1.957E+02			
								1.957E+02	Total External Dose (Person-rem)		

Dose to Workers from Environmental Remediation to 15 mrem/yr:											
Volume-Weighted Arithmetic Average Concentrations											File: WRKDOSE.wb3
Dose from Inhalation	Arithmetic Avg.										
Cleanup to 15 mrem/yr	RSC	DCF Inh	IR	Excavate & Package	Soil Volume	DL	Conversion Factor	Inhalation Dose w/o Resp.	Respirator PF	Inhalation Dose with Resp.	
Radionuclide	(pCi/g)	(mrem/pCi)	(m3/hr)	(Person hr/ m3)	(m3)	(g/m3)	rem/mrem	(person-rem)		(person-rem)	
Strontium-90	44	1.310E-03	1.2	1.62	19688	0.0004	0.001	8.825E-04	0.1	8.82E-05	
Cesium-137	15553	3.190E-05	1.2	1.62	19688	0.0004	0.001	7.598E-03	0.1	7.60E-04	
								8.48E-03		8.48E-04	Total Inhalation Dose (Person-rem)
External Dose	Arithmetic Avg.		Soil Density								
Cleanup to 15 mrem/yr	RSC	DCF ext	Correction	Excavate & Package	Soil Volume	Time Conversion	Conversion Factor	External Dose			
Radionuclide	(pCi/g)	(mrem/yr per pCi/g)	dimensionless	(Person hr/ m3)	(m3)	yr/person hr	rem/mrem	(person-rem)			
Strontium-90	44	0.000E+00	0.96	1.62	19688	0.000114	0.001	0.000E+00			
Cesium-137	15553	3.605E+00	0.96	1.62	19688	0.000114	0.001	1.965E+02			
								1.965E+02	Total External Dose (Person-rem)		

Dose to Workers from Environmental Remediation to 1 mrem/yr:											
Volume-Weighted Arithmetic Average Concentrations											File: WRKDOSE.wb3
Dose from Inhalation	Arithmetic Avg.										
Cleanup to 1 mrem/yr	RSC	DCF inh	IR	Excavate & Package	Soil Volume	DL	Conversion Factor	Inhalation Dose w/o Resp.	Respirator PF	Inhalation Dose with Resp.	
Radionuclide	(pCi/g)	(mrem/pCi)	(m3/hr)	(Person hr/ m3)	(m3)	(g/m3)	rem/mrem	(person-rem)		(person-rem)	
Strontium-90	15	1.310E-03	1.2	1.62	59862	0.0004	0.001	9.147E-04	0.1	9.15E-05	
Cesium-137	5196	3.190E-05	1.2	1.62	59862	0.0004	0.001	7.716E-03	0.1	7.72E-04	
								8.63E-03		8.63E-04	Total Inhalation Dose (Person-rem)
External Dose	Arithmetic Avg.		Soil Density								
Cleanup to 10 mrem/yr	RSC	DCF ext	Correction	Excavate & Package	Soil Volume	Time Conversion	Conversion Factor	External Dose			
Radionuclide	(pCi/g)	(mrem/yr per pCi/g)	dimensionless	(Person hr/ m3)	(m3)	yr/person hr	rem/mrem	(person-rem)			
Strontium-90	15	0.000E+00	0.96	1.62	59862	0.000114	0.001	0.000E+00			
Cesium-137	5196	3.605E+00	0.96	1.62	59862	0.000114	0.001	1.996E+02			
								1.996E+02	Total External Dose (Person-rem)		

Remediation Workers: Collective Doses to Remediate to the Various Risk-Based Remediation Goals using Geometric Averages

Dose to Workers from Environmental Remediation to 100 mrem/yr:											
Volume-Weighted Geometric Average Concentrations											File: WRKDOSE.wb3
Dose from Inhalation	Geometric										
Cleanup to 100 mrem/yr	RSC	DCF inh	IR	Excavate & Package	Soil Volume	DL	Conversion Factor	Inhalation Dose w/o Resp.	Respirator PF	Inhalation Dose with Resp.	
Radionuclide	(pCi/g)	(mrem/pCi)	(m3/hr)	(Person hr/ m3)	(m3)	(g/m3)	rem/mrem	(person-rem)		(person-rem)	
Strontium-90	87	1.310E-03	1.2	1.62	6117	0.0004	0.001	5.421E-04	0.1	5 42E-05	
Cesium-137	8036	3.190E-05	1.2	1.62	6117	0 0004	0.001	1.219E-03	0.1	1.22E-04	
								1.76E-03		1.76E-04	Total Inhalation Dose (Person-rem)
External Dose	Geometric		Soil Density								
Cleanup to 100 mrem/yr	RSC	DCF ext	Correction	Excavate & Package	Soil Volume	Time Conversion	Conversion Factor	External Dose			
Radionuclide	(pCi/g)	(rem/yr per pCi/g)	dimensionless	(Person hr/ m3)	(m3)	yr/person hr	rem/mrem	(person-rem)			
Strontium-90	87	0.000E+00	0.96	1.62	6117	0.000114	0.001	0.000E+00			
Cesium-137	8036	3.605E+00	0 96	1.62	6117	0.000114	0.001	3.154E+01			
								3.154E+01	Total External Dose (Person-rem)		

Dose to Workers from Environmental Remediation to 75 mrem/yr:											
Volume-Weighted Geometric Average Concentrations											File: WRKDOSE.wb3
Dose from Inhalation	Geometric										
Cleanup to 75 mrem/yr	RSC	DCF inh	IR	Excavate & Package	Soil Volume	DL	Conversion Factor	Inhalation Dose	Respirator PF	Inhalation Dose with Resp.	
Radionuclide	(pCi/g)	(mrem/pCi)	(m3/hr)	(Person hr/ m3)	(m3)	(g/m3)	rem/mrem	(person-rem)		(person-rem)	
Strontium-90	71	1.310E-03	1.2	1.62	6874	0.0004	0.001	4.971E-04	0.1	4.97E-05	
Cesium-137	6585	3.190E-05	1.2	1.62	6874	0.0004	0.001	1.123E-03	0.1	1.12E-04	
								1.62E-03		1.62E-04	Total Inhalation Dose (Person-rem)
External Dose	Geometric		Soil Density								
Cleanup to 75 mrem/yr	RSC	DCF ext	Correction	Excavate & Package	Soil Volume	Time Conversion	Conversion Factor	External Dose			
Radionuclide	(pCi/g)	(mrem/yr per pCi/g)	dimensionless	(Person hr/ m3)	(m3)	yr/person hr	rem/mrem	(person-rem)			
Strontium-90	71	0 000E+00	0.96	1.62	6874	0.000114	0.001	0.000E+00			
Cesium-137	6585	3.605E+00	0.96	1.62	6874	0.000114	0.001	2.905E+01			
								2.905E+01	Total External Dose (Person-rem)		

Dose to Workers from Environmental Remediation to 25 mrem/yr:											
Volume-Weighted Geometric Average Concentrations											File: WRKDOSE.wb3
Dose from Inhalation	Geometric										
Cleanup to 25 mrem/yr	RSC	DCF inh	IR	Excavate & Package	Soil Volume	DL	Conversion Factor	Inhalation Dose w/o Resp.	Respirator PF	Inhalation Dose with Resp.	
Radionuclide	(pCi/g)	(mrem/pCi)	(m3/hr)	(Person hr/ m3)	(m3)	(g/m3)	rem/mrem	(person-rem)		(person-rem)	
Strontium-90	21	1.310E-03	1.2	1.62	15445	0.0004	0 001	3.304E-04	0.1	3.30E-05	
Cesium-137	1981	3.190E-05	1.2	1.62	15445	0.0004	0 001	7.590E-04	0.1	7.59E-05	
								1.09E-03		1.09E-04	Total Inhalation Dose (Person-rem)
External Dose	Geometric		Soil Density								
Cleanup to 25 mrem/yr	RSC	DCF ext	Correction	Excavate & Package	Soil Volume	Time Conversion	Conversion Factor	External Dose			
Radionuclide	(pCi/g)	(mrem/yr per pCi/g)	dimensionless	(Person hr/ m3)	(m3)	yr/person hr	rem/mrem	(person-rem)			
Strontium-90	21	0.000E+00	0.96	1.62	15445	0.000114	0 001	0.000E+00			
Cesium-137	1981	3 605E+00	0 96	1.62	15445	0.000114	0.001	1.963E+01			
								1.963E+01	Total External Dose (Person-rem)		

Dose to Workers from Environmental Remediation to 15 mrem/yr:											
Volume-Weighted Geometric Average Concentrations											File: WRKDOSE.wb3
Dose from Inhalation	Geometric										
Cleanup to 15 mrem/yr	RSC	DCF inh	IR	Excavate & Package	Soil Volume	DL	Conversion Factor	Inhalation Dose w/o Resp.	Respirator PF	Inhalation Dose with Resp.	
Radionuclide	(pCi/g)	(mrem/pCi)	(m3/hr)	(Person hr/ m3)	(m3)	(g/m3)	rem/mrem	(person-rem)		(person-rem)	
Strontium-90	14	1.310E-03	1.2	1.62	19688	0.0004	0.001	2.808E-04	0.1	2.81E-05	
Cesium-137	1321	3.190E-05	1.2	1.62	19688	0.0004	0.001	6.452E-04	0.1	6.45E-05	
								9.26E-04		9.26E-05	Total Inhalation Dose (Person-rem)
External Dose	Geometric		Soil Density								
Cleanup to 15 mrem/yr	RSC	DCF ext	Correction	Excavate & Package	Soil Volume	Time Conversion	Conversion Factor	External Dose			
Radionuclide	(pCi/g)	(mrem/yr per pCi/g)	dimensionless	(Person hr/ m3)	(m3)	yr/person hr	rem/mrem	(person-rem)			
Strontium-90	14	0.000E+00	0.96	1.62	19688	0.000114	0.001	0.000E+00			
Cesium-137	1321	3.605E+00	0.96	1.62	19688	0.000114	0.001	1.669E+01			
								1.669E+01	Total External Dose (Person-rem)		

Dose to Workers from Environmental Remediation to 1 mrem/yr:											
Volume-Weighted Geometric Average Concentrations											File: WRKDOSE.wb3
Dose from Inhalation	Geometric										
Cleanup to 1 mrem/yr	RSC	DCF Inh	IR	Excavate & Package	Soil Volume	DL	Conversion Factor	Inhalation Dose w/o Resp.	Respirator PF	Inhalation Dose with Resp.	
Radionuclide	(pCi/g)	(mrem/pCi)	(m3/hr)	(Person hr/ m3)	(m3)	(g/m3)	rem/mrem	(person-rem)		(person-rem)	
Strontium-90	3	1.310E-03	1.2	1.62	59862	0.0004	0.001	1.829E-04	0.1	1.83E-05	
Cesium-137	266	3.190E-05	1.2	1.62	59862	0.0004	0.001	3.950E-04	0.1	3.95E-05	
								5.78E-04		5.78E-05	Total Inhalation Dose (Person-rem)
External Dose	Geometric		Soil Density								
Cleanup to 10 mrem/yr	RSC	DCF ext	Correction	Excavate & Package	Soil Volume	Time Conversion	Conversion Factor	External Dose			
Radionuclide	(pCi/g)	(mrem/yr per pCi/g)	dimensionless	(Person hr/ m3)	(m3)	yr/person hr	rem/mrem	(person-rem)			
Strontium-90	3	0.000E+00	0.96	1.62	59862	0.000114	0.001	0.000E+00			
Cesium-137	266	3.605E+00	0.96	1.62	59862	0.000114	0.001	1.022E+01			
								1.022E+01	Total External Dose (Person-rem)		

Remediation Workers: Dose Impacts Associated with Remediation

Dose Impacts to Workers form Remediation

Worker Collective Dose Impacts	Remediation Workers	Disposal Workers /Drivers	Worker Dose Impact
Geometric Average Concentration	(person-rem)	(person-rem)	(person-rem)
Dose to 1 mrem/yr	10	0.94	10.9
Dose to 15 mrem/yr	17	0.92	17.9
Dose to 25mrem/yr	20	0.91	20.9
Dose to 75 mrem/yr	29	0.88	29.9
Dose to 100 mrem/yr	32	0.87	32.4
Worker Collective Dose Impacts	Remediation Workers	Disposal Workers /Drivers	Worker Dose Impact
Arithmetic Average Concentration	(person-rem)	(person-rem)	(person-rem)
Dose to 1 mrem/yr	203	19.6	223
Dose to 15 mrem/yr	199	19.2	218
Dose to 25mrem/yr	199	19.1	218
Dose to 75 mrem/yr	195	18.4	213
Dose to 100 mrem/yr	194	18.3	212

Appendix E

Dose to Workers from Transport and Disposal of Contaminated Soil: Microshield Printouts and Spreadsheets

Contents Page

Dose to Workers from Transport of Contaminated Soil: Microshield Printouts. . E-1

Dose to Workers from Disposal of Contaminated Soil: Microshield Printouts. . E-9

Dose to Workers from Transport of Contaminated Soil: Spreadsheets E-19

Dose to Workers from Disposal of Contaminated Soil: Spreadsheets E-27

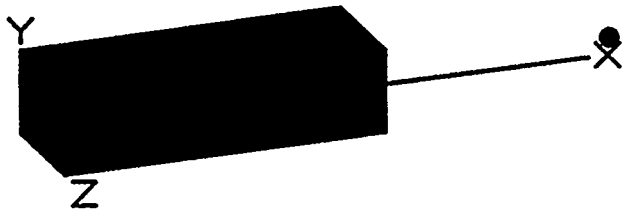
Dose to Workers from Transport of Contaminated Soil: Microshield Printouts

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory

Page : 1
DOS File : B25CDRIV.MS5
Run Date : June 1, 1997
Run Time: 11:10:27 AM
Duration : 00:00:26

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: B25CDRIV
Description: B-25 Box w Cs 137 @ 1 pCi/g in NBS Concrete : Driver @ 12 ft
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	487.68 cm	16 ft
Width	182.88 cm	6 ft
Height	121.92 cm	4 ft

Dose Points

	X	Y	Z
# 1	853.44 cm	60.96 cm	91.44 cm
	28 ft 0.0 in	2 ft	3 ft

Shields

Shield Name	Dimension	Material	Density
Source	384.0 ft³	NBS Concrete	2.35
Shield 1	.016 ft	Iron	7.86
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 4
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ba-137m	1.7178e-005	6.3560e+005	1.5798e-006	5.8453e-002
Cs-137	1.8159e-005	6.7188e+005	1.6700e-006	6.1790e-002

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.316e+04	3.408e-19	1.080e-18	2.838e-21	8.993e-21
0.0322	2.428e+04	1.663e-18	5.388e-18	1.338e-20	4.336e-20
0.0364	8.835e+03	2.719e-15	1.123e-14	1.545e-17	6.379e-17
0.6616	5.719e+05	1.735e-03	4.861e-03	3.363e-06	9.423e-06
TOTALS:	6.182e+05	1.735e-03	4.861e-03	3.363e-06	9.423e-06

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory
Conversion of calculated exposure in air to dose
FILE: C:\MS5\DATA\B25CDRIV.MS5
Case Title: B25CDRIV
This case was run on Sunday, June 1, 1997 at 11:10:27 AM
Dose Point # 1 - (28,2,3) ft

Results (Summed over energies)	Units	Without Buildup	With Buildup
Photon Fluence Rate (flux)	Photons/cm²/sec	2.622e-003	7.346e-003
Photon Energy Fluence Rate	MeV/cm²/sec	1.735e-003	4.861e-003
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	3.363e-006	9.423e-006
Absorbed Dose Rate in Air	mGy/hr	2.936e-008	8.226e-008
"	mrad/hr	2.936e-006	8.226e-006
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	3.476e-008	9.739e-008
o Opposed	"	2.783e-008	7.798e-008
o Rotational	"	2.783e-008	7.798e-008
o Isotropic	"	2.461e-008	6.895e-008
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	3.695e-008	1.035e-007
o Opposed	"	3.509e-008	9.832e-008
o Rotational	"	3.509e-008	9.832e-008
o Isotropic	"	2.631e-008	7.371e-008
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	3.074e-008	8.612e-008
o Posterior/Anterior	"	2.713e-008	7.601e-008
o Lateral	"	2.012e-008	5.637e-008
o Rotational	"	2.425e-008	6.793e-008
o Isotropic	"	2.064e-008	5.783e-008

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory
Custom Material : NBS Concrete
NBS Concrete
Density : 2.35 g/cm³
Average Atomic Number : 14 (based on average elements Z)
Effective Atomic Number : 11.58 (for Buildup Factor Interpolation)
Effective Atomic Weight : 18.8

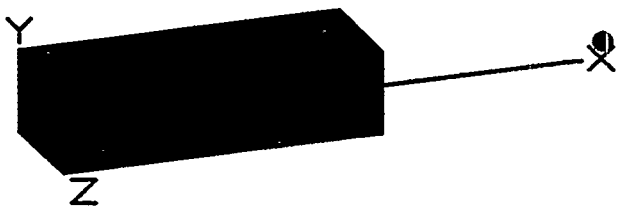
	Hydrogen 0.560%	Oxygen 49.830%	Sodium 1.710%	Magnesium 0.240%	Aluminum 4.560%	Silicon 31.580%	Sulfur 0.120%	Potassium 1.920%	Calcium 8.260%	Iron 1.220%
Hydrogen	1									
Oxygen		1								
Sodium			1							
Magnesium				1						
Aluminum					1					
Silicon						1				
Sulfur							1			
Potassium								1		
Calcium									1	
Iron										1

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory

Page : 1
DOS File : B25SDRIV.MS5
Run Date : June 1, 1997
Run Time: 11:06:44 AM
Duration : 00:00:25

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: B25SDRIVER
Description: B-25 Box w Cs 137 @ 1 pCi/g in BNL Soil: Driver @ 12 Ft.
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	487.68 cm	16 ft
Width	182.88 cm	6 ft
Height	121.92 cm	4 ft

Dose Points

	X	Y	Z
# 1	853.44 cm	60.96 cm	91.44 cm
	28 ft 0.0 in	2 ft	3 ft

Shields

Shield Name	Dimension	Material	Density
Source	384.0 ft³	BNL Soil	1.67
Shield 1	.016 ft	Iron	7.86
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 4
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ba-137m	1.7178e-005	6.3560e+005	1.5798e-006	5.8453e-002
Cs-137	1.8159e-005	6.7188e+005	1.6700e-006	6.1790e-002

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.316e+04	2.836e-18	1.701e-17	2.362e-20	1.417e-19
0.0322	2.428e+04	1.294e-17	7.970e-17	1.041e-19	6.414e-19
0.0364	8.835e+03	1.189e-14	9.657e-14	6.758e-17	5.487e-16
0.6616	5.719e+05	2.375e-03	6.834e-03	4.605e-06	1.325e-05
TOTALS:	6.182e+05	2.375e-03	6.834e-03	4.605e-06	1.325e-05

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory
Conversion of calculated exposure in air to dose
FILE: C:\MS5\DATA\B25SDRIV.MS5
Case Title: B25SDRIVER
This case was run on Sunday, June 1, 1997 at 11:06:44 AM
Dose Point # 1 - (28,2,3) ft

Results (Summed over energies)	Units	Without Buildup	With Buildup
Photon Fluence Rate (flux)	Photons/cm²/sec	3.590e-003	1.033e-002
Photon Energy Fluence Rate	MeV/cm²/sec	2.375e-003	6.834e-003
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	4.605e-006	1.325e-005
Absorbed Dose Rate in Air	mGy/hr	4.020e-008	1.157e-007
"	mrad/hr	4.020e-006	1.157e-005
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	4.759e-008	1.369e-007
o Opposed	"	3.811e-008	1.096e-007
o Rotational	"	3.811e-008	1.096e-007
o Isotropic	"	3.370e-008	9.695e-008
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	5.058e-008	1.455e-007
o Opposed	"	4.804e-008	1.382e-007
o Rotational	"	4.804e-008	1.382e-007
o Isotropic	"	3.602e-008	1.036e-007
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	4.208e-008	1.211e-007
o Posterior/Anterior	"	3.715e-008	1.069e-007
o Lateral	"	2.755e-008	7.925e-008
o Rotational	"	3.319e-008	9.551e-008
o Isotropic	"	2.826e-008	8.131e-008

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory
Custom Material : BNL Soil
BNL Soil w 18% Moisture
Density : 1.67 g/cm³
Average Atomic Number : 6.67 (based on average elements Z)
Effective Atomic Number : 10.16 (for Buildup Factor Interpolation)
Effective Atomic Weight : 14.1

	SiO2	H2O
	82.000%	18.000%
Hydrogen		2
Oxygen	2	1
Silicon	1	

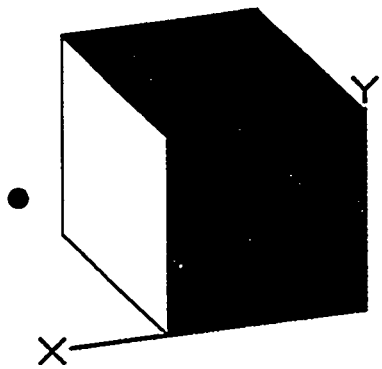
Dose to Workers from Disposal of Contaminated Soil: Microshield Printouts

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory

Page : 1
DOS File : 1B256FT.MS5
Run Date : June 20, 1997
Run Time : 6:50:18 PM
Duration : 00:00:24

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: B25CFORK
Description: B-25 Box w Cs 137 @ 1 pCi/g in NBS Concrete : Transit 6 ft
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	121.92 cm	4 ft
Width	182.88 cm	6 ft
Height	121.92 cm	4 ft

Dose Points

	X	Y	Z
# 1	182.88 cm	60.96 cm	91.44 cm
	6 ft	2 ft	3 ft

Shields

Shield Name	Dimension	Material	Density
Source	96.0 ft³	NBS Concrete	2.35
Shield 1	.016 ft	Iron	7.86
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ba-137m	4.2946e-006	1.5890e+005	1.5798e-006	5.8453e-002
Cs-137	4.5398e-006	1.6797e+005	1.6700e-006	6.1790e-002

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	3.290e+03	3.796e-18	1.175e-17	3.162e-20	9.790e-20
0.0322	6.070e+03	1.741e-17	5.513e-17	1.401e-19	4.436e-19
0.0364	2.209e+03	1.818e-14	7.323e-14	1.033e-16	4.161e-16
0.6616	1.430e+05	2.559e-02	7.224e-02	4.960e-05	1.401e-04
TOTALS:	1.545e+05	2.559e-02	7.224e-02	4.960e-05	1.401e-04

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory
Conversion of calculated exposure in air to dose
FILE: C:\MS5\DATA\1B256FT.MS5
Case Title: B25CFORK
This case was run on Friday, June 20, 1997 at 6:50:18 PM
Dose Point # 1 - (6,2,3) ft

Results (Summed over energies)	Units	Without Buildup	With Buildup
Photon Fluence Rate (flux)	Photons/cm²/sec	3.867e-002	1.092e-001
Photon Energy Fluence Rate	MeV/cm²/sec	2.559e-002	7.224e-002
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	4.960e-005	1.401e-004
Absorbed Dose Rate in Air	mGy/hr	4.330e-007	1.223e-006
"	mrad/hr	4.330e-005	1.223e-004
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	5.127e-007	1.448e-006
o Opposed	"	4.105e-007	1.159e-006
o Rotational	"	4.105e-007	1.159e-006
o Isotropic	"	3.630e-007	1.025e-006
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	5.449e-007	1.539e-006
o Opposed	"	5.175e-007	1.461e-006
o Rotational	"	5.175e-007	1.461e-006
o Isotropic	"	3.880e-007	1.096e-006
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	4.533e-007	1.280e-006
o Posterior/Anterior	"	4.001e-007	1.130e-006
o Lateral	"	2.967e-007	8.378e-007
o Rotational	"	3.576e-007	1.010e-006
o Isotropic	"	3.044e-007	8.595e-007

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory

Page : 1
DOS File : 4B256FT.MS5
Run Date : June 20, 1997
Run Time : 6:55:10 PM
Duration : 00:00:25

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: B25CFORK
Description: B-25 Box w Cs 137 @ 1 pCi/g in NBS Concrete : Pick @ 6 ft
Geometry: 13 - Rectangular Volume

Source Dimensions

Length	487.68 cm	16 ft
Width	182.88 cm	6 ft
Height	121.92 cm	4 ft

Dose Points

	X	Y	Z
# 1	670.56 cm	60.96 cm	91.44 cm
	22 ft	2 ft	3 ft

Shields

Shield Name	Dimension	Material	Density
Source	1.09e+07 cm³	NBS Concrete	2.35
Shield 1	.476 cm	Iron	7.86
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 4
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ba-137m	1.7178e-005	6.3560e+005	1.5798e-006	5.8453e-002
Cs-137	1.8159e-005	6.7188e+005	1.6700e-006	6.1790e-002

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.316e+04	6.406e-19	2.037e-18	5.336e-21	1.697e-20
0.0322	2.428e+04	3.169e-18	1.030e-17	2.550e-20	8.292e-20
0.0364	8.835e+03	5.936e-15	2.468e-14	3.372e-17	1.402e-16
0.6616	5.719e+05	6.105e-03	1.684e-02	1.184e-05	3.265e-05
TOTALS:	6.182e+05	6.105e-03	1.684e-02	1.184e-05	3.265e-05

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory
Conversion of calculated exposure in air to dose
FILE: C:\MS5\DATA\4B256FT.MS5
Case Title: B25CFORK
This case was run on Friday, June 20, 1997 at 6:55:10 PM
Dose Point # 1 - (670.56,60.96,91.44) cm

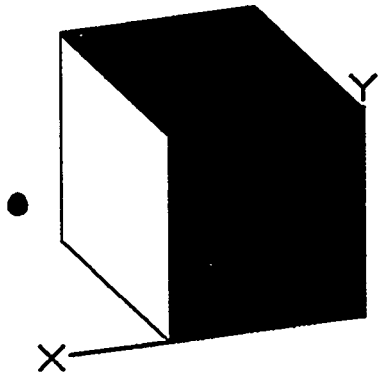
Results (Summed over energies)	Units	Without Buildup	With Buildup
Photon Fluence Rate (flux)	Photons/cm²/sec	9.227e-003	2.546e-002
Photon Energy Fluence Rate	MeV/cm²/sec	6.105e-003	1.684e-002
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	1.184e-005	3.265e-005
Absorbed Dose Rate in Air	mGy/hr	1.033e-007	2.851e-007
"	mrad/hr	1.033e-005	2.851e-005
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	1.223e-007	3.375e-007
o Opposed	"	9.795e-008	2.702e-007
o Rotational	"	9.795e-008	2.702e-007
o Isotropic	"	8.661e-008	2.389e-007
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	1.300e-007	3.587e-007
o Opposed	"	1.235e-007	3.407e-007
o Rotational	"	1.235e-007	3.407e-007
o Isotropic	"	9.259e-008	2.554e-007
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	1.082e-007	2.984e-007
o Posterior/Anterior	"	9.548e-008	2.634e-007
o Lateral	"	7.080e-008	1.953e-007
o Rotational	"	8.532e-008	2.354e-007
o Isotropic	"	7.264e-008	2.004e-007

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory

Page : 1
DOS File : 1B25S6FT.MS5
Run Date : June 20, 1997
Run Time: 7:07:05 PM
Duration : 00:00:24

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: B25SFORK
Description: B-25 Box, w Cs 137 @ 1 pCi/g in BNL Soil: Transit @ 6 Ft.
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	121.92 cm	4 ft
Width	182.88 cm	6 ft
Height	121.92 cm	4 ft

Dose Points

	X	Y	Z
# 1	182.88 cm	60.96 cm	91.44 cm
	6 ft	2 ft	3 ft

Shields

Shield Name	Dimension	Material	Density
Source	96.0 ft³	BNL Soil	1.67
Shield 1	.016 ft	Iron	7.86
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ba-137m	4.2946e-006	1.5890e+005	1.5798e-006	5.8453e-002
Cs-137	4.5398e-006	1.6797e+005	1.6700e-006	6.1790e-002

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	3.290e+03	8.504e-18	5.072e-17	7.084e-20	4.225e-19
0.0322	6.070e+03	3.874e-17	2.375e-16	3.118e-19	1.911e-18
0.0364	2.209e+03	3.821e-14	3.122e-13	2.171e-16	1.774e-15
0.6616	1.430e+05	3.474e-02	9.970e-02	6.734e-05	1.933e-04
TOTALS:	1.545e+05	3.474e-02	9.970e-02	6.734e-05	1.933e-04

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory
Conversion of calculated exposure in air to dose
FILE: C:\MS5\DATA\1B25S6FT.MS5
Case Title: B25SFORK
This case was run on Friday, June 20, 1997 at 7:07:05 PM
Dose Point # 1 - (6,2,3) ft

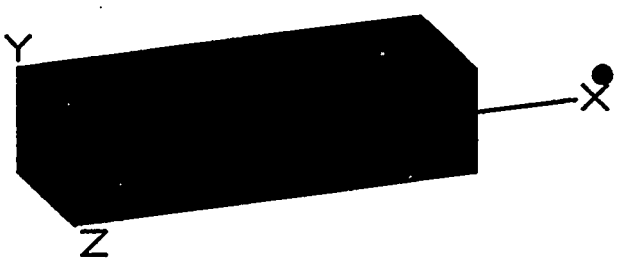
Results (Summed over energies)	Units	Without Buildup	With Buildup
Photon Fluence Rate (flux)	Photons/cm²/sec	5.250e-002	1.507e-001
Photon Energy Fluence Rate	MeV/cm²/sec	3.474e-002	9.970e-002
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	6.734e-005	1.933e-004
Absorbed Dose Rate in Air	mGy/hr	5.879e-007	1.687e-006
"	mrad/hr	5.879e-005	1.687e-004
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	6.960e-007	1.998e-006
o Opposed	"	5.573e-007	1.599e-006
o Rotational	"	5.573e-007	1.599e-006
o Isotropic	"	4.928e-007	1.414e-006
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	7.398e-007	2.123e-006
o Opposed	"	7.026e-007	2.017e-006
o Rotational	"	7.026e-007	2.017e-006
o Isotropic	"	5.268e-007	1.512e-006
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	6.155e-007	1.766e-006
o Posterior/Anterior	"	5.432e-007	1.559e-006
o Lateral	"	4.028e-007	1.156e-006
o Rotational	"	4.854e-007	1.393e-006
o Isotropic	"	4.133e-007	1.186e-006

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory

Page : 1
DOS File : 4B25S6FT.MS5
Run Date : June 20, 1997
Run Time: 7:02:01 PM
Duration : 00:00:25

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: B25SFORK
Description: B-25 Box w Cs 137 @ 1 pCi/g in BNL Soil: Pick @ 6 Ft.
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	487.68 cm	16 ft
Width	182.88 cm	6 ft
Height	121.92 cm	4 ft

Dose Points

	X	Y	Z
# 1	670.56 cm	60.96 cm	91.44 cm
	22 ft 0.0 in	2 ft	3 ft

Shields

Shield Name	Dimension	Material	Density
Source	384.0 ft³	BNL Soil	1.67
Shield 1	.016 ft	Iron	7.86
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 4
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ba-137m	1.7178e-005	6.3560e+005	1.5798e-006	5.8453e-002
Cs-137	1.8159e-005	6.7188e+005	1.6700e-006	6.1790e-002

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.316e+04	5.507e-18	3.325e-17	4.587e-20	2.769e-19
0.0322	2.428e+04	2.546e-17	1.579e-16	2.049e-19	1.271e-18
0.0364	8.835e+03	2.674e-14	2.195e-13	1.519e-16	1.247e-15
0.6616	5.719e+05	8.307e-03	2.342e-02	1.610e-05	4.541e-05
TOTALS:	6.182e+05	8.307e-03	2.342e-02	1.610e-05	4.541e-05

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory
Conversion of calculated exposure in air to dose
FILE: C:\MS5\DATA\4B25S6FT.MS5
Case Title: B25SFORK
This case was run on Friday, June 20, 1997 at 7:02:01 PM
Dose Point # 1 - (22,2,3) ft

Results (Summed over energies)	Units	Without Buildup	With Buildup
Photon Fluence Rate (flux)	Photons/cm²/sec	1.256e-002	3.540e-002
Photon Energy Fluence Rate	MeV/cm²/sec	8.307e-003	2.342e-002
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	1.610e-005	4.541e-005
Absorbed Dose Rate in Air	mGy/hr	1.406e-007	3.964e-007
"	mrad/hr	1.406e-005	3.964e-005
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	1.665e-007	4.693e-007
o Opposed	"	1.333e-007	3.758e-007
o Rotational	"	1.333e-007	3.758e-007
o Isotropic	"	1.179e-007	3.323e-007
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	1.769e-007	4.988e-007
o Opposed	"	1.680e-007	4.738e-007
o Rotational	"	1.680e-007	4.738e-007
o Isotropic	"	1.260e-007	3.552e-007
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	1.472e-007	4.150e-007
o Posterior/Anterior	"	1.299e-007	3.663e-007
o Lateral	"	9.634e-008	2.716e-007
o Rotational	"	1.161e-007	3.273e-007
o Isotropic	"	9.884e-008	2.787e-007

Dose to Workers from Transport of Contaminated Soil: Spreadsheets

Hanford & Envirocare Disposal Volumes: Cs 137 Vol. Weighted Arithmetic & Geometric Avg. Conc.

	Cs 137 Conc @ Midpoint	Volume in Conc. Range	Vol Weighted Arithmatic Avg Conc.				
Cesium 137 Conc. Range	(pCi/g)	(CY)	(pCi/g)				
1500 to 2800 pCi/g	2150	2020	2150				
2,800 to 5,600 pCi/g	4200	3200	2247		Vol Weighted Geometric Avg.:	Geometric Avg. Conc.	
5,600 to 30,000 pCi/g	17800	1980	5894	Hanford	V. W. Arithmatic Avg. Conc Ratio	(pCi/g)	Hanford
over 30,000 pCi/g	420000	800	56187	Cs 137 Concentration: Arithmatic			Cs 137 Concentration: Geometric
	Total Volume	8000	64328	< Vol Weighted Avg @ 100 mrem	0.0477	3071	< Vol Weighted Avg @ 100 mrem
				Envirocare			Envirocare
				Cs 137 Concentration: Arithmatic			Cs 137 Concentration: Geometric
			2150	< Vol Weighted Avg @ 100 mrem	0.0477	103	< Vol Weighted Avg @ 100 mrem
	Cs 137 Conc @ Midpoint	Volume in Conc. Range	Vol Weighted Arithmatic Avg Conc.				
Cesium 137 Conc. Range	(pCi/g)	(CY)	(pCi/g)				
1135 to 1500 pCi/g	1318	990	433				
1500 to 2800 pCi/g	2150	2020	1443				
2,800 to 5,600 pCi/g	4200	3200	2247				
5,600 to 30,000 pCi/g	17800	1980	5894	Hanford			Hanford
over 30,000 pCi/g	420000	800	56187	Cs 137 Concentration: Arithmatic			Cs 137 Concentration: Geometric
	Total Volume	8990	64328	< Vol Weighted Avg @ 75 mrem	0.0477	3071	< Vol Weighted Avg @ 75 mrem
				Envirocare			Envirocare
				Cs 137 Concentration: Arithmatic			Cs 137 Concentration: Geometric
			1876	< Vol Weighted Avg @ 75 mrem	0.0477	90	< Vol Weighted Avg @ 75 mrem
	Cs 137 Conc @ Midpoint	Volume in Conc. Range	Vol Weighted Arithmatic Avg Conc.				
Cesium 137 Conc. Range	(pCi/g)	(CY)	(pCi/g)				
378 to 1135 pCi/g	756	11210	598				
1135 to 1500 pCi/g	1318	990	92				
1500 to 2800 pCi/g	2150	2020	305				
2,800 to 5,600 pCi/g	4200	3200	2247				
5,600 to 30,000 pCi/g	17800	1980	5894	Hanford			Hanford
over 30,000 pCi/g	420000	800	56187	Cs 137 Concentration: Arithmatic			Cs 137 Concentration: Geometric
	Total Volume	20200	64328	< Vol Weighted Avg @ 25 mrem	0.0477	3071	< Vol Weighted Avg @ 25 mrem
				Envirocare			Envirocare
				Cs 137 Concentration: Arithmatic			Cs 137 Concentration: Geometric
			993	< Vol Weighted Avg @ 25 mrem	0.0477	47	< Vol Weighted Avg @ 25 mrem
	Cs 137 Conc @ Midpoint	Volume in Conc. Range	Vol Weighted Arithmatic Avg Conc.				
Cesium 137 Conc. Range	(pCi/g)	(CY)	(pCi/g)				
227 to 378 pCi/g	302	5550	85				
378 to 1135 pCi/g	756	11210	429				
1135 to 1500 pCi/g	1318	990	66				
1500 to 2800 pCi/g	2150	2020	220				
2,800 to 5,600 pCi/g	4200	3200	2247				
5,600 to 30,000 pCi/g	17800	1980	5894	Hanford			Hanford
over 30,000 pCi/g	420000	800	56187	Cs 137 Concentration: Arithmatic			Cs 137 Concentration: Geometric
	Total Volume	25750	64328	< Vol Weighted Avg @ 15 mrem	0.0477	3071	< Vol Weighted Avg @ 15 mrem
				Envirocare			Envirocare
				Cs 137 Concentration: Arithmatic			Cs 137 Concentration: Geometric
			799	< Vol Weighted Avg @ 15 mrem	0 0477	38	< Vol Weighted Avg @ 15 mrem
	Cs 137 Conc @ Midpoint	Volume in Conc. Range	Vol Weighted Arithmatic Avg Conc.				
Cesium 137 Conc. Range	(pCi/g)	(CY)	(pCi/g)				
15 to 227 pCi/g	121	52542	87				
227 to 378 pCi/g	302	5550	23				
378 to 1135 pCi/g	756	11210	116				
1135 to 1500 pCi/g	1318	990	18				
1500 to 2800 pCi/g	2150	2020	59				
2,800 to 5,600 pCi/g	4200	3200	2247				
5,600 to 30,000 pCi/g	17800	1980	5894	Hanford			Hanford
over 30,000 pCi/g	420000	800	56187	Cs 137 Concentration: Arithmatic			Cs 137 Concentration: Geometric
	Total Volume	78292	64328	< Vol Weighted Avg @ 1 mrem	0.0477	3071	< Vol Weighted Avg @ 1 mrem
				Envirocare			Envirocare
				Cs 137 Concentration: Arithmatic			Cs 137 Concentration: Geometric
			302	< Vol Weighted Avg @ 1 mrem	0.0477	14	< Vol Weighted Avg @ 1 mrem

Dose to Driver\Worker from Transport and Off-site Disposal to 100 mrem/yr:							File: WRKTRANS.wb3
Volume Weighted Arithmetic & Geometric Average Concentrations							
Dose from Transport to Hanford	**B-25C Dose Rate@12Ft**	**Geometric Avg.**	**Trip Time**	**No. of Drivers**	**No. Truck Trips**	**Collective Dose**	
Cleanup to 100 mrem/yr	**(Mrem/hr per pCi/g)**	**(pCi/g)**	**(hours)**			**(person-rem)**	**Hanford**
	0.00000760	2303	44	2	498	0.767	**Dose w Geometric Avg.**
		Arithmetic Avg.					
		(pCi/g)					**Hanford**
	0.00000760	48246	44	2	498	16.069	**Dose w Arithmetic Avg.**
Dose from Transport to Envirocare	**B-25S Dose Rate @ 12Ft**	**Geometric Avg.**	**Trip Time**	**No. of Drivers**	**No. Truck Trips**	**Collective Dose**	
Cleanup to 100 mrem/yr	**(Mrem/hr per pCi/g)**	**(pCi/g)**	**(hours)**			**(person-rem)**	**Envirocare**
	0.00001070	103	35	2	168	0.013	**Dose w Geometric Avg.**
		Arithmetic Avg.					
		(pCi/g)					**Envirocare**
	0.00001070	2150	35	2	168	0.271	**Dose w Arithmetic Avg.**

Dose to Driver\Worker from Transport and Off-site Disposal to 75 mrem/yr:							File: WRKTRANS.wb3
Volume Weighted Arithmetic & Geometric Average Concentrations							
Dose from Transport to Hanford	**B-25C Dose Rate@12Ft**	**Geometric Avg.**	**Trip Time**	**No. of Drivers**	**No. Truck Trips**	**Collective Dose**	
Cleanup to 75 mrem/yr	**(Mrem/hr per pCi/g)**	**(pCi/g)**	**(hours)**			**(person-rem)**	**Hanford**
	0.00000760	2303	44	2	498	0.767	**Dose w Geometric Avg.**
		Arithmetic Avg.					
		(pCi/g)					**Hanford**
	0.00000760	48246	44	2	498	16.069	**Dose w Arithmetic Avg.**
Dose from Transport to Envirocare	**B-25S Dose Rate @ 12Ft**	**Geometric Avg.**	**Trip Time**	**No. of Drivers**	**No. Truck Trips**	**Collective Dose**	
Cleanup to 75 mrem/yr	**(Mrem/hr per pCi/g)**	**(pCi/g)**	**(hours)**			**(person-rem)**	**Envirocare**
	0.00001070	90	35	2	250	0.017	**Dose w Geometric Avg.**
		Arithmetic Avg.					
		(pCi/g)					**Envirocare**
	0.00001070	1876	35	2	250	0.351	**Dose w Arithmetic Avg.**

Dose to Driver\Worker from Transport and Off-site Disposal to 25 mrem/yr:							File: WRKTRANS.wb3
Volume Weighted Arithmetic & Geometric Average Concentrations							
Dose from Transport to Hanford	**B-25C Dose Rate@12Ft**	**Geometric Avg.**	**Trip Time**	**No. of Drivers**	**No. Truck Trips**	**Collective Dose**	
Cleanup to 25 mrem/yr	**(Mrem/hr per pCi/g)**	**(pCi/g)**	**(hours)**			**(person-rem)**	**Hanford**
	0.00000760	2303	44	2	498	0.767	**Dose w Geometric Avg.**
		Arithmetic Avg.					
		(pCi/g)					**Hanford**
	0.00000760	48246	44	2	498	16.069	**Dose w Arithmetic Avg.**
Dose from Transport to Envirocare	**B-25S Dose Rate @ 12Ft**	**Geometric Avg.**	**Trip Time**	**No. of Drivers**	**No. Truck Trips**	**Collective Dose**	
Cleanup to 25 mrem/yr	**(Mrem/hr per pCi/g)**	**(pCi/g)**	**(hours)**			**(person-rem)**	**Envirocare**
	0.00001070	47	35	2	1185	0.042	**Dose w Geometric Avg.**
		Arithmetic Avg.					
		(pCi/g)					**Envirocare**
	0.00001070	993	35	2	1185	0.881	**Dose w Arithmetic Avg.**

Dose to Driver\Worker from Transport and Off-site Disposal to 15 mrem/yr:							File: WRKTRANS.wb3
Volume Weighted Arithmetic & Geometric Average Concentrations							
Dose from Transport to Hanford	**B-25C Dose Rate@12Ft**	**Geometric Avg.**	**Trip Time**	**No. of Drivers**	**No. Truck Trips**	**Collective Dose**	
Cleanup to 15 mrem/yr	**(Mrem/hr per pCi/g)**	**(pCi/g)**	**(hours)**			**(person-rem)**	**Hanford**
	0.00000760	2303	44	2	498	0.767	**Dose w Geometric Avg.**
		Arithmetic Avg.					
		(pCi/g)					**Hanford**
	0.00000760	48246	44	2	498	16.069	**Dose w Arithmetic Avg.**
Dose from Transport to Envirocare	**B-25S Dose Rate @ 12F**	**Geometric Avg.**	**Trip Time**	**No. of Drivers**	**No. Truck Trips**	**Collective Dose**	
Cleanup to 15 mrem/yr	**(Mrem/hr per pCi/g)**	**(pCi/g)**	**(hours)**			**(person-rem)**	**Envirocare**
	0.00001070	38	35	2	1648	0.047	**Dose w Geometric Avg.**
		Arithmetic Avg.					
		(pCi/g)					**Envirocare**
	0.00001070	779	35	2	1648	0.962	**Dose w Arithmetic Avg.**

Dose to Driver\Worker from Transport and Off-site Disposal to 1 mrem/yr:							File: WRKTRANS.wb3
Volume Weighted Arithmetic & Geometric Average Concentrations							
Dose from Transport to Hanford	**B-25C Dose Rate@12Ft**	**Geometric Avg.**	**Trip Time**	**No. of Drivers**	**No. Truck Trips**	**Collective Dose**	
Cleanup to 1 mrem/yr	**(Mrem/hr per pCi/g)**	**(pCi/g)**	**(hours)**			**(person-rem)**	**Hanford**
	0.00000760	2303	44	2	498	0.767	**Dose w Geometric Avg.**
		Arithmetic Avg.					
		(pCi/g)					**Hanford**
	0.00000760	48246	44	2	498	16.069	**Dose w Arithmetic Avg.**
Dose from Transport to Envirocare	**B-25S Dose Rate @ 12Ft**	**Geometric Avg.**	**Trip Time**	**No. of Drivers**	**No. Truck Trips**	**Collective Dose**	
Cleanup to 1 mrem/yr	**(Mrem/hr per pCi/g)**	**(pCi/g)**	**(hours)**			**(person-rem)**	**Envirocare**
	0.00001070	14	35	2	6026	0.063	**Dose w Geometric Avg.**
		Arithmetic Avg.					
		(pCi/g)					**Envirocare**
	0.00001070	302	35	2	6026	1.363	**Dose w Arithmetic Avg.**

Dose to Workers from Disposal of Contaminated Soil: Spreadsheets

Collective Dose to BNL Disposal Workers

Dose to BNL Waste Disposal Workers from Transport and Off-site Disposal to 100 mrem/yr:							File: WRKDISP.wb3
Volume Weighted Arithmetic & Geometric Average Concentrations							
Dose BNL Fork Truck Driver Picking B 25 to Hanford	B-25C Dose Rate@ 6 Ft	Geometric Avg.	Pick Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 100 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0.00029800	2303	0.066	1992	0.001	0.090	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00029800	48246	0.066	1992	0.001	1.890	Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Picking B 25 to Envirocare	B-25S Dose Rate @ 6 Ft	Geometric Avg.	Pick Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 100 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00041500	103	0.066	672	0.001	0.002	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00041500	2150	0.066	672	0.001	0.040	Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Transit B 25 to Hanford	B-25C Dose Rate@ 6 Ft	Geometric Avg.	Transit Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 100 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0.00012800	2303	0.066	1992	0.001	0.039	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00012800	48246	0.066	1992	0.001	0.812	Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Transit B 25 to Envirocare	B-25S Dose Rate @ 6 Ft	Geometric Avg.	Transit Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 100 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00017600	103	0.02	672	0.001	0.000	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00017600	2150	0.02	672	0.001	0.005	Dose w Arithmetic Avg.
Dose to BNL Truck Driver : Hanford B 25s	B-25C Dose Rate@12Ft	Geometric Avg.	Trip Time	No. of Drivers	No. Truck Trips	Collective Dose	
Cleanup to 100 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0.00000760	2303	0.083	1	498	0.001	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00000760	48246	0.083	1	498	0.015	Dose w Arithmetic Avg.
Dose to BNL Truck Driver : Envirocare B 25s	B-25S Dose Rate @ 12Ft	Geometric Avg.	Trip Time	No. of Drivers	No. Truck Trips	Collective Dose	
Cleanup to 100 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00001070	103	0.083	1	168	0.000	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00001070	2150	0.083	1	168	0.000	Dose w Arithmetic Avg.
						Total Dose	
						(person-rem)	
							Hanford
						0.130	Dose w Geometric Avg.
							Hanford
						2.717	Dose w Arithmetic Avg.
							Envirocare
						0.002	Dose w Geometric Avg.
							Envirocare
						0.045	Dose w Arithmetic Avg.

Collective Dose to BNL Disposal Workers

Dose to BNL Waste Disposal Workers from Transport and Off-site Disposal to 75 mrem/yr:							File: WRKDISP.wb3
Volume Weighted Arithmetic & Geometric Average Concentrations							
Dose BNL Fork Truck Driver Picking B 25 to Hanford	B-25C Dose Rate@ 6 Ft	Geometric Avg.	Pick Time	No. of B 25s	person-rem/mren	Collective Dose	
Cleanup to 75 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0.00029800	2303	0.066	1992	0.001	0.090	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00029800	48246	0.066	1992	0.001	1.890	Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Picking B 25 to Envirocare	B-25S Dose Rate @ 6 Ft	Geometric Avg.	Pick Time	No. of B 25s	person-rem/mren	Collective Dose	
Cleanup to 75 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00041500	90	0.066	1000	0.001	0.002	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00041500	1876	0.066	1000	0.001	0.051	Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Transit B 25 to Hanford	B-25C Dose Rate@ 6 Ft	Geometric Avg.	Transit Time	No. of B 25s	person-rem/mren	Collective Dose	
Cleanup to 75 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0.00012800	2303	0.066	1992	0.001	0.039	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00012800	48246	0.066	1992	0.001	0.812	Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Transit B 25 to Envirocare	B-25S Dose Rate @ 6 Ft	Geometric Avg.	Transit Time	No. of B 25s	person-rem/mren	Collective Dose	
Cleanup to 75 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00017600	90	0.02	1000	0.001	0.000	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00017600	1876	0.02	1000	0.001	0.007	Dose w Arithmetic Avg.
Dose to BNL Truck Driver : Hanford B 25s	B-25C Dose Rate@12Ft	Geometric Avg.	Trip Time	No. of Drivers	No. Truck Trips	Collective Dose	
Cleanup to 75 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0.00000760	2303	0.083	1	498	0.001	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00000760	48246	0.083	1	498	0.015	Dose w Arithmetic Avg.
Dose to BNL Truck Driver : Envirocare B 25s	B-25S Dose Rate @ 12Ft	Geometric Avg.	Trip Time	No. of Drivers	No. Truck Trips	Collective Dose	
Cleanup to 75 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00001070	90	0.083	1	250	0.000	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00001070	1876	0.083	1	250	0.000	Dose w Arithmetic Avg.
						Total Dose	
						(person-rem)	
							Hanford
						0.130	Dose w Geometric Avg.
							Hanford
						2.717	Dose w Arithmetic Avg.
							Envirocare
						0.003	Dose w Geometric Avg.
							Envirocare
						0.058	Dose w Arithmetic Avg.

Collective Dose to BNL Disposal Workers

Dose to BNL Waste Disposal Workers from Transport and Off-site Disposal to 25 mrem/yr:							File: WRKDISP.wb3
Volume Weighted Arithmetic & Geometric Average Concentrations							
Dose BNL Fork Truck Driver Picking B 25 to Hanford	B-25C Dose Rate@ 6 Ft	Geometric Avg.	Pick Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 25 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0.00029800	2303	0.066	1992	0.001	0.090	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00029800	48246	0.066	1992	0.001	1.890	Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Picking B 25 to Enviroc	B-25S Dose Rate @ 6 Ft	Geometric Avg.	Pick Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 25 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00041500	47	0.066	4740	0.001	0.006	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00041500	993	0.066	4740	0.001	0.129	Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Transit B 25 to Hanford	B-25C Dose Rate@ 6 Ft	Geometric Avg.	Transit Tim	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 25 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0.00012800	2303	0.066	1992	0.001	0.039	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00012800	48246	0.066	1992	0.001	0.812	Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Transit B 25 to Enviroc	B-25S Dose Rate @ 6 Ft	Geometric Avg.	Transit Tim	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 25 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00017600	47	0.02	4740	0.001	0.001	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00017600	993	0.02	4740	0.001	0.017	Dose w Arithmetic Avg.
Dose to BNL Truck Driver : Hanford B 25s	B-25C Dose Rate@12Ft	Geometric Avg.	Trip Time	No. of Drivers	No. Truck Trips	Collective Dose	
Cleanup to 25 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0.00000760	2303	0.083	1	498	0.001	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00000760	48246	0.083	1	498	0.015	Dose w Arithmetic Avg.
Dose to BNL Truck Driver : Envirocare B 25s	B-25S Dose Rate @ 12Ft	Geometric Avg.	Trip Time	No. of Drivers	No. Truck Trips	Collective Dose	
Cleanup to 25 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00001070	47	0.083	1	1185	0.000	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00001070	993	0.083	1	1185	0.001	Dose w Arithmetic Avg.
						Total Dose	
						(person-rem)	
							Hanford
						0.130	Dose w Geometric Avg.
							Hanford
						2.717	Dose w Arithmetic Avg.
							Envirocare
						0.007	Dose w Geometric Avg.
							Envirocare
						0.147	Dose w Arithmetic Avg.

Collective Dose to BNL Disposal Workers

Dose to BNL Waste Disposal Workers from Transport and Off-site Disposal to 15 mrem/yr:							File: WRKDISP.wb3
Volume Weighted Arithmetic & Geometric Average Concentrations							
Dose BNL Fork Truck Driver Picking B 25 to Hanford	B-25C Dose Rate@ 6 Ft	Geometric Avg.	Pick Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 15 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0.00029800	2303	0.066	1992	0.001	0.090	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00029800	48246	0.066	1992	0.001	1.890	Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Picking B 25 to Envirocare	B-25S Dose Rate @ 6 Ft	Geometric Avg.	Pick Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 15 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00041500	38	0.066	6592	0.001	0.007	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00041500	779	0.066	6592	0.001	0.141	Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Transit B 25 to Hanford	B-25C Dose Rate@ 6 Ft	Geometric Avg.	Transit Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 15 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0.00012800	2303	0.066	1992	0.001	0.039	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00012800	48246	0.066	1992	0.001	0.812	Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Transit B 25 to Envirocare	B-25S Dose Rate @ 6 Ft	Geometric Avg.	Transit Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 15 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00017600	38	0.02	6592	0.001	0.001	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00017600	779	0.02	6592	0.001	0.018	Dose w Arithmetic Avg.
Dose to BNL Truck Driver : Hanford B 25s	B-25C Dose Rate@12Ft	Geometric Avg.	Trip Time	No. of Drivers	No. Truck Trips	Collective Dose	
Cleanup to 15 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0.00000760	2303	0.083	1	498	0.001	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00000760	48246	0.083	1	498	0.015	Dose w Arithmetic Avg.
Dose to BNL Truck Driver : Envirocare B 25s	B-25S Dose Rate @ 12Ft	Geometric Avg.	Trip Time	No. of Drivers	No. Truck Trips	Collective Dose	
Cleanup to 15 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00001070	38	0.083	1	1648	0.000	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00001070	779	0.083	1	1648	0.001	Dose w Arithmetic Avg.
						Total Dose	
						(person-rem)	
							Hanford
						0.130	Dose w Geometric Avg.
							Hanford
						2.717	Dose w Arithmetic Avg.
							Envirocare
						0.008	Dose w Geometric Avg.
							Envirocare
						0.160	Dose w Arithmetic Avg.

Collective Dose to BNL Disposal Workers

Dose to BNL Waste Disposal Workers from Transport and Off-site Disposal to 1 mrem/yr:							File: WRKDISP.wb3
Volume Weighted Arithmetic & Geometric Average Concentrations							
Dose BNL Fork Truck Driver Picking B 25 to Hanford	B-25C Dose Rate@ 6 Ft	Geometric Avg.	Pick Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 1 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0.00029800	2303	0.066	1992	0.001	0.090	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00029800	48246	0.066	1992	0.001	1.890	Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Picking B 25 to Envirocare	B-25S Dose Rate @ 6 Ft	Geometric Avg.	Pick Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 1 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00041500	14	0.066	24104	0.001	0.009	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00041500	302	0.066	24104	0.001	0.199	Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Transit B 25 to Hanford	B-25C Dose Rate@ 6 Ft	Geometric Avg.	Transit Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 1 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0.00012800	2303	0.066	1992	0.001	0.039	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00012800	48246	0.066	1992	0.001	0.812	Dose w Arithmetic Avg.
Dose BNL Fork Truck Driver Transit B 25 to Envirocare	B-25S Dose Rate @ 6 Ft	Geometric Avg.	Transit Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 1 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00017600	14	0.02	24104	0.001	0.001	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00017600	302	0.02	24104	0.001	0.026	Dose w Arithmetic Avg.
Dose to BNL Truck Driver : Hanford B 25s	B-25C Dose Rate@12Ft	Geometric Avg.	Trip Time	No. of Drivers	No. Truck Trips	Collective Dose	
Cleanup to 1 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0.00000760	2303	0.083	1	498	0.001	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00000760	48246	0.083	1	498	0.015	Dose w Arithmetic Avg.
Dose to BNL Truck Driver : Envirocare B 25s	B-25S Dose Rate @ 12Ft	Geometric Avg.	Trip Time	No. of Drivers	No. Truck Trips	Collective Dose	
Cleanup to 1 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00001070	14	0.083	1	6026	0.000	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00001070	302	0.083	1	6026	0.002	Dose w Arithmetic Avg.
						Total Dose	
						(person-rem)	
							Hanford
						0.130	Dose w Geometric Avg.
							Hanford
						2.717	Dose w Arithmetic Avg.
							Envirocare
						0.011	Dose w Geometric Avg.
							Envirocare
						0.227	Dose w Arithmetic Avg.

Collective Dose to BNL & Off-site Disposal Workers

Dose to BNL & Off-site Waste Disposal Workers from Transport and Off-site Disposal to 100 mrem/yr:							File: WRKDISP.wb3
Volume Weighted Arithmetic & Geometric Average Concentrations							
Dose Off-site Fork Truck Driver Picking B 25 to Hanford	B-25C Dose Rate @ 6 Ft	Geometric Avg.	Pick Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 100 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0.00029800	2303	0.066	1992	0.001	0.090	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00029800	48246	0.066	1992	0.001	1.890	Dose w Arithmetic Avg.
Dose Off-site Fork Truck Driver Picking B 25 to Envirocare	B-25S Dose Rate @ 6 Ft	Geometric Avg.	Pick Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 100 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00041500	103	0.066	672	0.001	0.002	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00041500	2150	0.066	672	0.001	0.040	Dose w Arithmetic Avg.
Dose Off-site Fork Truck Driver Transit B 25 to Hanford	B-25C Dose Rate @ 6 Ft	Geometric Avg.	Transit Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 100 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0 00012800	2303	0.009	1992	0.001	0.005	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00012800	48246	0.009	1992	0.001	0.111	Dose w Arithmetic Avg.
Dose Off-site Fork Truck Driver Transit B 25 to Envirocare	B-25S Dose Rate @ 6 Ft	Geometric Avg.	Transit Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 100 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00017600	103	0.009	672	0.001	0.000	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00017600	2150	0.009	672	0.001	0.002	Dose w Arithmetic Avg.
						Total Dose	
						(person-rem)	
							Hanford
						0.096	Dose w Geometric Avg.
							Hanford
						2.001	Dose w Arithmetic Avg.
							Envirocare
						0.002	Dose w Geometric Avg.
							Envirocare
						0.042	Dose w Arithmetic Avg.

Collective Dose to BNL & Off-site Disposal Workers

Dose to BNL & Off-site Waste Disposal Workers from Transport and Off-site Disposal to 75 mrem/yr:							File: WRKDISP.wb3
Volume Weighted Arithmetic & Geometric Average Concentrations							
Dose Off-site Fork Truck Driver Picking B 25 to Hanford	B-25C Dose Rate @ 6 Ft	Geometric Avg.	Pick Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 75 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0.00029800	2303	0.066	1992	0.001	0.090	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00029800	48246	0.066	1992	0.001	1.890	Dose w Arithmetic Avg.
Dose Off-site Fork Truck Driver Picking B 25 to Envirocar	B-25S Dose Rate @ 6 Ft	Geometric Avg.	Pick Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 75 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00041500	90	0.066	1000	0.001	0.002	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00041500	1876	0.066	1000	0.001	0.051	Dose w Arithmetic Avg.
Dose Off-site Fork Truck Driver Transit B 25 to Hanford	B-25C Dose Rate @ 6 Ft	Geometric Avg.	Transit Tim	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 75 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0.00012800	2303	0.009	1992	0.001	0.005	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00012800	48246	0.009	1992	0.001	0.111	Dose w Arithmetic Avg.
Dose Off-site Fork Truck Driver Transit B 25 to Envirocare	B-25S Dose Rate @ 6 Ft	Geometric Avg.	Transit Tim	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 75 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00017600	90	0.009	1000	0.001	0.000	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00017600	1876	0.009	1000	0.001	0.003	Dose w Arithmetic Avg.
						Total Dose	
						(person-rem)	
							Hanford
						0.096	Dose w Geometric Avg.
							Hanford
						2.001	Dose w Arithmetic Avg.
							Envirocare
						0.003	Dose w Geometric Avg.
							Envirocare
						0.054	Dose w Arithmetic Avg.

Collective Dose to BNL & Off-site Disposal Workers

Dose to BNL & Off-site Waste Disposal Workers from Transport and Off-site Disposal to 25 mrem/yr:							File: WRKDISP.wb3
Volume Weighted Arithmetic & Geometric Average Concentrations							
Dose Off-site Fork Truck Driver Picking B 25 to Hanford	B-25C Dose Rate @ 6 Ft	Geometric Avg.	Pick Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 25 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0.00029800	2303	0.066	1992	0.001	0.090	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00029800	48246	0.066	1992	0.001	1.890	Dose w Arithmetic Avg.
Dose Off-site Fork Truck Driver Picking B 25 to Envirocare	B-25S Dose Rate @ 6 Ft	Geometric Avg.	No. of B 25s	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 25 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00041500	47	0.066	4740	0.001	0.006	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00041500	993	0.066	4740	0.001	0.129	Dose w Arithmetic Avg.
Dose Off-site Fork Truck Driver Transit B 25 to Hanford	B-25C Dose Rate @ 6 Ft	Geometric Avg.	Transit Tim	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 25 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0.00012800	2303	0.009	1992	0.001	0.005	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00012800	48246	0.009	1992	0.001	0.111	Dose w Arithmetic Avg.
Dose Off-site Fork Truck Driver Transit B 25 to Envirocare	B-25S Dose Rate @ 6 Ft	Geometric Avg.	No. of B 25s	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 25 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00017600	47	0.009	4740	0.001	0.000	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00017600	993	0.009	4740	0.001	0.007	Dose w Arithmetic Avg.
						Total Dose	
						(person-rem)	
							Hanford
						0.096	Dose w Geometric Avg.
							Hanford
						2.001	Dose w Arithmetic Avg.
							Envirocare
						0.006	Dose w Geometric Avg.
							Envirocare
						0.136	Dose w Arithmetic Avg.

Collective Dose to BNL & Off-site Disposal Workers

Dose to BNL & Off-site Waste Disposal Workers from Transport and Off-site Disposal to 15 mrem/yr:							File: WRKDISP.wb3
Volume Weighted Arithmetic & Geometric Average Concentrations							
Dose Off-site Fork Truck Driver Picking B 25 to Hanford	B-25C Dose Rate @ 6 Ft	Geometric Avg.	Pick Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 15 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0.00029800	2303	0.066	1992	0.001	0.090	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00029800	48246	0.066	1992	0.001	1.890	Dose w Arithmetic Avg.
Dose Off-site Fork Truck Driver Picking B 25 to Envirocar	B-25S Dose Rate @ 6 Ft	Geometric Avg.	Pick Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 15 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00041500	38	0.066	6592	0.001	0.007	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00041500	779	0.066	6592	0.001	0.141	Dose w Arithmetic Avg.
Dose Off-site Fork Truck Driver Transit B 25 to Hanford	B-25C Dose Rate @ 6 Ft	Geometric Avg.	Transit Tim	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 15 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0.00012800	2303	0.009	1992	0.001	0.005	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00012800	48246	0.009	1992	0.001	0.111	Dose w Arithmetic Avg.
Dose Off-site Fork Truck Driver Transit B 25 to Envirocare	B-25S Dose Rate @ 6 Ft	Geometric Avg.	Transit Tim	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 15 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00017600	38	0.009	6592	0.001	0.000	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00017600	779	0.009	6592	0.001	0.008	Dose w Arithmetic Avg.
						Total Dose	
						(person-rem)	
							Hanford
						0.096	Dose w Geometric Avg.
							Hanford
						2.001	Dose w Arithmetic Avg.
							Envirocare
						0.007	Dose w Geometric Avg.
							Envirocare
						0.149	Dose w Arithmetic Avg.

Collective Dose to BNL & Off-site Disposal Workers

Dose to BNL & Off-site Waste Disposal Workers from Transport and Off-site Disposal to 1 mrem/yr:							File: WRKDISP.wb3
Volume Weighted Arithmetic & Geometric Average Concentrations							
Dose Off-site Fork Truck Driver Picking B 25 to Hanford	B-25C Dose Rate @ 6 Ft	Geometric Avg.	Pick Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 1 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0.00029800	2303	0.066	1992	0.001	0.090	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00029800	48246	0.066	1992	0.001	1.890	Dose w Arithmetic Avg.
Dose Off-site Fork Truck Driver Picking B 25 to Envirocare	B-25S Dose Rate @ 6 Ft	Geometric Avg.	Pick Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 1 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00041500	14	0.066	24104	0.001	0.009	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00041500	302	0.066	24104	0.001	0.199	Dose w Arithmetic Avg.
Dose Off-site Fork Truck Driver Transit B 25 to Hanford	B-25C Dose Rate @ 6 Ft	Geometric Avg.	Transit Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 1 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Hanford
	0.00012800	2303	0.009	1992	0.001	0.005	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Hanford
	0.00012800	48246	0.009	1992	0.001	0.111	Dose w Arithmetic Avg.
Dose Off-site Fork Truck Driver Transit B 25 to Envirocare	B-25S Dose Rate @ 6 Ft	Geometric Avg.	Transit Time	No. of B 25s	person-rem/mrem	Collective Dose	
Cleanup to 1 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)			(person-rem)	Envirocare
	0.00017600	14	0.009	24104	0.001	0.001	Dose w Geometric Avg.
		Arithmetic Avg.					
		(pCi/g)					Envirocare
	0.00017600	302	0.009	24104	0.001	0.012	Dose w Arithmetic Avg.
						Total Dose	
						(person-rem)	
							Hanford
						0.096	Dose w Geometric Avg.
							Hanford
						2.001	Dose w Arithmetic Avg.
							Envirocare
						0.010	Dose w Geometric Avg.
							Envirocare
						0.211	Dose w Arithmetic Avg.

Appendix F

Dose to the Future Visitors to the Open Space Before and After Environmental Remediation: RESRAD Printouts and Spreadsheets

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1 - 12 feet Depth Intervals F-1

Dose to the Future Visitors to the
Open-Space Before and After Environmental
Remediation: Spreadsheets F-19

Visitors Dose:
Before and After
Remediation:
RESRAD Printouts
for
0 - 1 foot
and
1 - 12 feet Depth Intervals

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Dose Conversion Factor (and Related) Parameter Summary
File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(1)
B-1	Sr-90+D	1.310E-03	1.310E-03	DCF2(2)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(1)
D-1	Sr-90+D	1.530E-04	1.530E-04	DCF3(2)
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-34				
D-34	Sr-90+D , plant/soil concentration ratio, dimensionless	3.000E-01	3.000E-01	RTF(2,1)
D-34	Sr-90+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-03	8.000E-03	RTF(2,2)
D-34	Sr-90+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(2,3)
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)
D-5				
D-5	Sr-90+D , fish	6.000E+01	6.000E+01	BIOFAC(2,1)
D-5	Sr-90+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(2,2)

Site-Specific Parameter Summary

enu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
011	Area of contaminated zone (m**2)	1.932E+04	1.000E+04	---	AREA
011	Thickness of contaminated zone (m)	3.048E-01	2.000E+00	---	THICK0
011	Length parallel to aquifer flow (m)	1.615E+02	1.000E+02	---	LCZPAQ
011	Basic radiation dose limit (mrem/yr)	1.500E+01	3.000E+01	---	BRDL
011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
011	Times for calculations (yr)	6.500E+01	1.000E+00	---	T(2)
011	Times for calculations (yr)	9.500E+01	3.000E+00	---	T(3)
011	Times for calculations (yr)	1.250E+02	1.000E+01	---	T(4)
011	Times for calculations (yr)	1.550E+02	3.000E+01	---	T(5)
011	Times for calculations (yr)	1.850E+02	1.000E+02	---	T(6)
011	Times for calculations (yr)	2.150E+02	3.000E+02	---	T(7)
011	Times for calculations (yr)	2.450E+02	1.000E+03	---	T(8)
011	Times for calculations (yr)	2.750E+02	0.000E+00	---	T(9)
011	Times for calculations (yr)	3.050E+02	0.000E+00	---	T(10)
012	Initial principal radionuclide (pCi/g): Cs-137	1.000E+00	0.000E+00	---	S1(1)
012	Initial principal radionuclide (pCi/g): Sr-90	1.000E+00	0.000E+00	---	S1(2)
012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(1)
012	Concentration in groundwater (pCi/L): Sr-90	not used	0.000E+00	---	W1(2)
013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
013	Density of contaminated zone (g/cm**3)	1.660E+00	1.500E+00	---	DENSCZ
013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
013	Contaminated zone total porosity	3.300E-01	4.000E-01	---	TPCZ
013	Contaminated zone effective porosity	2.400E-01	2.000E-01	---	EPCZ
013	Contaminated zone hydraulic conductivity (m/yr)	5.000E+03	1.000E+01	---	HCCZ
013	Contaminated zone b parameter	4.900E+00	5.300E+00	---	BCZ
013	Humidity in air (g/cm**3)	not used	8.000E+00	---	HUMID
013	Evapotranspiration coefficient	4.600E-01	5.000E-01	---	EVAPTR
013	Precipitation (m/yr)	1.230E+00	1.000E+00	---	PRECIP
013	Irrigation (m/yr)	2.600E-01	2.000E-01	---	RI
013	Irrigation mode	overhead	overhead	---	IDITCH
013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
014	Density of saturated zone (g/cm**3)	1.660E+00	1.500E+00	---	DENSAQ
014	Saturated zone total porosity	3.300E-01	4.000E-01	---	TPSZ
014	Saturated zone effective porosity	2.400E-01	2.000E-01	---	EPSZ
014	Saturated zone hydraulic conductivity (m/yr)	2.000E+04	1.000E+02	---	HCSZ
014	Saturated zone hydraulic gradient	4.800E-03	2.000E-02	---	HGWT
014	Saturated zone b parameter	4.900E+00	5.300E+00	---	BSZ
014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
014	Well pump intake depth (m below water table)	1.800E+01	1.000E+01	---	DWIBWT
014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
015	Number of unsaturated zone strata	1	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)	3.353E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.660E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	3.300E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.400E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	5.000E+03	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	4.400E+01	1.000E+03	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	4.400E+01	1.000E+03	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	4.400E+01	1.000E+03	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.011E-02	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Sr-90				
R016	Contaminated zone (cm**3/g)	3.000E+00	3.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	3.000E+00	3.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	3.000E+00	3.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.284E-01	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R017	Inhalation rate (m**3/yr)	1.500E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-05	2.000E-04	---	MLINH
R017	Dilution length for airborne dust, inhalation (m)	3.000E+00	3.000E+00	---	LM
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	1.000E+00	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	1.000E+00	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)	1.400E-03	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	1 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)	1.600E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	0.000E+00	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	5.110E+01	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)	1.800E+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	0.000E+00	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	0.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	3.000E-04	-1	---	FPLANT
R018	Contamination fraction of meat	2.000E-02	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	1.360E+00	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)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	1.000E-02	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-05	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	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	0.000E+00	1.000E+00	---	FGWIR
14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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	not used	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	not used	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	not used	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	0.000E+00	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR
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 annual wind speed (m/sec)	not used	2.000E+00	---	WIND
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)

Summary of Pathway Selections

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

Summary : HWMF Dose to Visitors(2046-2316):Open Space,Avg.Ind.,30yrPeriod, 0-1f
File : HWMFOSA.DAT

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	19315.00 square meters	Cs-137	1.000E+00
Thickness:	0.30 meters	Sr-90	1.000E+00
Cover Depth:	0.00 meters		

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 15 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	6.500E+01	9.500E+01	1.250E+02	1.550E+02	1.850E+02	2.150E+02	2.450E+02	2.750E+02	3.050E+02
TDOSE(t):	5.611E-03	1.447E-04	2.898E-05	5.760E-06	1.129E-06	2.154E-07	3.934E-08	6.571E-09	8.663E-10	0.000E+00
M(t):	3.740E-04	9.643E-06	1.932E-06	3.840E-07	7.525E-08	1.436E-08	2.623E-09	4.381E-10	5.775E-11	0.000E+00

Maximum TDOSE(t): 5.611E-03 mrem/yr at t = 0.000E+00 years

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	6.500E+01	9.500E+01	1.250E+02	1.550E+02	1.850E+02	2.150E+02	2.450E+02	2.750E+02	3.050E+02
Cs-137	Cs-137	1.000E+00	4.641E-03	1.447E-04	2.898E-05	5.760E-06	1.129E-06	2.154E-07	3.934E-08	6.571E-09	8.663E-10	0.000E+00
Sr-90	Sr-90	1.000E+00	9.691E-04	1.326E-16	1.502E-22	1.670E-28	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

BRF(i) is the branch fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	S(j,t), pCi/g t= 0.000E+00	6.500E+01	9.500E+01	1.250E+02	1.550E+02	1.850E+02	2.150E+02	2.450E+02	2.750E+02	3.050E+02
Cs-137	Cs-137	1.000E+00	1.000E+00	3.147E-02	6.377E-03	1.292E-03	2.618E-04	5.306E-05	1.075E-05	2.179E-06	4.415E-07	8.946E-08
Sr-90	Sr-90	1.000E+00	1.000E+00	1.716E-13	2.201E-19	2.823E-25	3.622E-31	4.646E-37	5.956E-43	0.000E+00	0.000E+00	0.000E+00

BRF(i) is the branch fraction of the parent nuclide.

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Dose Conversion Factor (and Related) Parameter Summary

File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(1)
B-1	Sr-90+D	1.310E-03	1.310E-03	DCF2(2)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(1)
D-1	Sr-90+D	1.530E-04	1.530E-04	DCF3(2)
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-34				
D-34	Sr-90+D , plant/soil concentration ratio, dimensionless	3.000E-01	3.000E-01	RTF(2,1)
D-34	Sr-90+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-03	8.000E-03	RTF(2,2)
D-34	Sr-90+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(2,3)
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)
D-5				
D-5	Sr-90+D , fish	6.000E+01	6.000E+01	BIOFAC(2,1)
D-5	Sr-90+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(2,2)

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)	6.798E+03	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	3.352E+00	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	6.400E+01	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	1.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	6.500E+01	1.000E+00	---	T(2)
R011	Times for calculations (yr)	9.500E+01	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.250E+02	1.000E+01	---	T(4)
R011	Times for calculations (yr)	1.550E+02	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.850E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	2.150E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	2.450E+02	1.000E+03	---	T(8)
R011	Times for calculations (yr)	2.750E+02	0.000E+00	---	T(9)
R011	Times for calculations (yr)	3.050E+02	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Cs-137	1.000E+00	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Sr-90	1.000E+00	0.000E+00	---	S1(2)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Sr-90	not used	0.000E+00	---	W1(2)
R013	Cover depth (m)	3.048E-01	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	1.660E+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)	1.660E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	3.300E-01	4.000E-01	---	TPCZ
R013	Contaminated zone effective porosity	2.400E-01	2.000E-01	---	EPCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	5.000E+03	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	4.900E+00	5.300E+00	---	BCZ
R013	Humidity in air (g/cm**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	4.600E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.230E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.600E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.660E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	3.300E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.400E-01	2.000E-01	---	EPSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.000E+04	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	4.800E-03	2.000E-02	---	HGWT
R014	Saturated zone b parameter	4.900E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.800E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	0	1	---	NS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	4.400E+01	1.000E+03	---	DCNUCC(1)
R016	Saturated zone (cm**3/g)	4.400E+01	1.000E+03	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.738E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Sr-90				
R016	Contaminated zone (cm**3/g)	3.000E+00	3.000E+01	---	DCNUCC(2)
R016	Saturated zone (cm**3/g)	3.000E+00	3.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.896E-02	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R017	Inhalation rate (m**3/yr)	1.500E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-05	2.000E-04	---	MLINH
R017	Dilution length for airborne dust, inhalation (m)	3.000E+00	3.000E+00	---	LM
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	1.000E+00	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	1.000E+00	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)	1.400E-03	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	1 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)
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)	1.600E+02	1.600E+02	---	DIET(1)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
2018	Leafy vegetable consumption (kg/yr)	0.000E+00	1.400E+01	---	DIET(2)
2018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
2018	Meat and poultry consumption (kg/yr)	5.110E+01	6.300E+01	---	DIET(4)
2018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
2018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
2018	Soil ingestion rate (g/yr)	1.800E+01	3.650E+01	---	SOIL
2018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
2018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
2018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
2018	Contamination fraction of livestock water	0.000E+00	1.000E+00	---	FLW
2018	Contamination fraction of irrigation water	0.000E+00	1.000E+00	---	FIRW
2018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
2018	Contamination fraction of plant food	3.000E-04	-1	---	FPLANT
2018	Contamination fraction of meat	2.000E-02	-1	---	FMEAT
2018	Contamination fraction of milk	not used	-1	---	FMILK
2019	Livestock fodder intake for meat (kg/day)	1.360E+00	6.800E+01	---	LFI5
2019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
2019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
2019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
2019	Livestock soil intake (kg/day)	1.000E-02	5.000E-01	---	LSI
2019	Mass loading for foliar deposition (g/m**3)	1.000E-05	1.000E-04	---	MLFD
2019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
2019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
2019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
2019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
2019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
2019	Irrigation fraction from ground water	0.000E+00	1.000E+00	---	FGWIR
214	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
214	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
214	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
214	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
214	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
214	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
214	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
214	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
214	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
TOR	Storage times of contaminated foodstuffs (days):				
TOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
TOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
TOR	Milk	not used	1.000E+00	---	STOR_T(3)
TOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
TOR	Fish	not used	7.000E+00	---	STOR_T(5)
TOR	Crustacea and mollusks	not used	7.000E+00	---	STOR_T(6)
TOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
TOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
TOR	Livestock fodder	0.000E+00	4.500E+01	---	STOR_T(9)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR
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 annual wind speed (m/sec)	not used	2.000E+00	---	WIND
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)

Summary of Pathway Selections

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

ummary : HWMP Dose to Visitors(2046-2316):Open Space,Avg.Ind.,30yrPeriod,1-12f
ile : HWMPOSB.DAT

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	6798.00 square meters	Cs-137	1.000E+00
Thickness:	3.35 meters	Sr-90	1.000E+00
over Depth:	0.30 meters		

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 15 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	6.500E+01	9.500E+01	1.250E+02	1.550E+02	1.850E+02	2.150E+02	2.450E+02	2.750E+02	3.050E+02
TDOSE(t):	1.948E-03	7.697E-05	3.106E-05	1.680E-05	1.046E-05	6.971E-06	4.806E-06	3.386E-06	2.423E-06	1.745E-06
M(t):	1.298E-04	5.132E-06	2.071E-06	1.120E-06	6.971E-07	4.648E-07	3.204E-07	2.257E-07	1.615E-07	1.163E-07

aximum TDOSE(t): 1.948E-03 mrem/yr at t = 0.000E+00 years

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	6.500E+01	9.500E+01	1.250E+02	1.550E+02	1.850E+02	2.150E+02	2.450E+02	2.750E+02	3.050E+02
Cs-137	Cs-137	1.000E+00	1.547E-04	4.332E-05	2.571E-05	1.595E-05	1.032E-05	6.950E-06	4.802E-06	3.386E-06	2.423E-06	1.745E-06
Sr-90	Sr-90	1.000E+00	1.793E-03	3.365E-05	5.354E-06	8.502E-07	1.348E-07	2.137E-08	3.385E-09	5.357E-10	8.476E-11	1.343E-11

BRF(i) is the branch fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	S(j,t), pCi/g t= 0.000E+00	6.500E+01	9.500E+01	1.250E+02	1.550E+02	1.850E+02	2.150E+02	2.450E+02	2.750E+02	3.050E+02
Cs-137	Cs-137	1.000E+00	1.000E+00	1.864E-01	8.586E-02	3.955E-02	1.821E-02	8.389E-03	3.864E-03	1.780E-03	8.196E-04	3.775E-04
Sr-90	Sr-90	1.000E+00	1.000E+00	1.692E-02	2.575E-03	3.918E-04	5.961E-05	9.071E-06	1.380E-06	2.101E-07	3.196E-08	4.864E-09

BRF(i) is the branch fraction of the parent nuclide.

Dose to the Future Visitors to the Open Space Before and After Environmental Remediation: Spreadsheets

Volume Weighted Arithmetic & Geometric Concentration vs. Depth Interval

Visitors Dose: Radionuclide Concentrations before Remediation for 0-1 foot and 1-12 feet Depth Intervals

Volume Weighted Averages	Vol.: 0-1 ft Interval	Vol.: 1-4 ft Interval	Vol.: 4-8 ft Interval	Vol.: 8-12 ft Interval	TOTAL VOLUME	
Volume vs. Depth Interval *	(CY)	(CY)	(CY)	(CY)	(CY)	
Depth Interval Total Volume	7600	8110	9830	5260	30800	
	Concentration (pCi/g)	Concentration (pCi/g)	Concentration (pCi/g)	Concentration (pCi/g)		
Cs 137 Geometric Average Conc.	608.48	164.43	1003.81	614.97		
Sr 90 Geometric Average Conc.	14.31	2.50	6.25	2.99		
Cs 137 Arithmetic Average Conc.	50721	510	5553	1678		
Sr 90 Artihmetic Average Conc.	112.5	6.95	27.93	13.92		
Weighted Geometric Avg. Conc.	Vol.: 0-1 ft Interval	Vol.: 1-4 ft Interval	Vol.: 4-8 ft Interval	Vol.: 8-12 ft Interval	Vol.: 0-12 ft Interval	
Radionuclide	Weighted Geometric Avg. Conc.	Weighted Geometric Avg. Conc.	Weighted Geometric Avg. Conc.	Weighted Geometric Avg. Conc.	Weighted Geometric Avg. Conc.	
	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	
Cesium 137	150	43	320	105	619	Geometric Average
Strontium 90	3.53	0.66	2.00	0.51	6.69	Sr 90/Cs137 Ratio
Sr 90/Cs 137	0.0235	0.0152	0.0062	0.0049		0.0108
Weighted Arithmetic Avg. Conc.	Vol.: 0-1 ft Interval	Vol.: 1-4 ft Interval	Vol.: 4-8 ft Interval	Vol.: 8-12 ft Interval	Vol.: 0-12 ft Interval	
Radionuclide	Weighted Arithmetic Avg. Conc.	Weighted Arithmetic Avg. Conc.	Weighted Arithmetic Avg. Conc.	Weighted Arithmetic Avg. Conc.	Weighted Arithmetic Avg. Conc.	
	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	
Cesium 137	12516	134	1772	287	14709	Arithmetic Average
Strontium 90	27.76	1.83	8.92	2.38	40.89	Sr 90/Cs137 Ratio
Sr 90/Cs 137	0.0022	0.0136	0.0050	0.0083		0.0028
No action Alternative						
Cs 137 Arithmatic Avg. 0 -1 ft	50721					
Cs 137 Vol W Arithmatic Avg. 1 -12 ft	2912					
Cs 137 Geometric Avg. 0 -1 ft	608					
Cs 137 Vol W Geometric Avg. 1 -12 ft	622					

Projected Dose to Visitors to HWMF: No Action

	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	VISITORDOSE wb3	
Average Individual Dose Projections 2046 to 2316	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)		
Undeveloped Recreationist Dose 0-1 ft.	1.45E-04	2.90E-05	5.67E-06	1.13E-06	2.154E-07	3.93E-08	6.571E-09	8.66E-10	0		
Undeveloped Recreationist Dose 1-12 ft.	4.33E-05	2.58E-05	1.60E-05	1.03E-05	6.95E-06	4.802E-06	3.386E-06	2.423E-06	1.745E-06		
Undeveloped Recreationist Dose 0-12 ft.	1.88E-04	5.47E-05	2.16E-05	1.14E-05	7.17E-06	4.84E-06	3.39E-06	2.423866E-06	1.745E-06		
Dose CalculationYear	2061	2091	2121	2151	2181	2211	2241	2271	2301		
Future Visitor Collective Dose: 2046 - 2316	**Collective Dose**	**Collective Dose**	**Collective Dose**	**Collective Dose**	**Collective Dose**	**Collective Dose**	**Collective Dose**	**Collective Dose**	**Collective Dose**	**Total Collective Dose**	
Geometric Mean Concentration	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	
Surface Soil Geometric MeanCs 137 Concentration	608	608	608	608	608	608	608	608	608		
1-12 ft.Vol. Weighted Geometric MeanCs 137Concentration	622	622	622	622	622	622	622	622	622		
Collective Dose to 30 Visitors for 30 Yr Period	1.03E-01	3.03E-02	1.20E-02	6.39E-03	4.01E-03	2.71E-03	1.90E-03	1.36E-03	9.77E-04	0.1631	**No Action**
30 yr Period	2046 to 2076	2076 to 2106	2106 to 2136	2136 to 2166	2166 to 2196	2196 to 2226	2226 to 2256	2256 to 2286	2286 to 2316	2046 to 2316	
Average Individual Annual Dose	1.15E-04	3.36E-05	1.34E-05	7.11E-06	4.45E-06	3.01E-06	2.11E-06	1.51E-06	1.09E-06		
Future Visitor Collective Dose: 2046 - 2316	**Collective Dose**	**Collective Dose**	**Collective Dose**	**Collective Dose**	**Collective Dose**	**Collective Dose**	**Collective Dose**	**Collective Dose**	**Collective Dose**	**Total Collective Dose**	
Arithmatic Mean Concentration	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	
Surface Soil Arithmatic MeanCs 137 Concentration	50720	50720	50720	50720	50720	50720	50720	50720	50720		
1-12 ft.Vol. Weighted Arithmatic MeanCs 137Concentration	2912	2912	2912	2912	2912	2912	2912	2912	2912		
Collective Dose to 30 Visitors for 30 Yr Period	6.72E+00	1.39E+00	3.01E-01	7.86E-02	2.80E-02	1.44E-02	9.17E-03	6.39E-03	4.57E-03	8.5509	**No Action**
30 yr Period	2046 to 2076	2076 to 2106	2106 to 2136	2136 to 2166	2166 to 2196	2196 to 2226	2226 to 2256	2256 to 2286	2286 to 2316	2046 to 2316	
Average Individual Annual Dose	7.47E-03	1.54E-03	3.34E-04	8.73E-05	3.12E-05	1.60E-05	1.02E-05	7.10E-06	5.08E-06		

Visitors Dose: Radionuclide Concentrations after Remediation to Various Remediation Goals

Differential Volumes vs. Cs 137 Derived Concentration Guideline Limit Interval							
	Strontium 90	Cesium 137	Concentration	Concentration	Cummulative Volume	Cummulative Volume	Total Cesium-137
Soil Cleanup Limit/Goals	DCGL	DCGL	@ DCGL Upper Limit	@ DCGL Lower Limit	@ DCGL Upper Limit *	@ DCGL Lower Limit	Differential Volume
(mrem/yr)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(CY)	(CY)	(CY)
100	38556	1513	810000	1513	188	8000	7812
75	28920	1135	1513	1135	8000	8990	990
25	9636	378	1135	378	8990	20200	11210
15	5784	227	378	227	20200	25750	5550
1	386	15	227	15	25750	78292	52542
* Volume for Cs 137 > 810000pCi/g	= 352792(Conc.)-0.554	Volume for Cs 137 15 pCi/g	= 352792(Conc.)-0.554			TOTAL VOLUME >	78103

Projected Dose to Visitors to HWMF: 100 mrem

	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	File: VISITORDOSE.wb3	
Average Individual Dose Projections 2046 to 2316	(mrem/yr per pCi/g)	(mrem/yr per pCi/	(mrem/yr per pCi/	(mrem/yr per pCi/	(mrem/yr per pCi/	(mrem/yr per pCi/	(mrem/yr per pCi/	(mrem/yr per pCi/	(mrem/yr per pCi/g)		
Undeveloped Recreationist Dose 0-1 ft.	1.45E-04	2.90E-05	5.67E-06	1.13E-06	2.154E-07	3.93E-08	6.571E-09	8.66E-10	0		
Undeveloped Recreationist Dose 1-12 ft.	4.33E-05	2.58E-05	1.60E-05	1.03E-05	6.95E-06	4.802E-06	3.386E-06	2.423E-06	1.745E-06		
Undeveloped Recreationist Dose 0-12 ft.	1.88E-04	5.47E-05	2.16E-05	1.14E-05	7.17E-06	4.84E-06	3.39E-06	2.423866E-06	1.745E-06		
Dose CalculationYear	2061	2091	2121	2151	2181	2211	2241	2271	2301		
Future Visitor Collective Dose: 2046 - 2316	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Total Collective Dose	
Geometric Mean Concentration	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	
Surface Soil Geometric Mean:Cs 137 Concentration	456.47	456.4721	456.4721	456.4721	456.4721	456.4721	456.4721	456.4721	456.4721		
1-12 ft.Vol. Weighted Geometric Mean:Cs 137Concentration	456.47	456.4721	456.4721	456.4721	456.4721	456.4721	456.4721	456.4721	456.4721		
Collective Dose to 30 Visitors for 30 Yr Period	7.72E-02	2.25E-02	8.88E-03	4.70E-03	2.94E-03	1.99E-03	1.39E-03	9.96E-04	7.17E-04	0.1214	@ 100 mrem/yr
30 yr Period	2046 to 2076	2076 to 2106	2106 to 2136	2136 to 2166	2166 to 2196	2196 to 2226	2226 to 2256	2256 to 2286	2286 to 2316	2046 to 2316	
Average Individual Annual Dose	8.58E-05	2.50E-05	9.87E-06	5.23E-06	3.27E-06	2.21E-06	1.55E-06	1.11E-06	7.97E-07		
Future Visitor Collective Dose: 2046 - 2316	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Total Collective Dose	
Arithmatic Mean Concentration	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	
Surface Soil Arithmatic Mean:Cs 137 Concentration	1513	1513	1513	1513	1513	1513	1513	1513	1513		
1-12 ft.Vol. Weighted Arithmatic Mean:Cs 137Concentration	1513	1513	1513	1513	1513	1513	1513	1513	1513		
Collective Dose to 30 Visitors for 30 Yr Period	2.56E-01	7.45E-02	2.94E-02	1.56E-02	9.76E-03	6.59E-03	4.62E-03	3.30E-03	2.38E-03	0.4022	@ 100 mrem/yr
30 yr Period	2046 to 2076	2076 to 2106	2106 to 2136	2136 to 2166	2166 to 2196	2196 to 2226	2226 to 2256	2256 to 2286	2286 to 2316	2046 to 2316	
Average Individual Annual Dose	2.84E-04	8.28E-05	3.27E-05	1.73E-05	1.08E-05	7.32E-06	5.13E-06	3.67E-06	2.64E-06		

Projected Dose to Visitors to HWMF: 75 mrem

	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	File: VISITORDOSE.wb3	
Average Individual Dose Projections 2046 to 2316	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)		
Undeveloped Recreationist Dose 0-1 ft.	1.45E-04	2.90E-05	5.67E-06	1.13E-06	2.154E-07	3.93E-08	6.571E-09	8.66E-10	0		
Undeveloped Recreationist Dose 1-12 ft.	4.33E-05	2.58E-05	1.60E-05	1.03E-05	6.95E-06	4.602E-06	3.386E-06	2.423E-06	1.745E-06		
Undeveloped Recreationist Dose 0-12 ft.	1.88E-04	5.47E-05	2.16E-05	1.14E-05	7.17E-06	4.84E-06	3.39E-06	2.423866E-06	1.745E-06		
Dose CalculationYear	2061	2091	2121	2151	2181	2211	2241	2271	2301		
Future Visitor Collective Dose: 2046 - 2316	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Total Collective Dose	
Geometric Mean Concentration	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	
Surface Soil Geometric Mean:Cs 137 Concentration	342	342	342	342	342	342	342	342	342		
1-12 ft.Vol. Weighted Geometric Mean:Cs 137Concentration	342	342	342	342	342	342	342	342	342		
Collective Dose to 30 Visitors for 30 Yr Period	5.79E-02	1.69E-02	6.66E-03	3.53E-03	2.21E-03	1.49E-03	1.05E-03	7.47E-04	5.36E-04	0.0910	@75 mrem/yr
30 yr Period	2046 to 2076	2076 to 2106	2106 to 2136	2136 to 2166	2166 to 2196	2196 to 2226	2226 to 2256	2256 to 2286	2286 to 2316	2046 to 2316	
Average Individual Annual Dose	6.44E-05	1.87E-05	7.40E-06	3.92E-06	2.45E-06	1.66E-06	1.16E-06	8.30E-07	5.98E-07		
Future Visitor Collective Dose: 2046 - 2316	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Total Collective Dose	
Arithmatic Mean Concentration	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	
Surface Soil Arithmatic Mean:Cs 137 Concentration	1135	1135	1135	1135	1135	1135	1135	1135	1135		
1-12 ft.Vol. Weighted Arithmatic Mean:Cs 137Concentration	1135	1135	1135	1135	1135	1135	1135	1135	1135		
Collective Dose to 30 Visitors for 30 Yr Period	1.92E-01	5.59E-02	2.21E-02	1.17E-02	7.32E-03	4.95E-03	3.47E-03	2.48E-03	1.78E-03	0.3017	@75 mrem/yr
30 yr Period	2046 to 2076	2076 to 2106	2106 to 2136	2136 to 2166	2166 to 2196	2196 to 2226	2226 to 2256	2256 to 2286	2286 to 2316	2046 to 2316	
Average Individual Annual Dose	2.13E-04	6.21E-05	2.45E-05	1.30E-05	8.13E-06	5.49E-06	3.85E-06	2.75E-06	1.98E-06		

Projected Dose to Visitors to HWMF: 25 mrem

	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	File: VISITORDOSE.wb3	
Average Individual Dose Projections 2046 to 2316	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)		
Undeveloped Recreationist Dose 0-1 ft.	1.45E-04	2.90E-05	5.67E-06	1.13E-06	2.154E-07	3.93E-08	6.571E-09	6.66E-10	0		
Undeveloped Recreationist Dose 1-12 ft.	4.33E-05	2.58E-05	1.60E-05	1.03E-05	6.95E-06	4.802E-06	3.386E-06	2.423E-06	1.745E-06		
Undeveloped Recreationist Dose 0-12 ft.	1.88E-04	5.47E-05	2.16E-05	1.14E-05	7.17E-06	4.84E-06	3.39E-06	2.423866E-06	1.745E-06		
Dose CalculationYear	2061	2091	2121	2151	2181	2211	2241	2271	2301		
Future Visitor Collective Dose: 2046 - 2316	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Total Collective Dose	
Geometric Mean Concentration	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	
Surface Soil Geometric Mean:Cs 137 Concentration	114	114.0426	114.0426	114.0426	114.0426	114.0426	114.0426	114.0426	114.0426		
1-12 ft.Vol. Weighted Geometric Mean:Cs 137Concentration	114	114.0426	114.0426	114.0426	114.0426	114.0426	114.0426	114.0426	114.0426		
Collective Dose to 30 Visitors for 30 Yr Period	1.93E-02	5.62E-03	2.22E-03	1.18E-03	7.35E-04	4.97E-04	3.48E-04	2.40E-04	1.79E-04	0.0303	@ 25 mrem/yr
30 yr Period	2046 to 2076	2076 to 2106	2106 to 2136	2136 to 2166	2166 to 2196	2196 to 2226	2226 to 2256	2256 to 2286	2286 to 2316	2046 to 2316	
Average Individual Annual Dose	2.14E-05	6.24E-06	2.47E-06	1.31E-06	8.17E-07	5.52E-07	3.87E-07	2.76E-07	1.99E-07		
Future Visitor Collective Dose: 2046 - 2316	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Total Collective Dose	
Arithmatic Mean Concentration	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	
Surface Soil Arithmatic Mean:Cs 137 Concentration	378	378	378	378	378	378	378	378	378		
1-12 ft.Vol. Weighted Arithmatic Mean:Cs 137Concentration	378	378	378	378	378	378	378	378	378		
Collective Dose to 30 Visitors for 30 Yr Period	6.40E-02	1.86E-02	7.36E-03	3.89E-03	2.44E-03	1.65E-03	1.15E-03	8.25E-04	5.94E-04	0.1005	@ 25 mrem/yr
30 yr Period	2046 to 2076	2076 to 2106	2106 to 2136	2136 to 2166	2166 to 2196	2196 to 2226	2226 to 2256	2256 to 2286	2286 to 2316	2046 to 2316	
Average Individual Annual Dose	7.11E-05	2.07E-05	8.17E-06	4.33E-06	2.71E-06	1.83E-06	1.28E-06	9.18E-07	6.60E-07		

Projected Dose to Visitors to HWMF: 15 mrem

Average Individual Dose Projections 2046 to 2316	Dose:Conc. (mrem/yr per pCi/g)	Dose:Conc. (mrem/yr per pCi/g)	Dose:Conc. (mrem/yr per pCi/g)	Dose:Conc. (mrem/yr per pCi/g)	Dose:Conc. (mrem/yr per pCi/g)	Dose:Conc. (mrem/yr per pCi/g)	Dose:Conc. (mrem/yr per pCi/g)	Dose:Conc. (mrem/yr per pCi/g)	Dose:Conc. (mrem/yr per pCi/g)	File: VISITORDOSE.wb3	
Undeveloped Recreationist Dose 0-1 ft.	1.45E-04	2.90E-05	5.67E-06	1.13E-06	2.154E-07	3.93E-08	6.571E-09	8.66E-10	0		
Undeveloped Recreationist Dose 1-12 ft.	4.33E-05	2.58E-05	1.60E-05	1.03E-05	6.95E-06	4.802E-06	3.386E-06	2.423E-06	1.745E-06		
Undeveloped Recreationist Dose 0-12 ft.	1.88E-04	5.47E-05	2.16E-05	1.14E-05	7.17E-06	4.84E-06	3.39E-06	2.423866E-06	1.745E-06		
Dose CalculationYear	2061	2091	2121	2151	2181	2211	2241	2271	2301		
Future Visitor Collective Dose: 2046 - 2316	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Total Collective Dose	
Geometric Mean Concentration	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	
Surface Soil Geometric Mean:Cs 137 Concentration	68	68.4859	68.4859	68.4859	68.4859	68.4859	68.4859	68.4859	68.4859		
1-12 ft.Vol. Weighted Geometric Mean:Cs 137Concentration	68	68.4859	68.4859	68.4859	68.4859	68.4859	68.4859	68.4859	68.4859		
Collective Dose to 30 Visitors for 30 Yr Period	1.16E-02	3.37E-03	1.33E-03	7.06E-04	4.42E-04	2.98E-04	2.09E-04	1.49E-04	1.06E-04	0.0162	@15 mrem/yr
30 yr Period	2046 to 2076	2076 to 2106	2106 to 2136	2136 to 2166	2166 to 2196	2196 to 2226	2226 to 2256	2256 to 2286	2286 to 2316	2046 to 2316	
Average Individual Annual Dose	1.29E-05	3.75E-06	1.48E-06	7.84E-07	4.91E-07	3.32E-07	2.32E-07	1.66E-07	1.20E-07		
Future Visitor Collective Dose: 2046 - 2316	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Total Collective Dose	
Arithmatic Mean Concentration	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	
Surface Soil Arithmatic Mean:Cs 137 Concentration	227	227	227	227	227	227	227	227	227		
1-12 ft.Vol. Weighted Arithmatic Mean:Cs 137Concentration	227	227	227	227	227	227	227	227	227		
Collective Dose to 30 Visitors for 30 Yr Period	3.84E-02	1.12E-02	4.42E-03	2.34E-03	1.46E-03	9.89E-04	6.93E-04	4.95E-04	3.57E-04	0.0603	@15 mrem/yr
30 yr Period	2046 to 2076	2076 to 2106	2106 to 2136	2136 to 2166	2166 to 2196	2196 to 2226	2226 to 2256	2256 to 2286	2286 to 2316	2046 to 2316	
Average Individual Annual Dose	4.27E-05	1.24E-05	4.91E-06	2.60E-06	1.63E-06	1.10E-06	7.70E-07	5.50E-07	3.96E-07		

Projected Dose to Visitors to HWMF: 1 mrem

	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	Dose:Conc.	File: VISITORDOSE.wb3	
Average Individual Dose Projections 2046 to 2316	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)	(mrem/yr per pCi/g)		
Undeveloped Recreationist Dose 0-1 ft.	1.45E-04	2.90E-05	5.67E-06	1.13E-06	2.154E-07	3.93E-08	6.571E-09	8.66E-10	0		
Undeveloped Recreationist Dose 1-12 ft.	4.33E-05	2.58E-05	1.60E-05	1.03E-05	6.95E-06	4.602E-06	3.366E-06	2.423E-06	1.745E-06		
Undeveloped Recreationist Dose 0-12 ft.	1.88E-04	5.47E-05	2.16E-05	1.14E-05	7.17E-06	4.84E-06	3.39E-06	2.423866E-06	1.745E-06		
Dose CalculationYear	2061	2091	2121	2151	2181	2211	2241	2271	2301		
Future Visitor Collective Dose: 2046 - 2316	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Total Collective Dose	
Geometric Mean Concentration	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	
Surface Soil Geometric Mean:Cs 137 Concentration	5	4.55567	4.55567	4.55567	4.55567	4.55567	4.55567	4.55567	4.55567		
1-12 ft.Vol. Weighted Geometric Mean:Cs 137Concentration	5	4.55567	4.55567	4.55567	4.55567	4.55567	4.55567	4.55567	4.55567		
Collective Dose to 30 Visitors for 30 Yr Period	7.71E-04	2.24E-04	8.86E-05	4.69E-05	2.94E-05	1.98E-05	1.39E-05	9.94E-06	7.15E-06	0.0012	@1 mrem/yr
30 yr Period	2046 to 2076	2076 to 2106	2106 to 2136	2136 to 2166	2166 to 2196	2196 to 2226	2226 to 2256	2256 to 2286	2286 to 2316	2046 to 2316	
Average Individual Annual Dose	6.57E-07	2.49E-07	9.85E-08	5.22E-08	3.26E-08	2.21E-08	1.55E-08	1.10E-08	7.95E-09		
Future Visitor Collective Dose: 2046 - 2316	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Collective Dose	Total Collective Dose	
Arithmatic Mean Concentration	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	(person-rem)	
Surface Soil Arithmatic Mean:Cs 137 Concentration	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1		
1-12 ft.Vol. Weighted Arithmatic Mean:Cs 137Concentration	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1		
Collective Dose to 30 Visitors for 30 Yr Period	2.56E-03	7.44E-04	2.94E-04	1.56E-04	9.74E-05	6.58E-05	4.61E-05	3.29E-05	2.37E-05	0.0040	@1 mrem/yr
30 yr Period	2046 to 2076	2076 to 2106	2106 to 2136	2136 to 2166	2166 to 2196	2196 to 2226	2226 to 2256	2256 to 2286	2286 to 2316	2046 to 2316	
Average Individual Annual Dose	2.84E-06	8.26E-07	3.26E-07	1.73E-07	1.08E-07	7.31E-08	5.12E-08	3.66E-08			

Appendix G

Dose to the Public from Environmental Remediation: CAP88 Printouts and Spreadsheets

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Dose to the Public from Environmental Remediation: 100 mrem/yr Limit. G-1

Dose to the Public from Environmental Remediation: 75 mrem/yr Goal. G-13

Dose to the Public from Environmental Remediation: 25 mrem/yr Goal G-23

Dose to the Public from Environmental Remediation: 15 mrem/yr Goal G-33

Dose to the Public from Environmental Remediation: 1 mrem/yr Goal G-43

Dose to Future Public: Savings, Impacts and Avoided G-53

Dose to the Public from Environmental Remediation: 100 mrem/yr Limit

Fugitive Dust Release Rates:100 mrem/yr

Fugitive Dust		Arithmatic Avg		Arithmatic Avg
Arithmatic Avg Release	Conv. Factor	RSC	E 10	Q
Radionuclide	(pCi/Ci)	(pCi/g)	(g/yr)	(Ci/yr)
Strontium-90	1.00E-12	136	152	2.07E-08
Cesium-137	1.00E-12	48628	152	7.39E-06
Fugitive Dust		Geometric Avg		Geometric Avg
Geometric Avg Release	Conv. Factor	RSC	E 10	Q
Radionuclide	(pCi/Ci)	(pCi/g)	(g/yr)	(Ci/yr)
Strontium-90	1.00E-12	87	152	1.32E-08
Cesium-137	1.00E-12	8036	152	1.22E-06

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Version 2.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Population Assessment
Mar 11, 1997 01:04 pm

Facility: BNLs Hazardous Waste Management Facility
Address: Brookhaven National Laboratory
Bldg 454
City: Upton
State: NY Zip: 11973

Source Category: Ground Level Point Source
Source Type: Area
Emission Year: 1998

Comments: Dose to Public from ER at HWMF @ 100 mrem/yr (A)

Effective Dose Equivalent (mrem/year)
2.00E-05

At This Location: 1550 Meters Northeast

Dataset Name: Public Dose 100A
Dataset Date: Mar 11, 1997 01:04 pm
Wind File: C:\CAP88PC2\WNDFILES\BNL8089A.WND
Population File: C:\CAP88PC2\POPFILES\BNL93SER.POP

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 1550 Meters Northeast
Lifetime Fatal Cancer Risk: 4.82E-10

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	2.34E-05	5.23E-04
BREAST	2.15E-05	4.85E-04
R MAR	1.81E-05	4.12E-04
LUNGS	1.78E-05	4.06E-04
THYROID	2.22E-05	5.03E-04
ENDOST	1.98E-05	4.42E-04
RMNDR	1.80E-05	4.13E-04
EFFEC	2.00E-05	4.54E-04

FREQUENCY DISTRIBUTION OF LIFETIME FATAL CANCER RISKS

Risk Range	# of People	# of People in This Risk Range or Higher	Deaths/Year in This Risk Range	Deaths/Year in This Risk Range or Higher
1.0E+00 TO 1.0E-01	0	0	0.00E+00	0.00E+00
1.0E-01 TO 1.0E-02	0	0	0.00E+00	0.00E+00
1.0E-02 TO 1.0E-03	0	0	0.00E+00	0.00E+00
1.0E-03 TO 1.0E-04	0	0	0.00E+00	0.00E+00
1.0E-04 TO 1.0E-05	0	0	0.00E+00	0.00E+00
1.0E-05 TO 1.0E-06	0	0	0.00E+00	0.00E+00
LESS THAN 1.0E-06	4940116	4940116	1.55E-07	1.55E-07

RADIONUCLIDE EMISSIONS DURING THE YEAR 1998

Nuclide	Class	Size	Source #1 Ci/y	TOTAL Ci/y
CS-137	D	1.00	7.4E-06	7.4E-06
BA-137M	D	1.00	0.0E+00	0.0E+00
SR-90	D	1.00	2.1E-08	2.1E-08
Y-90	Y	1.00	0.0E+00	0.0E+00

SITE INFORMATION

Temperature:	10	degrees C
Precipitation:	123	cm/y
Mixing Height:	2000	m

SOURCE INFORMATION

Source Number: 1

Source Height (m): 1.
Area (sq m): 19565.

Plume Rise Pasquill Cat:	A	B	C	D	E	F	G
Zero:	0.	0.	0.	0.	0.	0.	0.

AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.700	0.399	0.442
Fraction From Assessment Area:	0.300	0.601	0.558
Fraction Imported:	0.000	0.000	0.000

Beef Cattle Density: 5.83E-02
Milk Cattle Density: 8.56E-02
Land Fraction Cultivated for Vegetable Crops: 1.88E-02

POPULATION DATA

Direction	Distance (m) 750	1550	1650	8850	24000	40000	56000
N	0	1	0	4600	0	0	250750
NNW	0	1	0	7760	0	210635	108020
NW	0	1	0	18220	1585	136710	123880
WNW	0	1	0	42290	59260	130	216640
W	0	1	0	50185	135645	240690	226970
WSW	0	1	0	38425	145975	356715	426660
SW	0	1	0	22090	65745	3460	0
SSW	0	1	0	21640	1110	0	0
S	0	1	0	15730	35	0	0
SSE	0	1	0	22685	0	0	0
SE	0	1	0	9175	0	0	0
ESE	0	1	0	6310	7780	0	0
E	0	1	0	3060	16155	17575	9155
ENE	0	1	0	2510	7000	13035	15060
NE	0	1	0	2980	755	0	13680
NNE	0	1	0	7660	0	0	44770

Direction	Distance (m) 72000
N	260880
NNW	54595
NW	111300
WNW	130400
W	372315
WSW	777545
SW	0
SSW	0
S	0
SSE	0
SE	0
ESE	0
E	575
ENE	2280
NE	33345
NNE	65965

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Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Population Assessment
Feb 3, 1997 05:10 pmm

Facility: BNLs Hazardous Waste Management Facility
Address: Brookhaven National Laboratory
Bldg 454
City: Upton
State: NY Zip: 11973

Source Category: Ground Level Point Source
Source Type: Area
Emission Year: 1998

Comments: Dose to Public from ER at HWMF @ 100 mrem/yr (G)

Effective Dose Equivalent (mrem/year)
3.31E-06

At This Location: 1550 Meters Northeast

Dataset Name: Public Dose 100G
Dataset Date: Feb 3, 1997 05:09 pm
Wind File: C:\CAP88PC2\WNDFILES\BNL8089A.WND
Population File: C:\CAP88PC2\POPFILES\BNL93SER.POP

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 1550 Meters Northeast
Lifetime Fatal Cancer Risk: 7.96E-11

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	3.86E-06	8.63E-05
BREAST	3.55E-06	8.02E-05
R MAR	3.01E-06	6.92E-05
LUNGS	2.94E-06	6.70E-05
THYROID	3.67E-06	8.31E-05
ENDOST	3.34E-06	7.55E-05
RMNDR	2.97E-06	6.82E-05
EFFEC	3.31E-06	7.51E-05

FREQUENCY DISTRIBUTION OF LIFETIME FATAL CANCER RISKS

Risk Range	# of People	# of People in This Risk Range or Higher	Deaths/Year in This Risk Range	Deaths/Year in This Risk Range or Higher
1.0E+00 TO 1.0E-01	0	0	0.00E+00	0.00E+00
1.0E-01 TO 1.0E-02	0	0	0.00E+00	0.00E+00
1.0E-02 TO 1.0E-03	0	0	0.00E+00	0.00E+00
1.0E-03 TO 1.0E-04	0	0	0.00E+00	0.00E+00
1.0E-04 TO 1.0E-05	0	0	0.00E+00	0.00E+00
1.0E-05 TO 1.0E-06	0	0	0.00E+00	0.00E+00
LESS THAN 1.0E-06	4940116	4940116	2.57E-08	2.57E-08

RADIONUCLIDE EMISSIONS DURING THE YEAR 1998

Nuclide	Class	Size	Source #1 Ci/y	TOTAL Ci/y
CS-137	D	1.00	1.2E-06	1.2E-06
BA-137M	D	1.00	0.0E+00	0.0E+00
SR-90	D	1.00	1.3E-08	1.3E-08
Y-90	Y	1.00	0.0E+00	0.0E+00

SITE INFORMATION

Temperature:	10	degrees C
Precipitation:	123	cm/y
Mixing Height:	2000	m

Dose to the Public from Environmental Remediation: 75 mrem/yr Goal

Fugitive Dust Release Rates: 75 mrem/yr

Fugitive Dust				
Arithmatic Avg Release		Arithmatic Avg		Arithmatic Avg
Radionuclide	Conv. Factor	RSC	E 10	Q
	(pCi/Ci)	(pCi/g)	(g/yr)	(Ci/yr)
Strontium-90	1.00E-12	122	174	2.13E-08
Cesium-137	1.00E-12	43418	174	7.57E-06
Fugitive Dust		Geometric Avg		Geometric Avg
Geometric Avg Release	Conv. Factor	RSC	E 10	Q
Radionuclide	(pCi/Ci)	(pCi/g)	(g/yr)	(Ci/yr)
Strontium-90	1.00E-12	71	174	1.24E-08
Cesium-137	1.00E-12	6585	174	1.15E-06

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Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Population Assessment
Feb 3, 1997 05:01 pmm

Facility: BNLs Hazardous Waste Management Facility
Address: Brookhaven National Laboratory
Bldg 454
City: Upton
State: NY Zip: 11973

Source Category: Ground Level Point Source
Source Type: Area
Emission Year: 1998

Comments: Dose to Public from ER at HWMF @ 75 mrem/yr (A)

Effective Dose Equivalent (mrem/year)
2.01E-05

At This Location: 1550 Meters Northeast

Dataset Name: Public Dose @ 75
Dataset Date: Feb 3, 1997 05:01 pm
Wind File: C:\CAP88PC2\WNDFILES\BNL8089A.WND
Population File: C:\CAP88PC2\POPFILES\BNL93SER.POP

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 1550 Meters Northeast
Lifetime Fatal Cancer Risk: 4.84E-10

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	2.35E-05	5.25E-04
BREAST	2.16E-05	4.87E-04
R MAR	1.82E-05	4.14E-04
LUNGS	1.79E-05	4.07E-04
THYROID	2.23E-05	5.05E-04
ENDOST	1.99E-05	4.44E-04
RMNDR	1.81E-05	4.15E-04
EFFEC	2.01E-05	4.56E-04

FREQUENCY DISTRIBUTION OF LIFETIME FATAL CANCER RISKS

Risk Range	# of People	# of People in This Risk Range or Higher	Deaths/Year in This Risk Range	Deaths/Year in This Risk Range or Higher
1.0E+00 TO 1.0E-01	0	0	0.00E+00	0.00E+00
1.0E-01 TO 1.0E-02	0	0	0.00E+00	0.00E+00
1.0E-02 TO 1.0E-03	0	0	0.00E+00	0.00E+00
1.0E-03 TO 1.0E-04	0	0	0.00E+00	0.00E+00
1.0E-04 TO 1.0E-05	0	0	0.00E+00	0.00E+00
1.0E-05 TO 1.0E-06	0	0	0.00E+00	0.00E+00
LESS THAN 1.0E-06	4940116	4940116	1.56E-07	1.56E-07

RADIONUCLIDE EMISSIONS DURING THE YEAR 1998

Nuclide	Class	Size	Source #1 Ci/y	TOTAL Ci/y
CS-137	D	1.00	7.4E-06	7.4E-06
BA-137M	D	1.00	0.0E+00	0.0E+00
SR-90	D	1.00	2.4E-08	2.4E-08
Y-90	Y	1.00	0.0E+00	0.0E+00

SITE INFORMATION

Temperature:	10	degrees C
Precipitation:	123	cm/y
Mixing Height:	2000	m

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S Y N O P S I S R E P O R T

Non-Radon Population Assessment
Mar 11, 1997 01:10 pm

Facility: BNLs Hazardous Waste Management Facility
Address: Brookhaven National Laboratory
Bldg 454
City: Upton
State: NY Zip: 11973

Source Category: Ground Level Point Source
Source Type: Area
Emission Year: 1998

Comments: Dose to Public from ER at HWMF @ 75 mrem/yr (G)

Effective Dose Equivalent (mrem/year)
3.07E-06

At This Location: 1550 Meters Northeast

Dataset Name: Public Dose 75G
Dataset Date: Mar 11, 1997 01:10 pm
Wind File: C:\CAP88PC2\WNDFILES\BNL8089A.WND
Population File: C:\CAP88PC2\POPFILES\BNL93SER.POP

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 1550 Meters Northeast
Lifetime Fatal Cancer Risk: 7.38E-11

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	3.57E-06	7.99E-05
BREAST	3.29E-06	7.42E-05
R MAR	2.79E-06	6.41E-05
LUNGS	2.73E-06	6.20E-05
THYROID	3.40E-06	7.70E-05
ENDOST	3.09E-06	6.99E-05
RMNDR	2.75E-06	6.32E-05
EFFEC	3.07E-06	6.96E-05

FREQUENCY DISTRIBUTION OF LIFETIME FATAL CANCER RISKS

Risk Range	# of People	# of People in This Risk Range or Higher	Deaths/Year in This Risk Range	Deaths/Year in This Risk Range or Higher
1.0E+00 TO 1.0E-01	0	0	0.00E+00	0.00E+00
1.0E-01 TO 1.0E-02	0	0	0.00E+00	0.00E+00
1.0E-02 TO 1.0E-03	0	0	0.00E+00	0.00E+00
1.0E-03 TO 1.0E-04	0	0	0.00E+00	0.00E+00
1.0E-04 TO 1.0E-05	0	0	0.00E+00	0.00E+00
1.0E-05 TO 1.0E-06	0	0	0.00E+00	0.00E+00
LESS THAN 1.0E-06	4940116	4940116	2.38E-08	2.38E-08

RADIONUCLIDE EMISSIONS DURING THE YEAR 1998

Nuclide	Class	Size	Source #1 Ci/y	TOTAL Ci/y
CS-137	D	1.00	1.1E-06	1.1E-06
BA-137M	D	1.00	0.0E+00	0.0E+00
SR-90	D	1.00	1.2E-08	1.2E-08
Y-90	Y	1.00	0.0E+00	0.0E+00

SITE INFORMATION

Temperature:	10	degrees C
Precipitation:	123	cm/y
Mixing Height:	2000	m

Dose to the Public from Environmental Remediation: 25 mrem/yr Goal

Fugitive Dust Release Rates: 25 mrem/yr

Fugitive Dust				
Arithmatic Avg Release		Arithmatic Avg		Arithmatic Avg
Radionuclide	Conv. Factor	RSC	E 10	Q
	(pCi/Ci)	(pCi/g)	(g/yr)	(Ci/yr)
Strontium-90	1.00E-12	55	374	2.05E-08
Cesium-137	1.00E-12	19743	374	7.37E-06
Fugitive Dust		Geometric Avg		Geometric Avg
Geometric Avg Release	Conv. Factor	RSC	E 10	Q
Radionuclide	(pCi/Ci)	(pCi/g)	(g/yr)	(Ci/yr)
Strontium-90	1.00E-12	21	374	7.84E-09
Cesium-137	1.00E-12	1981	374	7.40E-07

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Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Population Assessment
Feb 4, 1997 12:27 pmm

Facility: BNLs Hazardous Waste Management Facility
Address: Brookhaven National Laboratory
Bldg 454
City: Upton
State: NY Zip: 11973

Source Category: Ground Level Point Source
Source Type: Area
Emission Year: 1998

Comments: Dose to Public from ER at HWMF @ 25 mrem/yr(A)

Effective Dose Equivalent (mrem/year)
2.06E-05

At This Location: 1550 Meters Northeast

Dataset Name: Public Dose @ 25A
Dataset Date: Feb 4, 1997 12:26 pm
Wind File: C:\CAP88PC2\WNDFILES\BNL8089A.WND
Population File: C:\CAP88PC2\POPFILES\BNL93SER.POP

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 1550 Meters Northeast
Lifetime Fatal Cancer Risk: 4.96E-10

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	2.40E-05	5.37E-04
BREAST	2.21E-05	4.99E-04
R MAR	1.86E-05	4.24E-04
LUNGS	1.83E-05	4.17E-04
THYROID	2.29E-05	5.18E-04
ENDOST	2.04E-05	4.55E-04
RMNDR	1.85E-05	4.25E-04
EFFEC	2.06E-05	4.67E-04

FREQUENCY DISTRIBUTION OF LIFETIME FATAL CANCER RISKS

Risk Range	# of People	# of People in This Risk Range or Higher	Deaths/Year in This Risk Range	Deaths/Year in This Risk Range or Higher
1.0E+00 TO 1.0E-01	0	0	0.00E+00	0.00E+00
1.0E-01 TO 1.0E-02	0	0	0.00E+00	0.00E+00
1.0E-02 TO 1.0E-03	0	0	0.00E+00	0.00E+00
1.0E-03 TO 1.0E-04	0	0	0.00E+00	0.00E+00
1.0E-04 TO 1.0E-05	0	0	0.00E+00	0.00E+00
1.0E-05 TO 1.0E-06	0	0	0.00E+00	0.00E+00
LESS THAN 1.0E-06	4940116	4940116	1.60E-07	1.60E-07

RADIONUCLIDE EMISSIONS DURING THE YEAR 1998

Nuclide	Class	Size	Source #1 Ci/y	TOTAL Ci/y
CS-137	D	1.00	7.6E-06	7.6E-06
BA-137M	D	1.00	0.0E+00	0.0E+00
SR-90	D	1.00	2.4E-08	2.4E-08
Y-90	Y	1.00	0.0E+00	0.0E+00

SITE INFORMATION

Temperature:	10	degrees C
Precipitation:	123	cm/y
Mixing Height:	2000	m

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Version 2.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Population Assessment
Mar 11, 1997 01:20 pm

Facility: BNLs Hazardous Waste Management Facility
Address: Brookhaven National Laboratory
Bldg 454
City: Upton
State: NY Zip: 11973

Source Category: Ground Level Point Source
Source Type: Area
Emission Year: 1998

Comments: Dose to Public from ER at HWMF @ 25 mrem/yr (G)

Effective Dose Equivalent (mrem/year)
2.07E-06

At This Location: 1550 Meters Northeast

Dataset Name: Public Dose 25G
Dataset Date: Mar 11, 1997 01:20 pm
Wind File: C:\CAP88PC2\WNDFILES\BNL8089A.WND
Population File: C:\CAP88PC2\POPFILES\BNL93SER.POP

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 1550 Meters Northeast
Lifetime Fatal Cancer Risk: 4.98E-11

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	2.41E-06	5.40E-05
BREAST	2.22E-06	5.01E-05
R MAR	1.88E-06	4.32E-05
LUNGS	1.84E-06	4.19E-05
THYROID	2.30E-06	5.20E-05
ENDOST	2.09E-06	4.72E-05
RMNDR	1.86E-06	4.26E-05
EFFEC	2.07E-06	4.70E-05

FREQUENCY DISTRIBUTION OF LIFETIME FATAL CANCER RISKS

Risk Range	# of People	# of People in This Risk Range or Higher	Deaths/Year in This Risk Range	Deaths/Year in This Risk Range or Higher
1.0E+00 TO 1.0E-01	0	0	0.00E+00	0.00E+00
1.0E-01 TO 1.0E-02	0	0	0.00E+00	0.00E+00
1.0E-02 TO 1.0E-03	0	0	0.00E+00	0.00E+00
1.0E-03 TO 1.0E-04	0	0	0.00E+00	0.00E+00
1.0E-04 TO 1.0E-05	0	0	0.00E+00	0.00E+00
1.0E-05 TO 1.0E-06	0	0	0.00E+00	0.00E+00
LESS THAN 1.0E-06	4940116	4940116	1.60E-08	1.60E-08

RADIONUCLIDE EMISSIONS DURING THE YEAR 1998

Nuclide	Class	Size	Source #1 Ci/y	TOTAL Ci/y
CS-137	D	1.00	7.6E-07	7.6E-07
BA-137M	D	1.00	0.0E+00	0.0E+00
SR-90	D	1.00	8.1E-09	8.1E-09
Y-90	Y	1.00	0.0E+00	0.0E+00

SITE INFORMATION

Temperature:	10 degrees C
Precipitation:	123 cm/y
Mixing Height:	2000 m

Dose to the Public from Environmental Remediation: 15 mrem/yr Goal

Fugitive Dust Release Rates: 15 mrem/yr

Fugitive Dust				
Arithmatic Avg Release		Arithmatic Avg		Arithmatic Avg
Radionuclide	Conv. Factor	RSC	E 10	Q
	(pCi/Ci)	(pCi/g)	(g/yr)	(Ci/yr)
Strontium-90	1.00E-12	44	498	2.19E-08
Cesium-137	1.00E-12	15553	498	7.75E-06
Fugitive Dust		Geometric Avg		Geometric Avg
Geometric Avg Release	Conv. Factor	RSC	E 10	Q
Radionuclide	(pCi/Ci)	(pCi/g)	(g/yr)	(Ci/yr)
Strontium-90	1.00E-12	14	498	6.97E-09
Cesium-137	1.00E-12	1321	498	6.58E-07

C A P 8 8 - P C

Version 2.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Population Assessment
Feb 4, 1997 12:38 pmm

Facility: BNLs Hazardous Waste Management Facility
Address: Brookhaven National Laboratory
Bldg 454
City: Upton
State: NY Zip: 11973

Source Category: Ground Level Point Source
Source Type: Area
Emission Year: 1998

Comments: Dose to Public from ER at HWMF @ 15 mrem/yr(A)

Effective Dose Equivalent (mrem/year)
2.07E-05

At This Location: 1550 Meters Northeast

Dataset Name: Public Dose @ 15A
Dataset Date: Feb 4, 1997 12:37 pm
Wind File: C:\CAP88PC2\WNDFILES\BNL8089A.WND
Population File: C:\CAP88PC2\POPFILES\BNL93SER.POP

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 1550 Meters Northeast
Lifetime Fatal Cancer Risk: 4.97E-10

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	2.41E-05	5.39E-04
BREAST	2.22E-05	5.01E-04
R MAR	1.87E-05	4.25E-04
LUNGS	1.84E-05	4.18E-04
THYROID	2.29E-05	5.19E-04
ENDOST	2.05E-05	4.56E-04
RMNDR	1.86E-05	4.26E-04
EFFEC	2.07E-05	4.68E-04

FREQUENCY DISTRIBUTION OF LIFETIME FATAL CANCER RISKS

Risk Range	# of People	# of People in This Risk Range or Higher	Deaths/Year in This Risk Range	Deaths/Year in This Risk Range or Higher
1.0E+00 TO 1.0E-01	0	0	0.00E+00	0.00E+00
1.0E-01 TO 1.0E-02	0	0	0.00E+00	0.00E+00
1.0E-02 TO 1.0E-03	0	0	0.00E+00	0.00E+00
1.0E-03 TO 1.0E-04	0	0	0.00E+00	0.00E+00
1.0E-04 TO 1.0E-05	0	0	0.00E+00	0.00E+00
1.0E-05 TO 1.0E-06	0	0	0.00E+00	0.00E+00
LESS THAN 1.0E-06	4940116	4940116	1.60E-07	1.60E-07

RADIONUCLIDE EMISSIONS DURING THE YEAR 1998

Nuclide	Class	Size	Source #1 Ci/y	TOTAL Ci/y
CS-137	D	1.00	7.6E-06	7.6E-06
BA-137M	D	1.00	0.0E+00	0.0E+00
SR-90	D	1.00	2.5E-08	2.5E-08
Y-90	Y	1.00	0.0E+00	0.0E+00

SITE INFORMATION

Temperature:	10	degrees C
Precipitation:	123	cm/y
Mixing Height:	2000	m

C A P 8 8 - P C

Version 2.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Population Assessment
Mar 11, 1997 01:28 pm

Facility: BNLs Hazardous Waste Management Facility
Address: Brookhaven National Laboratory
Bldg 454
City: Upton
State: NY Zip: 11973

Source Category: Ground Level Point Source
Source Type: Area
Emission Year: 1998

Comments: Dose to Public from ER at HWMF @ 15 mrem/yr(G)

Effective Dose Equivalent (mrem/year)
1.76E-06

At This Location: 1550 Meters Northeast

Dataset Name: Public Dose 15G
Dataset Date: Mar 11, 1997 01:27 pm
Wind File: C:\CAP88PC2\WNDFILES\BNL8089A.WND
Population File: C:\CAP88PC2\POPFILES\BNL93SER.POP

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 1550 Meters Northeast
Lifetime Fatal Cancer Risk: 4.22E-11

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	2.05E-06	4.58E-05
BREAST	1.88E-06	4.25E-05
R MAR	1.60E-06	3.67E-05
LUNGS	1.56E-06	3.55E-05
THYROID	1.95E-06	4.41E-05
ENDOST	1.77E-06	4.00E-05
RMNDR	1.58E-06	3.62E-05
EFFEC	1.76E-06	3.98E-05

FREQUENCY DISTRIBUTION OF LIFETIME FATAL CANCER RISKS

Risk Range	# of People	# of People in This Risk Range or Higher	Deaths/Year in This Risk Range	Deaths/Year in This Risk Range or Higher
1.0E+00 TO 1.0E-01	0	0	0.00E+00	0.00E+00
1.0E-01 TO 1.0E-02	0	0	0.00E+00	0.00E+00
1.0E-02 TO 1.0E-03	0	0	0.00E+00	0.00E+00
1.0E-03 TO 1.0E-04	0	0	0.00E+00	0.00E+00
1.0E-04 TO 1.0E-05	0	0	0.00E+00	0.00E+00
1.0E-05 TO 1.0E-06	0	0	0.00E+00	0.00E+00
LESS THAN 1.0E-06	4940116	4940116	1.36E-08	1.36E-08

RADIONUCLIDE EMISSIONS DURING THE YEAR 1998

Nuclide	Class	Size	Source #1 Ci/y	TOTAL Ci/y
CS-137	D	1.00	6.5E-07	6.5E-07
BA-137M	D	1.00	0.0E+00	0.0E+00
SR-90	D	1.00	6.9E-09	6.9E-09
Y-90	Y	1.00	0.0E+00	0.0E+00

SITE INFORMATION

Temperature:	10	degrees C
Precipitation:	123	cm/y
Mixing Height:	2000	m

Dose to the Public from Environmental Remediation: 1 mrem/yr Goal

Fugitive Dust Release Rates: 1 mrem/yr

Fugitive Dust				
Arithmatic Avg Release		Arithmatic Avg		Arithmatic Avg
Radionuclide	Conv. Factor	RSC	E 10	Q
	(pCi/Ci)	(pCi/g)	(g/yr)	(Ci/yr)
Strontium-90	1.00E-12	15	1942	2.91E-08
Cesium-137	1.00E-12	5196	1942	1.01E-05
Fugitive Dust		Geometric Avg		Geometric Avg
Geometric Avg Release	Conv. Factor	RSC	E 10	Q
Radionuclide	(pCi/Ci)	(pCi/g)	(g/yr)	(Ci/yr)
Strontium-90	1.00E-12	3	1942	5.83E-09
Cesium-137	1.00E-12	266	1942	5.17E-07

C A P 8 8 - P C

Version 2.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Population Assessment
Dec 8, 1997 03:46 pmm

Facility: BNLs Hazardous Waste Management Facility
Address: Brookhaven National Laboratory
Bldg 454
City: Upton
State: NY Zip: 11973

Source Category: Ground Level Point Source
Source Type: Area
Emission Year: 1998

Comments: Dose to Public from ER at HWMF @ 1 mrem/yr(A)

Effective Dose Equivalent (mrem/year)
2.74E-05

At This Location: 1550 Meters Northeast

Dataset Name: Public Dose @ 1A
Dataset Date: Dec 8, 1997 03:46 pm
Wind File: C:\CAP88PC2\WNDFILES\BNL8089A.WND
Population File: C:\CAP88PC2\POPFILES\BNL93SER.POP

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 1550 Meters Northeast
Lifetime Fatal Cancer Risk: 6.59E-10

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	3.19E-05	7.14E-04
BREAST	2.94E-05	6.63E-04
R MAR	2.47E-05	5.63E-04
LUNGS	2.44E-05	5.54E-04
THYROID	3.04E-05	6.88E-04
ENDOST	2.71E-05	6.04E-04
RMNDR	2.46E-05	5.64E-04
EFFEC	2.74E-05	6.20E-04

FREQUENCY DISTRIBUTION OF LIFETIME FATAL CANCER RISKS

Risk Range	# of People	# of People in This Risk Range or Higher	Deaths/Year in This Risk Range	Deaths/Year in This Risk Range or Higher
1.0E+00 TO 1.0E-01	0	0	0.00E+00	0.00E+00
1.0E-01 TO 1.0E-02	0	0	0.00E+00	0.00E+00
1.0E-02 TO 1.0E-03	0	0	0.00E+00	0.00E+00
1.0E-03 TO 1.0E-04	0	0	0.00E+00	0.00E+00
1.0E-04 TO 1.0E-05	0	0	0.00E+00	0.00E+00
1.0E-05 TO 1.0E-06	0	0	0.00E+00	0.00E+00
LESS THAN 1.0E-06	4940116	4940116	2.12E-07	2.12E-07

RADIONUCLIDE EMISSIONS DURING THE YEAR 1998

Nuclide	Class	Size	Source #1 Ci/y	TOTAL Ci/y
CS-137	D	1.00	1.0E-05	1.0E-05
BA-137M	D	1.00	0.0E+00	0.0E+00
SR-90	D	1.00	2.9E-08	2.9E-08
Y-90	Y	1.00	0.0E+00	0.0E+00

SITE INFORMATION

Temperature:	10	degrees C
Precipitation:	123	cm/y
Mixing Height:	2000	m

C A P 8 8 - P C

Version 2.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Population Assessment
Dec 8, 1997 03:40 pmm

Facility: BNLs Hazardous Waste Management Facility
Address: Brookhaven National Laboratory
Bldg 454
City: Upton
State: NY Zip: 11973

Source Category: Ground Level Point Source
Source Type: Area
Emission Year: 1998

Comments: Dose to Public from ER at HWMF @ 1 mrem/yr(G)

Effective Dose Equivalent (mrem/year)
1.40E-06

At This Location: 1550 Meters Northeast

Dataset Name: Public Dose 1 G
Dataset Date: Dec 8, 1997 03:39 pm
Wind File: C:\CAP88PC2\WNDFILES\BNL8089A.WND
Population File: C:\CAP88PC2\POPFILES\BNL93SER.POP

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 1550 Meters Northeast
Lifetime Fatal Cancer Risk: 3.38E-11

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	1.64E-06	3.66E-05
BREAST	1.50E-06	3.40E-05
R MAR	1.28E-06	2.93E-05
LUNGS	1.25E-06	2.84E-05
THYROID	1.56E-06	3.52E-05
ENDOST	1.42E-06	3.21E-05
RMNDR	1.26E-06	2.89E-05
EFFEC	1.40E-06	3.19E-05

FREQUENCY DISTRIBUTION OF LIFETIME FATAL CANCER RISKS

Risk Range	# of People	# of People in This Risk Range or Higher	Deaths/Year in This Risk Range	Deaths/Year in This Risk Range or Higher
1.0E+00 TO 1.0E-01	0	0	0.00E+00	0.00E+00
1.0E-01 TO 1.0E-02	0	0	0.00E+00	0.00E+00
1.0E-02 TO 1.0E-03	0	0	0.00E+00	0.00E+00
1.0E-03 TO 1.0E-04	0	0	0.00E+00	0.00E+00
1.0E-04 TO 1.0E-05	0	0	0.00E+00	0.00E+00
1.0E-05 TO 1.0E-06	0	0	0.00E+00	0.00E+00
LESS THAN 1.0E-06	4940116	4940116	1.09E-08	1.09E-08

RADIONUCLIDE EMISSIONS DURING THE YEAR 1998

Nuclide	Class	Size	Source #1 Ci/y	TOTAL Ci/y
CS-137	D	1.00	5.2E-07	5.2E-07
BA-137M	D	1.00	0.0E+00	0.0E+00
SR-90	D	1.00	5.8E-09	5.8E-09
Y-90	Y	1.00	0.0E+00	0.0E+00

SITE INFORMATION

Temperature:	10	degrees C
Precipitation:	123	cm/y
Mixing Height:	2000	m

Dose to Future Public: Savings, Impacts and Avoided

Savings, Impacts and Avoided Dose to Public

Dose Impacts to Public from Remediation and Public Dose Averted				File: PUBDOSE.wb3
Public Collective Dose Impacts	**Remediation Dose**	**Transport/Disposal Dose**	**Public Dose Impact**	
Geometric Average Concentration	(Person-rem)	(Person-rem)	(Person-rem)	
Dose to 1 mrem/yr	0.000032	0.32	0.32	
Dose to 15 mrem/yr	0.000040	0.31	0.31	
Dose to 25mrem/yr	0.000047	0.31	0.31	
Dose to 75 mrem/yr	0.000070	0.30	0.30	
Dose to 100 mrem/yr	0.000075	0.30	0.30	
Public Collective Dose Impacts	**Remediation Dose**	**Transport/Disposal Dose**	**Public Dose Impact**	
Arithmatic Average Concentration	(Person-rem)	(Person-rem)	(Person-rem)	
Dose to 1 mrem/yr	0.000620	6.68	6.68	
Dose to 15 mrem/yr	0.000468	6.54	6.54	
Dose to 25mrem/yr	0.000467	6.50	6.50	
Dose to 75 mrem/yr	0.000456	6.31	6.31	
Dose to 100 mrem/yr	0.000454	6.28	6.28	
Public Collective Dose Averted	**Public Dose w/o Remed**	**Public Dose w Remed**	**Public Dose Impact**	**Public Dose Averted**
Arithmatic Average Concentration	(Person-rem)	(Person-rem)	(Person-rem)	(Person-rem)
Dose to 1 mrem/yr	8.55	0.004	6.68	1.87
Dose to 15 mrem/yr	8.55	0.060	6.54	1.95
Dose to 25mrem/yr	8.55	0.100	6.50	1.95
Dose to 75 mrem/yr	8.55	0.302	6.31	1.94
Dose to 100 mrem/yr	8.55	0.402	6.28	1.87

Appendix H

Dose to Public from Transport and Disposal of Contaminated Soil: Microshield Printouts and Spreadsheets

Contents Page

Dose to Public from Transport and Disposal of Contaminated Soil: Microshield Printouts for B-25s with NBS Concrete & BNL Soil. .H-1

Dose to Public from Transport and Disposal of Contaminated Soil: Spreadsheets H-15

Dose to Public from Transport and Disposal of Contaminated Soil: Microshield Printouts for B-25s with NBS Concrete & BNL Soil

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory

'age : 1
)OS File : B25CPUB.MS5
:un Date : June 1, 1997
:un Time: 11:55:38 AM
luration : 00:01:15

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: B25CPUB
Description: B-25 Box w Cs 137@1 pCi/g in NBS Concrete :Public @12ft side
Geometry: 13 - Rectangular Volume

Source Dimensions

Length	487.68 cm	16 ft
Width	182.88 cm	6 ft
Height	121.92 cm	4 ft

Dose Points

	X	Y	Z
# 1	3535.68 cm	60.96 cm	182.88 cm
	116 ft	2 ft	6 ft
# 2	853.44 cm	60.96 cm	182.88 cm
	28 ft 0.0 in	2 ft	6 ft
# 3	2773.68 cm	60.96 cm	182.88 cm
	91 ft	2 ft	6 ft

Shields

Shield Name	Dimension	Material	Density
Source	384.0 ft³	NBS Concrete	2.35
Shield 1	.016 ft	Iron	7.86
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 4
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ba-137m	1.7178e-005	6.3560e+005	1.5798e-006	5.8453e-002
Cs-137	1.8159e-005	6.7188e+005	1.6700e-006	6.1790e-002

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (116,2,6) ft

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.316e+04	2.756e-21	8.786e-21	2.295e-23	7.318e-23
0.0322	2.428e+04	1.351e-20	4.406e-20	1.087e-22	3.546e-22
0.0364	8.835e+03	2.290e-17	9.565e-17	1.301e-19	5.435e-19
0.6616	5.719e+05	2.081e-05	6.754e-05	4.035e-08	1.309e-07
TOTALS:	6.182e+05	2.081e-05	6.754e-05	4.035e-08	1.309e-07

Results - Dose Point # 2 - (28,2,6) ft

DOS File : B25CPUB.MS5
Run Date: June 1, 1997
Run Time: 11:55:38 AM
Duration : 00:01:15

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.316e+04	2.049e-19	6.505e-19	1.707e-21	5.419e-21
0.0322	2.428e+04	1.007e-18	3.271e-18	8.107e-21	2.633e-20
0.0364	8.835e+03	1.782e-15	7.390e-15	1.012e-17	4.199e-17
0.6616	5.719e+05	1.593e-03	4.490e-03	3.088e-06	8.705e-06
TOTALS:	6.182e+05	1.593e-03	4.490e-03	3.088e-06	8.705e-06

Results - Dose Point # 3 - (91,2,6) ft

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.316e+04	6.362e-21	2.023e-20	5.299e-23	1.685e-22
0.0322	2.428e+04	3.107e-20	1.011e-19	2.501e-22	8.133e-22
0.0364	8.835e+03	5.094e-17	2.118e-16	2.894e-19	1.204e-18
0.6616	5.719e+05	3.963e-05	1.238e-04	7.683e-08	2.400e-07
TOTALS:	6.182e+05	3.963e-05	1.238e-04	7.683e-08	2.400e-07

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory
Conversion of calculated exposure in air to dose
FILE: C:\MS5\DATA\B25CPUB.MS5
Case Title: B25CPUB
This case was run on Sunday, June 1, 1997 at 11:55:38 AM
Dose Point # 1 - (116,2,6) ft

Results (Summed over energies)	Units	Without Buildup	With Buildup
Photon Fluence Rate (flux)	Photons/cm²/sec	3.146e-005	1.021e-004
Photon Energy Fluence Rate	MeV/cm²/sec	2.081e-005	6.754e-005
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	4.035e-008	1.309e-007
Absorbed Dose Rate in Air	mGy/hr	3.522e-010	1.143e-009
"	mrad/hr	3.522e-008	1.143e-007
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	4.170e-010	1.353e-009
o Opposed	"	3.339e-010	1.083e-009
o Rotational	"	3.339e-010	1.083e-009
o Isotropic	"	2.953e-010	9.581e-010
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	4.433e-010	1.438e-009
o Opposed	"	4.210e-010	1.366e-009
o Rotational	"	4.210e-010	1.366e-009
o Isotropic	"	3.156e-010	1.024e-009
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	3.688e-010	1.197e-009 #1
o Posterior/Anterior	"	3.255e-010	1.056e-009
o Lateral	"	2.414e-010	7.832e-010
o Rotational	"	2.909e-010	9.439e-010
o Isotropic	"	2.476e-010	8.035e-010

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory
Conversion of calculated exposure in air to dose
FILE: C:\MS5\DATA\B25CPUB.MS5
Case Title: B25CPUB
This case was run on Sunday, June 1, 1997 at 11:55:38 AM
Dose Point # 3 - (91,2,6) ft

Results (Summed over energies)	Units	Without Buildup	With Buildup
Photon Fluence Rate (flux)	Photons/cm²/sec	5.990e-005	1.871e-004
Photon Energy Fluence Rate	MeV/cm²/sec	3.963e-005	1.238e-004
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	7.683e-008	2.400e-007
Absorbed Dose Rate in Air	mGy/hr	6.707e-010	2.096e-009
"	mrad/hr	6.707e-008	2.096e-007
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	7.941e-010	2.481e-009
o Opposed	"	6.358e-010	1.986e-009
o Rotational	"	6.358e-010	1.986e-009
o Isotropic	"	5.622e-010	1.757e-009
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	8.440e-010	2.637e-009
o Opposed	"	8.016e-010	2.505e-009
o Rotational	"	8.016e-010	2.505e-009
o Isotropic	"	6.010e-010	1.878e-009
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	7.022e-010	2.194e-009
o Posterior/Anterior	"	6.198e-010	1.936e-009
o Lateral	"	4.596e-010	1.436e-009
o Rotational	"	5.539e-010	1.730e-009 #4
o Isotropic	"	4.715e-010	1.473e-009

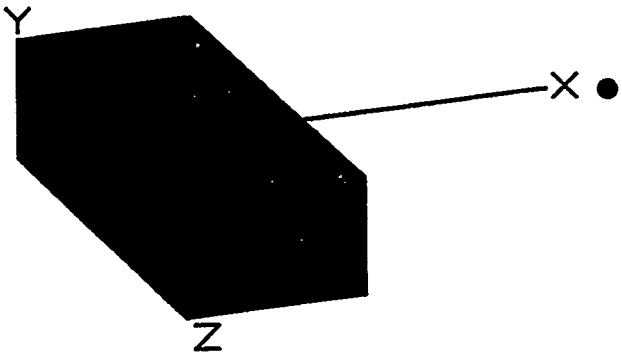
MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory

Page : 1
DOS File : B25CSPUB.MS5
Run Date : June 1, 1997
Run Time : 11:49:27 AM
Duration : 00:00:25

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: B25CSPUB

Description: B-25 Box w Cs 137@1 pCi/g in NBS Concrete :Public @12ft side
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	182.88 cm	6 ft
Width	487.68 cm	16 ft
Height	121.92 cm	4 ft

Dose Points

	X	Y	Z
# 1	548.64 cm	60.96 cm	182.88 cm
	18 ft	2 ft	6 ft

Shields

Shield Name	Dimension	Material	Density
Source	384.0 ft³	NBS Concrete	2.35
Shield 1	.016 ft	Iron	7.86
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 4
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ba-137m	1.7178e-005	6.3560e+005	1.5798e-006	5.8453e-002
Cs-137	1.8159e-005	6.7188e+005	1.6700e-006	6.1790e-002

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.316e+04	1.827e-18	5.663e-18	1.522e-20	4.717e-20
0.0322	2.428e+04	8.374e-18	2.653e-17	6.739e-20	2.135e-19
0.0364	8.835e+03	8.259e-15	3.316e-14	4.693e-17	1.884e-16
0.6616	5.719e+05	3.852e-03	1.094e-02	7.467e-06	2.121e-05
TOTALS:	6.182e+05	3.852e-03	1.094e-02	7.467e-06	2.121e-05

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory
Conversion of calculated exposure in air to dose
FILE: C:\MS5\DATA\B25CSPUB.MS5
Case Title: B25CSPUB
This case was run on Sunday, June 1, 1997 at 11:49:27 AM
Dose Point # 1 - (18,2,6) ft

Results (Summed over energies)	Units	Without Buildup	With Buildup
Photon Fluence Rate (flux)	Photons/cm²/sec	5.821e-003	1.653e-002
Photon Energy Fluence Rate	MeV/cm²/sec	3.852e-003	1.094e-002
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	7.467e-006	2.121e-005
Absorbed Dose Rate in Air	mGy/hr	6.519e-008	1.851e-007
"	mrad/hr	6.519e-006	1.851e-005
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	7.718e-008	2.192e-007
o Opposed	"	6.179e-008	1.755e-007
o Rotational	"	6.179e-008	1.755e-007
o Isotropic	"	5.464e-008	1.552e-007
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	8.203e-008	2.330e-007
o Opposed	"	7.791e-008	2.213e-007
o Rotational	"	7.791e-008	2.213e-007
o Isotropic	"	5.841e-008	1.659e-007
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	6.825e-008	1.938e-007
o Posterior/Anterior	"	6.024e-008	1.711e-007
o Lateral	"	4.467e-008	1.269e-007 } #2¢3
o Rotational	"	5.383e-008	1.529e-007
o Isotropic	"	4.583e-008	1.301e-007

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory

Page : 1
DOS File : B25SPUB.MS5
Run Date : June 1, 1997
Run Time : 11:24:33 AM
Duration : 00:01:14

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: B25SPUBLIC
Description: B-25 Box w Cs 137 @ 1 pCi/g in BNL Soil: Public 100,12,75 Ft
Geometry: 13 - Rectangular Volume

Source Dimensions

Length	487.68 cm	16 ft
Width	182.88 cm	6 ft
Height	121.92 cm	4 ft

Dose Points

	X	Y	Z
# 1	3535.68 cm	60.96 cm	91.44 cm
	116 ft	2 ft	3 ft
# 2	853.44 cm	60.96 cm	91.44 cm
	28 ft 0.0 in	2 ft	3 ft
# 3	2773.68 cm	60.96 cm	91.44 cm
	91 ft	2 ft	3 ft

Shields

Shield Name	Dimension	Material	Density
Source	384.0 ft³	BNL Soil	1.67
Shield 1	.016 ft	Iron	7.86
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 4
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ba-137m	1.7178e-005	6.3560e+005	1.5798e-006	5.8453e-002
Cs-137	1.8159e-005	6.7188e+005	1.6700e-006	6.1790e-002

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (116,2,3) ft

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.316e+04	2.270e-20	1.378e-19	1.891e-22	1.148e-21
0.0322	2.428e+04	1.040e-19	6.490e-19	8.373e-22	5.223e-21
0.0364	8.835e+03	9.945e-17	8.236e-16	5.650e-19	4.679e-18
0.6616	5.719e+05	2.879e-05	9.685e-05	5.581e-08	1.878e-07
TOTALS:	6.182e+05	2.879e-05	9.685e-05	5.581e-08	1.878e-07

Results - Dose Point # 2 - (28,2,3) ft

DOS File : B25SPUB.MS5
Run Date : June 1, 1997
Run Time: 11:24:33 AM
Duration : 00:01:14

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.316e+04	2.836e-18	1.701e-17	2.362e-20	1.417e-19
0.0322	2.428e+04	1.294e-17	7.970e-17	1.041e-19	6.414e-19
0.0364	8.835e+03	1.189e-14	9.657e-14	6.758e-17	5.487e-16
0.6616	5.719e+05	2.375e-03	6.834e-03	4.605e-06	1.325e-05
TOTALS:	6.182e+05	2.375e-03	6.834e-03	4.605e-06	1.325e-05

Results - Dose Point # 3 - (91,2,3) ft

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.316e+04	5.298e-20	3.200e-19	4.413e-22	2.665e-21
0.0322	2.428e+04	2.418e-19	1.501e-18	1.946e-21	1.208e-20
0.0364	8.835e+03	2.229e-16	1.832e-15	1.267e-18	1.041e-17
0.6616	5.719e+05	5.486e-05	1.775e-04	1.064e-07	3.441e-07
TOTALS:	6.182e+05	5.486e-05	1.775e-04	1.064e-07	3.441e-07

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory
Conversion of calculated exposure in air to dose
FILE: C:\MS5\DATA\B25SPUB.MS5
Case Title: B25SPUBLIC
This case was run on Sunday, June 1, 1997 at 11:24:33 AM
Dose Point # 1 - (116,2,3) ft

Results (Summed over energies)	Units	Without Buildup	With Buildup
Photon Fluence Rate (flux)	Photons/cm²/sec	4.351e-005	1.464e-004
Photon Energy Fluence Rate	MeV/cm²/sec	2.879e-005	9.685e-005
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	5.581e-008	1.878e-007
Absorbed Dose Rate in Air	mGy/hr	4.873e-010	1.639e-009
"	mrad/hr	4.873e-008	1.639e-007
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	5.769e-010	1.941e-009
o Opposed	"	4.619e-010	1.554e-009
o Rotational	"	4.619e-010	1.554e-009
o Isotropic	"	4.084e-010	1.374e-009
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	6.131e-010	2.063e-009
o Opposed	"	5.824e-010	1.959e-009
o Rotational	"	5.824e-010	1.959e-009
o Isotropic	"	4.366e-010	1.469e-009
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	5.101e-010	1.716e-009 #1
o Posterior/Anterior	"	4.502e-010	1.515e-009
o Lateral	"	3.339e-010	1.123e-009
o Rotational	"	4.024e-010	1.354e-009
o Isotropic	"	3.425e-010	1.152e-009

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory
Conversion of calculated exposure in air to dose
FILE: C:\MS5\DATA\B25SPUB.MS5
Case Title: B25SPUBLIC
This case was run on Sunday, June 1, 1997 at 11:24:33 AM
Dose Point # 3 - (91,2,3) ft

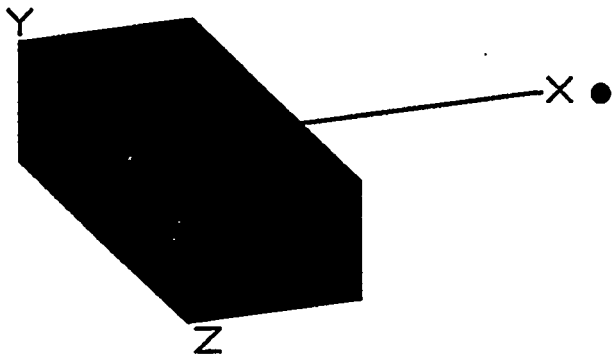
Results (Summed over energies)	Units	Without Buildup	With Buildup
Photon Fluence Rate (flux)	Photons/cm²/sec	8.291e-005	2.682e-004
Photon Energy Fluence Rate	MeV/cm²/sec	5.486e-005	1.775e-004
Exposure and Dose Rates:			
Exposure Rate in Air	mR/hr	1.064e-007	3.441e-007
Absorbed Dose Rate in Air	mGy/hr	9.285e-010	3.004e-009
"	mrad/hr	9.285e-008	3.004e-007
Deep Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	1.099e-009	3.556e-009
o Opposed	"	8.801e-010	2.847e-009
o Rotational	"	8.801e-010	2.847e-009
o Isotropic	"	7.783e-010	2.518e-009
Shallow Dose Equivalent Rate	(ICRP 51 - 1987)		
o Parallel Geometry	mSv/hr	1.168e-009	3.780e-009
o Opposed	"	1.110e-009	3.590e-009
o Rotational	"	1.110e-009	3.590e-009
o Isotropic	"	8.320e-010	2.692e-009
Effective Dose Equivalent Rate	(ICRP 51 - 1987)		
o Anterior/Posterior Geometry	mSv/hr	9.720e-010	3.145e-009
o Posterior/Anterior	"	8.580e-010	2.776e-009
o Lateral	"	6.362e-010	2.058e-009
o Rotational	"	7.667e-010	2.480e-009 }#2¢3
o Isotropic	"	6.527e-010	2.112e-009

MicroShield v5.01 (5.01-00009)
Brookhaven National Laboratory

Page : 1
DOS File : B25SSPUB.MS5
Run Date : June 1, 1997
Run Time : 11:32:43 AM
Duration : 00:00:24

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: B25SSPUB
Description: B-25 Box w Cs 137 @ 1 pCi/g in BNL Soil: Public 12 Ft Side
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	182.88 cm	6 ft
Width	487.68 cm	16 ft
Height	121.92 cm	4 ft

Dose Points

	X	Y	Z
# 1	548.64 cm	60.96 cm	182.88 cm
	18 ft	2 ft	6 ft

Shields

Shield Name	Dimension	Material	Density
Source	384.0 ft³	BNL Soil	1.67
Shield 1	.016 ft	Iron	7.86
Air Gap	.	Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 4
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ba-137m	1.7178e-005	6.3560e+005	1.5798e-006	5.8453e-002
Cs-137	1.8159e-005	6.7188e+005	1.6700e-006	6.1790e-002

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.316e+04	4.583e-18	2.720e-17	3.818e-20	2.266e-19
0.0322	2.428e+04	2.065e-17	1.259e-16	1.662e-19	1.014e-18
0.0364	8.835e+03	1.792e-14	1.448e-13	1.018e-16	8.226e-16
0.6616	5.719e+05	5.284e-03	1.541e-02	1.024e-05	2.987e-05
TOTALS:	6.182e+05	5.284e-03	1.541e-02	1.024e-05	2.987e-05

Dose to Public from Transport and Disposal of Contaminated Soil: Spreadsheets

Hanford & Envirocare Shipments: Cs 137 Vol. Weighted Arithmetic & Geometric Avg. Conc.

	Cs 137 Conc @ Midpoint	Volume in Conc. Range	Vol Weighted Arithmatic Avg Conc.				
Cesium 137 Conc. Range	(pCi/g)	(CY)	(pCi/g)				
1500 to 2800 pCi/g	2150	2020	2150				
2,800 to 5,600 pCi/g	4200	3200	2247		Vol Weighted Geometric Avg.:	Geometric Avg. Conc.	
5,600 to 30,000 pCi/g	17800	1980	5894	Hanford	V. W. Arithmatic Avg. Conc Ratio	(pCi/g)	Hanford
over 30,000 pCi/g	420000	800	56187	Cs 137 Concentration: Arithmatic			Cs 137 Concentration: Geometric
	Total Volume	8000	64328	< Vol Weighted Avg @ 100 mrem	0.0477	3071	< Vol Weighted Avg @ 100 mrem
				Envirocare			Envirocare
				Cs 137 Concentration: Arithmatic			Cs 137 Concentration: Geometric
			2150	< Vol Weighted Avg @ 100 mrem	0.0477	103	< Vol Weighted Avg @ 100 mrem
	Cs 137 Conc @ Midpoint	Volume in Conc. Range	Vol Weighted Arithmatic Avg Conc.				
Cesium 137 Conc. Range	(pCi/g)	(CY)	(pCi/g)				
1135 to 1500 pCi/g	1318	990	433				
1500 to 2800 pCi/g	2150	2020	1443				
2,800 to 5,600 pCi/g	4200	3200	2247				
5,600 to 30,000 pCi/g	17800	1980	5894	Hanford			Hanford
over 30,000 pCi/g	420000	800	56187	Cs 137 Concentration: Arithmatic			Cs 137 Concentration: Geometric
	Total Volume	8990	64328	< Vol Weighted Avg @ 75 mrem	0.0477	3071	< Vol Weighted Avg @ 75 mrem
				Envirocare			Envirocare
				Cs 137 Concentration: Arithmatic			Cs 137 Concentration: Geometric
			1876	< Vol Weighted Avg @ 75 mrem	0.0477	90	< Vol Weighted Avg @ 75 mrem
	Cs 137 Conc @ Midpoint	Volume in Conc. Range	Vol Weighted Arithmatic Avg Conc.				
Cesium 137 Conc. Range	(pCi/g)	(CY)	(pCi/g)				
378 to 1135 pCi/g	756	11210	596				
1135 to 1500 pCi/g	1318	990	92				
1500 to 2800 pCi/g	2150	2020	305				
2,800 to 5,600 pCi/g	4200	3200	2247				
5,600 to 30,000 pCi/g	17800	1980	5894	Hanford			Hanford
over 30,000 pCi/g	420000	800	56187	Cs 137 Concentration: Arithmatic			Cs 137 Concentration: Geometric
	Total Volume	20200	64328	< Vol Weighted Avg @ 25 mrem	0.0477	3071	< Vol Weighted Avg @ 25 mrem
				Envirocare			Envirocare
				Cs 137 Concentration: Arithmatic			Cs 137 Concentration: Geometric
			893	< Vol Weighted Avg @ 25 mrem	0.0477	47	< Vol Weighted Avg @ 25 mrem
	Cs 137 Conc @ Midpoint	Volume in Conc. Range	Vol Weighted Arithmatic Avg Conc.				
Cesium 137 Conc. Range	(pCi/g)	(CY)	(pCi/g)				
227 to 378 pCi/g	302	5550	85				
378 to 1135 pCi/g	756	11210	429				
1135 to 1500 pCi/g	1318	990	66				
1500 to 2800 pCi/g	2150	2020	220				
2,800 to 5,600 pCi/g	4200	3200	2247				
5,600 to 30,000 pCi/g	17800	1980	5894	Hanford			Hanford
over 30,000 pCi/g	420000	800	56187	Cs 137 Concentration: Arithmatic			Cs 137 Concentration: Geometric
	Total Volume	25750	64328	< Vol Weighted Avg @ 15 mrem	0.0477	3071	< Vol Weighted Avg @ 15 mrem
				Envirocare			Envirocare
				Cs 137 Concentration: Arithmatic			Cs 137 Concentration: Geometric
			799	< Vol Weighted Avg @ 15 mrem	0.0477	38	< Vol Weighted Avg @ 15 mrem
	Cs 137 Conc @ Midpoint	Volume in Conc. Range	Vol Weighted Arithmatic Avg Conc.				
Cesium 137 Conc. Range	(pCi/g)	(CY)	(pCi/g)				
15 to 227 pCi/g	121	52542	87				
227 to 378 pCi/g	302	5550	23				
378 to 1135 pCi/g	756	11210	116				
1135 to 1500 pCi/g	1318	990	18				
1500 to 2800 pCi/g	2150	2020	59				
2,800 to 5,600 pCi/g	4200	3200	2247				
5,600 to 30,000 pCi/g	17800	1980	5894	Hanford			Hanford
over 30,000 pCi/g	420000	800	56187	Cs 137 Concentration: Arithmatic			Cs 137 Concentration: Geometric
	Total Volume	78292	64328	< Vol Weighted Avg @ 1 mrem	0.0477	3071	< Vol Weighted Avg @ 1 mrem
				Envirocare			Envirocare
				Cs 137 Concentration: Arithmatic			Cs 137 Concentration: Geometric
			302	< Vol Weighted Avg @ 1 mrem	0.0477	14	< Vol Weighted Avg @ 1 mrem

Dose to Public from Transport and Offsite Disposal to 100 mrem/yr:									File:PUBTRANS wb3
Volume Weighted Arithmetic & Geometric Average Concentrations									
		Cs 137							
#1 Tailgater Dose to Hanford	B-25C Dose Rate @ 100 Ft	Geometric Avg.	Tailgate Time	Trip Time	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 100 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	Fraction	(hours)	(persons)		(person-rem)	Hanford	
	0.00000012	2303	0.18	44	2	498	0.002180	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Hanford	
	0.00000012	48248	0.18	44	2	498	0.045670	< Dose w Arithmetic Avg.	
#1 Tailgater Dose to Envirocare	B-25S Dose Rate @ 100 Ft	Geometric Avg.	Tailgate Time	Trip Time	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 100 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	Fraction	(hours)	(persons)		(person-rem)	Envirocare	
	0.00000017	103	0.15	35	2	168	0.000031	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Envirocare	
	0.00000017	2150	0.15	35	2	168	0.000652	< Dose w Arithmetic Avg.	
#2 Dose Cars in Traffic to Hanford	B-25C Dose Rate @ 12 Ft	Geometric Avg.	No. Traffic	Stop Time	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 100 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	Jams	(hours)	(persons)		(person-rem)	Hanford	
	0.00001269	2303	4	0.5	2	498	0.058223	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Hanford	
	0.00001269	48248	4	0.5	2	498	1.219586	< Dose w Arithmetic Avg.	
#2 Dose Cars in Traffic to Envirocare	B-25S Dose Rate @ 12 Ft	Geometric Avg.	No. Traffic	Stop Time	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 100 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	Jams	(hours)	(persons)		(person-rem)	Envirocare	
	0.00001787	103	3	0.5	2	168	0.000928	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Envirocare	
	0.00001787	2150	3	0.5	2	168	0.019384	< Dose w Arithmetic Avg.	
#3 Truck Stop Adjacent Driver Dose to Hanford	B-25C Dose Rate @ 12 Ft	Geometric Avg.	Stop Time	Stops /Trip	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 100 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)		(persons)		(person-rem)	Hanford	
	0.00001269	2303	1	8	2	498	0.232891	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Hanford	
	0.00001269	48248	1	8	2	498	4.878342	< Dose w Arithmetic Avg.	
#3 Truck Stop Adjacent Driver Dose to Envirocare	B-25S Dose Rate @ 12 Ft	Geometric Avg.	Stop Time	Stops/ Trip	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 100 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)		(persons)		(person-rem)	Envirocare	
	0.00001787	103	1	6	2	168	0.003711	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Envirocare	
	0.00001787	2150	1	6	2	168	0.077456	< Dose w Arithmetic Avg.	
#4 Dose to Gas Station Attendent to Hanford	B-25C Dose Rate @ 75 Ft	Geometric Avg.	Stop Time	Miles/Tank	Miles / Trip	No. Truck Trips	No. Persons Exposed	Collective Dose	
Cleanup to 100 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)					(person-rem)	Hanford
	0.00000017	2303	0.33	600	2806	498	6	0.001848	< Dose w Geometric Avg.
		Arithmetic Avg.							
		(pCi/g)							Hanford
	0.00000017	48248	0.33	600	2806	498	6	0.038712	< Dose w Arithmetic Avg.
#4 Dose to Gas Station Attendent to Envirocare	B-25S Dose Rate @ 75 Ft	Geometric Avg.	Stop Time	Miles/Tank	Miles / Trip	No. Truck Trips	No. Persons Exposed	Collective Dose	
Cleanup to 100 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)					(person-rem)	Envirocare
	0.00000025	103	0.33	600	2245	168	6	0.000032	< Dose w Geometric Avg.
		Arithmetic Avg.							
		(pCi/g)							Envirocare
	0.00000025	2150	0.33	600	2245	168	6	0.000664	< Dose w Arithmetic Avg.
					Total Mileage:	1774548			
					Vehicle Accident Deaths:	0.007			Sub Total Hanford
								0.295142	< Dose w Geometric Avg
									Sub Total Hanford
								6.182309	< Dose w Arithmetic Avg.
									Sub Total Envirocare
								0.004701	< Dose w Geometric Avg.
									Sub Total Envirocare
								0.098136	< Dose w Arithmetic Avg.
									Grand Total
								0.29984	< Dose w Geometric Avg
									Grand Total
								6.28044	< Dose w Arithmetic Avg.

Dose to Public from Transport and Off-site Disposal to 75 mrem/yr:									File:PUBTRANS.wb3
Volume Weighted Arithmetic & Geometric Average Concentrations									
		Cs 137							
#1 Tailgater Dose to Hanford	B-25C Dose Rate @ 100 Ft	Geometric Avg.	Tailgate Time	Trip Time	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 75 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	Fraction	(hours)	(persons)		(person-rem)	Hanford	
	0.00000012	2303	0.18	44	2	498	0.002180	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Hanford	
	0.00000012	48246	0.18	44	2	498	0.045670	< Dose w Arithmetic Avg.	
#1 Tailgater Dose to Envirocare	B-25S Dose Rate @ 100 Ft	Geometric Avg.	Tailgate Time	Trip Time	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 75 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	Fraction	(hours)	(persons)		(person-rem)	Envirocare	
	0.00000017	90	0.15	35	2	250	0.000041	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Envirocare	
	0.00000017	1876	0.15	35	2	250	0.000847	< Dose w Arithmetic Avg.	
#2 Dose Cars in Traffic to Hanford	B-25C Dose Rate @ 12 Ft	Geometric Avg.	No. Traffic	Stop Time	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 75 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	Jams	(hours)	(persons)		(person-rem)	Hanford	
	0.00001269	2303	4	0.5	2	498	0.058223	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Hanford	
	0.00001269	48246	4	0.5	2	498	1.219588	< Dose w Arithmetic Avg.	
#2 Dose Cars in Traffic to Envirocare	B-25S Dose Rate @ 12 Ft	Geometric Avg.	No. Traffic	Stop Time	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 75 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	Jams	(hours)	(persons)		(person-rem)	Envirocare	
	0.00001787	90	3	0.5	2	250	0.001206	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Envirocare	
	0.00001787	1876	3	0.5	2	250	0.025143	< Dose w Arithmetic Avg.	
#3 Truck Stop Adjacent Driver Dose to Hanford	B-25C Dose Rate @ 12 Ft	Geometric Avg.	Stop Time	Stops /Trip	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 75 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)		(persons)		(person-rem)	Hanford	
	0.00001269	2303	1	8	2	498	0.232891	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Hanford	
	0.00001269	48246	1	8	2	498	4.878342	< Dose w Arithmetic Avg.	
#3 Truck Stop Adjacent Driver Dose to Envirocare	B-25S Dose Rate @ 12 Ft	Geometric Avg.	Stop Time	Stops/ Trip	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 75 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)		(persons)		(person-rem)	Envirocare	
	0.00001787	90	1	6	2	250	0.004825	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Envirocare	
	0.00001787	1876	1	6	2	250	0.100572	< Dose w Arithmetic Avg.	
#4 Dose to Gas Station Attendent to Hanford	B-25C Dose Rate @ 75 Ft	Geometric Avg.	Stop Time	Miles/Tank	Miles / Trip	No. Truck Trips	No. Persons Exposed	Collective Dose	
Cleanup to 75 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)					(person-rem)	Hanford
	0.00000017	2303	0.33	600	2806	498	6	0.001848	< Dose w Geometric Avg.
		Arithmetic Avg.							
		(pCi/g)							Hanford
	0.00000017	48246	0.33	600	2806	498	6	0.038712	< Dose w Arithmetic Avg.
#4 Dose to Gas Station Attendent to Envirocare	B-25S Dose Rate @ 75 Ft	Geometric Avg.	Stop Time	Miles/Tank	Miles / Trip	No. Truck Trips	No. Persons Exposed	Collective Dose	
Cleanup to 75 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)					(person-rem)	Envirocare
	0.00000025	90	0.33	600	2245	250	6	0.000041	< Dose w Geometric Avg.
		Arithmetic Avg.							
		(pCi/g)							Envirocare
	0.00000025	1876	0.33	600	2245	250	6	0.000862	< Dose w Arithmetic Avg.
					Total Mileage:	1958838			
					Vehicle Accident Deaths:	0.008			Sub Total Hanford
								0.295142	< Dose w Geometric Avg.
									Sub Total Hanford
								6.182309	< Dose w Arithmetic Avg.
									Sub Total Envirocare
								0.006113	< Dose w Geometric Avg.
									Sub Total Envirocare
								0.127424	< Dose w Arithmetic Avg.
									Grand Total
								0.30125	< Dose w Geometric Avg.
									Grand Total
								6.30973	< Dose w Arithmetic Avg.

Dose to Public from Transport and Off-site Disposal to 25 mrem/yr:									File:PUBTRANS.wb3
Volume Weighted Arithmetic & Geometric Average Concentrations									
		Cs 137							
#1 Tailgater Dose to Hanford	B-25C Dose Rate @ 100 Ft	Geometric Avg.	Tailgate Time	Trip Time	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 25 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	Fraction	(hours)	(persons)		(person-rem)	Hanford	
	0.00000012	2303	0.18	44	2	498	0.002180	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Hanford	
	0.00000012	48246	0.18	44	2	498	0.045670	< Dose w Arithmetic Avg.	
#1 Tailgater Dose to Envirocare	B-25S Dose Rate @ 100 Ft	Geometric Avg.	Tailgate Time	Trip Time	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 25 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	Fraction	(hours)	(persons)		(person-rem)	Envirocare	
	0.00000017	47	0.15	35	2	1185	0.000101	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Envirocare	
	0.00000017	993	0.15	35	2	1185	0.002125	< Dose w Arithmetic Avg.	
#2 Dose Cars in Traffic to Hanford	B-25C Dose Rate @ 12 Ft	Geometric Avg.	No. Traffic	Stop Time	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 25 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	Jams	(hours)	(persons)		(person-rem)	Hanford	
	0.00001269	2303	4	0.5	2	498	0.058223	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Hanford	
	0.00001269	48246	4	0.5	2	498	1.219586	< Dose w Arithmetic Avg.	
#2 Dose Cars in Traffic to Envirocare	B-25S Dose Rate @ 12 Ft	Geometric Avg.	No. Traffic	Stop Time	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 25 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	Jams	(hours)	(persons)		(person-rem)	Envirocare	
	0.00001787	47	3	0.5	2	1185	0.002988	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Envirocare	
	0.00001787	993	3	0.5	2	1185	0.063083	< Dose w Arithmetic Avg.	
#3 Truck Stop Adjacent Driver Dose to Hanford	B-25C Dose Rate @ 12 Ft	Geometric Avg.	Stop Time	Stops /Trip	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 25 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)		(persons)		(person-rem)	Hanford	
	0.00001269	2303	1	8	2	498	0.232891	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Hanford	
	0.00001269	48246	1	8	2	498	4.878342	< Dose w Arithmetic Avg.	
#3 Truck Stop Adjacent Driver Dose to Envirocare	B-25S Dose Rate @ 12 Ft	Geometric Avg.	Stop Time	Stops/ Trip	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 25 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)		(persons)		(person-rem)	Envirocare	
	0.00001787	47	1	6	2	1185	0.011943	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Envirocare	
	0.00001787	993	1	6	2	1185	0.252333	< Dose w Arithmetic Avg.	
#4 Dose to Gas Station Attendent to Hanford	B-25C Dose Rate @ 75 Ft	Geometric Avg.	Stop Time	Miles/Tank	Miles / Trip	No. Truck Trips	No. Persons Exposed	Collective Dose	
Cleanup to 25 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)					(person-rem)	Hanford
	0.00000017	2303	0.33	600	2806	498	6	0.001848	< Dose w Geometric Avg.
		Arithmetic Avg.							
		(pCi/g)							Hanford
	0.00000017	48246	0.33	600	2806	498	6	0.038712	< Dose w Arithmetic Avg.
#4 Dose to Gas Station Attendent to Envirocare	B-25S Dose Rate @ 75 Ft	Geometric Avg.	Stop Time	Miles/Tank	Miles / Trip	No. Truck Trips	No. Persons Exposed	Collective Dose	
Cleanup to 25 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)					(person-rem)	Envirocare
	0.00000025	47	0.33	600	2245	1185	6	0.000102	< Dose w Geometric Avg.
		Arithmetic Avg.							
		(pCi/g)							Envirocare
	0.00000025	993	0.33	600	2245	1185	6	0.002162	< Dose w Arithmetic Avg.
					Total Mileage:	4057713			
					Vehicle Accident Deaths:	0 016			Sub Total Hanford
								0.295142	< Dose w Geometric Avg.
									Sub Total Hanford
								6.182309	< Dose w Arithmetic Avg.
									Sub Total Envirocare
								0.015132	< Dose w Geometric Avg.
									Sub Total Envirocare
								0.319703	< Dose w Arithmetic Avg.
									Grand Total
								0.31027	< Dose w Geometric Avg.
									Grand Total
								6.50201	< Dose w Arithmetic Avg.

Dose to Public from Transport and Off-site Disposal to 15 mrem/yr:									File:PUBTRANS wb3
Volume Weighted Arithmetic & Geometric Average Concentrations									
		Cs 137							
#1 Tailgater Dose to Hanford	B-25C Dose Rate @ 100 Ft	Geometric Avg.	Tailgate Time	Trip Time	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 15 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	Fraction	(hours)	(persons)		(person-rem)	Hanford	
	0.00000012	2303	0 18	44	2	498	0.002180	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Hanford	
	0 00000012	48246	0.18	44	2	498	0.045670	< Dose w Arithmetic Avg.	
#1 Tailgater Dose to Envirocare	B-25S Dose Rate @ 100 Ft	Geometric Avg.	Tailgate Time	Trip Time	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 15 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	Fraction	(hours)	(persons)		(person-rem)	Envirocare	
	0.00000017	38	0.15	35	2	1648	0.000113	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Envirocare	
	0.00000017	799	0.15	35	2	1648	0.002378	< Dose w Arithmetic Avg.	
#2 Dose Cars in Traffic to Hanford	B-25C Dose Rate @ 12 Ft	Geometric Avg.	No. Traffic	Stop Time	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 15 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	Jams	(hours)	(persons)		(person-rem)	Hanford	
	0.00001269	2303	4	0.5	2	498	0.058223	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Hanford	
	0.00001269	48246	4	0.5	2	498	1.219586	< Dose w Arithmetic Avg.	
#2 Dose Cars in Traffic to Envirocare	B-25S Dose Rate @ 12 Ft	Geometric Avg.	No. Traffic	Stop Time	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 15 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	Jams	(hours)	(persons)		(person-rem)	Envirocare	
	0 00001787	38	3	0.5	2	1648	0.003357	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Envirocare	
	0.00001787	799	3	0.5	2	1648	0.070591	< Dose w Arithmetic Avg.	
#3 Truck Stop Adjacent Driver Dose to Hanford	B-25C Dose Rate @ 12 Ft	Geometric Avg.	Stop Time	Stops /Trip	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 15 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)		(persons)		(person-rem)	Hanford	
	0.00001269	2303	1	8	2	498	0.232891	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Hanford	
	0.00001269	48246	1	8	2	498	4.878342	< Dose w Arithmetic Avg.	
#3 Truck Stop Adjacent Driver Dose to Envirocare	B-25S Dose Rate @ 12 Ft	Geometric Avg.	Stop Time	Stops/ Trip	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 15 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)		(persons)		(person-rem)	Envirocare	
	0.00001787	38	1	8	2	1648	0.013429	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Envirocare	
	0.00001787	799	1	8	2	1648	0.282384	< Dose w Arithmetic Avg.	
#4 Dose to Gas Station Attendent to Hanford	B-25C Dose Rate @ 75 Ft	Geometric Avg.	Stop Time	Miles/Tank	Miles / Trip	No. Truck Trips	No. Persons Exposed	Collective Dose	
Cleanup to 15 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)					(person-rem)	Hanford
	0.00000017	2303	0.33	600	2806	498	6	0.001848	< Dose w Geometric Avg.
		Arithmetic Avg.							
		(pCi/g)							Hanford
	0.00000017	48246	0.33	600	2806	498	6	0.038712	< Dose w Arithmetic Avg.
#4 Dose to Gas Station Attendent to Envirocare	B-25S Dose Rate @ 75 Ft	Geometric Avg.	Stop Time	Miles/Tank	Miles / Trip	No. Truck Trips	No. Persons Exposed	Collective Dose	
Cleanup to 15 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)					(person-rem)	Envirocare
	0 00000025	38	0.33	600	2245	1648	6	0.000115	< Dose w Geometric Avg.
		Arithmetic Avg.							
		(pCi/g)							Envirocare
	0.00000025	799	0.33	600	2245	1648	6	0.002419	< Dose w Arithmetic Avg.
					Total Mileage:	5097148			
					Vehicle Accident Deaths:	0.020			Sub Total Hanford
								0.295142	< Dose w Geometric Avg.
									Sub Total Hanford
								6.182309	< Dose w Arithmetic Avg.
									Sub Total Envirocare
								0.017015	< Dose w Geometric Avg.
									Sub Total Envirocare
								0.357753	< Dose w Arithmetic Avg.
									Grand Total
								0.31216	< Dose w Geometric Avg.
									Grand Total
								6.54006	< Dose w Arithmetic Avg.

Dose to Public from Transport and Off-site Disposal to 1 mrem/yr:									File:PUBTRANS.wb3
Volume Weighted Arithmetic & Geometric Average Concentrations									
		Cs 137							
#1 Tailgater Dose to Hanford	B-25C Dose Rate @ 100 Ft	Geometric Avg.	Tailgate Time	Trip Time	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 1 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	Fraction	(hours)	(persons)		(person-rem)	Hanford	
	0.00000012	2303	0.18	44	2	498	0.002180	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Hanford	
	0.00000012	48246	0.18	44	2	498	0.045670	< Dose w Arithmetic Avg.	
#1 Tailgater Dose to Envirocare	B-25S Dose Rate @ 100 Ft	Geometric Avg.	Tailgate Time	Trip Time	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 1 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	Fraction	(hours)	(persons)		(person-rem)	Envirocare	
	0.00000017	14	0.15	35	2	6026	0.000152	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Envirocare	
	0.00000017	302	0.15	35	2	6026	0.003287	< Dose w Arithmetic Avg.	
#2 Dose Cars in Traffic to Hanford	B-25C Dose Rate @ 12 Ft	Geometric Avg.	No. Traffic	Stop Time	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 1 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	Jams	(hours)	(persons)		(person-rem)	Hanford	
	0.00001269	2303	4	0.5	2	498	0.058223	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Hanford	
	0.00001269	48246	4	0.5	2	498	1.219588	< Dose w Arithmetic Avg.	
#2 Dose Cars in Traffic to Envirocare	B-25S Dose Rate @ 12 Ft	Geometric Avg.	No. Traffic	Stop Time	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 1 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	Jams	(hours)	(persons)		(person-rem)	Envirocare	
	0.00001787	14	3	0.5	2	6026	0.004523	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Envirocare	
	0.00001787	302	3	0.5	2	6026	0.097562	< Dose w Arithmetic Avg.	
#3 Truck Stop Adjacent Driver Dose to Hanford	B-25C Dose Rate @ 12 Ft	Geometric Avg.	Stop Time	Stops /Trip	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 1 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)		(persons)		(person-rem)	Hanford	
	0.00001269	2303	1	8	2	498	0.232891	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Hanford	
	0.00001269	48246	1	8	2	498	4.878342	< Dose w Arithmetic Avg.	
#3 Truck Stop Adjacent Driver Dose to Envirocare	B-25S Dose Rate @ 12 Ft	Geometric Avg.	Stop Time	Stops/ Trip	No. of Persons Exposed	No. Truck Trips	Collective Dose		
Cleanup to 1 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)		(persons)		(person-rem)	Envirocare	
	0.00001787	14	1	6	2	6026	0.018091	< Dose w Geometric Avg.	
		Arithmetic Avg.							
		(pCi/g)						Envirocare	
	0.00001787	302	1	6	2	6026	0.390249	< Dose w Arithmetic Avg.	
#4 Dose to Gas Station Attendent to Hanford	B-25C Dose Rate @ 75 Ft	Geometric Avg.	Stop Time	Miles/Tank	Miles / Trip	No. Truck Trips	No. Persons Exposed	Collective Dose	
Cleanup to 1 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)					(person-rem)	Hanford
	0.00000017	2303	0.33	600	2806	498	6	0.001848	< Dose w Geometric Avg.
		Arithmetic Avg.							
		(pCi/g)							Hanford
	0.00000017	48246	0.33	600	2806	498	6	0.038712	< Dose w Arithmetic Avg.
#4 Dose to Gas Station Attendent to Envirocare	B-25S Dose Rate @ 75 Ft	Geometric Avg.	Stop Time	Miles/Tank	Miles / Trip	No. Truck Trips	No. Persons Exposed	Collective Dose	
Cleanup to 1 mrem/yr	(mrem/hr per pCi/g)	(pCi/g)	(hours)					(person-rem)	Envirocare
	0.00000025	14	0.33	600	2245	6026	6	0.000155	< Dose w Geometric Avg.
		Arithmetic Avg.							
		(pCi/g)							Envirocare
	0.00000025	302	0.33	600	2245	6026	6	0.003344	< Dose w Arithmetic Avg.
					Total Mileage:	14925758			
					Vehicle Accident Deaths:	0.060			Sub Total Hanford
								0.295142	< Dose w Geometric Avg.
									Sub Total Hanford
								6.182309	< Dose w Arithmetic Avg.
									Sub Total Envirocare
								0.022921	< Dose w Geometric Avg.
									Sub Total Envirocare
								0.494442	< Dose w Arithmetic Avg.
									Grand Total
								0.31806	< Dose w Geometric Avg.
									Grand Total
								6.67675	< Dose w Arithmetic Avg.

Appendix I

Dose to Basement Resident for the Failure of Active Controls Scenario: RESRAD Printouts and Spreadsheets

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Attachment A
Calculation Package for Residual Radioactive Material in the 6" of Topsoil

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Dose Conversion Factor (and Related) Parameter Summary
File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.720E+00	6.720E+00	DCF2(1)
B-1	Am-241	4.440E-01	4.440E-01	DCF2(2)
B-1	Co-60	2.190E-04	2.190E-04	DCF2(3)
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(4)
B-1	Eu-152	2.210E-04	2.210E-04	DCF2(5)
B-1	Eu-154	2.860E-04	2.860E-04	DCF2(7)
B-1	Eu-155	4.140E-05	4.140E-05	DCF2(8)
B-1	Gd-152	2.430E-01	2.430E-01	DCF2(9)
B-1	H-3	6.400E-08	6.400E-08	DCF2(10)
B-1	Np-237+D	5.400E-01	5.400E-01	DCF2(11)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(12)
B-1	Pb-210+D	2.320E-02	2.320E-02	DCF2(13)
B-1	Pu-238	3.920E-01	3.920E-01	DCF2(14)
B-1	Pu-239	4.290E-01	4.290E-01	DCF2(15)
B-1	Pu-240	4.290E-01	4.290E-01	DCF2(16)
B-1	Ra-226+D	8.600E-03	8.600E-03	DCF2(17)
B-1	Ra-228+D	5.080E-03	5.080E-03	DCF2(18)
B-1	Sr-90+D	1.310E-03	1.310E-03	DCF2(19)
B-1	Th-228+D	3.450E-01	3.450E-01	DCF2(20)
B-1	Th-229+D	2.160E+00	2.160E+00	DCF2(21)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(22)
B-1	Th-232	1.640E+00	1.640E+00	DCF2(23)
B-1	U-233	1.350E-01	1.350E-01	DCF2(24)
B-1	U-234	1.320E-01	1.320E-01	DCF2(25)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(26)
B-1	U-236	1.250E-01	1.250E-01	DCF2(27)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(28)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.480E-02	DCF3(1)
D-1	Am-241	3.640E-03	3.640E-03	DCF3(2)
D-1	Co-60	2.690E-05	2.690E-05	DCF3(3)
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(4)
D-1	Eu-152	6.480E-06	6.480E-06	DCF3(5)
D-1	Eu-154	9.550E-06	9.550E-06	DCF3(7)
D-1	Eu-155	1.530E-06	1.530E-06	DCF3(8)
D-1	Gd-152	1.610E-04	1.610E-04	DCF3(9)
D-1	H-3	6.400E-08	6.400E-08	DCF3(10)
D-1	Np-237+D	4.440E-03	4.440E-03	DCF3(11)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(12)
D-1	Pb-210+D	7.270E-03	7.270E-03	DCF3(13)
D-1	Pu-238	3.200E-03	3.200E-03	DCF3(14)
D-1	Pu-239	3.540E-03	3.540E-03	DCF3(15)
D-1	Pu-240	3.540E-03	3.540E-03	DCF3(16)
D-1	Ra-226+D	1.330E-03	1.330E-03	DCF3(17)
D-1	Ra-228+D	1.440E-03	1.440E-03	DCF3(18)
D-1	Sr-90+D	1.530E-04	1.530E-04	DCF3(19)
D-1	Th-228+D	8.080E-04	8.080E-04	DCF3(20)
D-1	Th-229+D	4.030E-03	4.030E-03	DCF3(21)

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
D-1	Th-230	5.480E-04	5.480E-04	DCF3(22)
D-1	Th-232	2.730E-03	2.730E-03	DCF3(23)
D-1	U-233	2.890E-04	2.890E-04	DCF3(24)
D-1	U-234	2.830E-04	2.830E-04	DCF3(25)
D-1	U-235+D	2.670E-04	2.670E-04	DCF3(26)
D-1	U-236	2.690E-04	2.690E-04	DCF3(27)
D-1	U-238+D	2.690E-04	2.690E-04	DCF3(28)
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
D-34				
D-34	Am-241 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(2,1)
D-34	Am-241 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-05	5.000E-05	RTF(2,2)
D-34	Am-241 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-06	2.000E-06	RTF(2,3)
D-34				
D-34	Co-60 , plant/soil concentration ratio, dimensionless	8.000E-02	8.000E-02	RTF(3,1)
D-34	Co-60 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-02	2.000E-02	RTF(3,2)
D-34	Co-60 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(3,3)
D-34				
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(4,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(4,3)
D-34				
D-34	Eu-152 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(5,1)
D-34	Eu-152 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(5,2)
D-34	Eu-152 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(5,3)
D-34				
D-34	Eu-154 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(7,1)
D-34	Eu-154 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(7,2)
D-34	Eu-154 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(7,3)
D-34				
D-34	Eu-155 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(8,1)
D-34	Eu-155 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(8,2)
D-34	Eu-155 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(8,3)
D-34				
D-34	Gd-152 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(9,1)
D-34	Gd-152 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(9,2)
D-34	Gd-152 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(9,3)
D-34				
D-34	H-3 , plant/soil concentration ratio, dimensionless	4.800E+00	4.800E+00	RTF(10,1)
D-34	H-3 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.200E-02	1.200E-02	RTF(10,2)
D-34	H-3 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-02	1.000E-02	RTF(10,3)
D-34				
D-34	Np-237+D , plant/soil concentration ratio, dimensionless	2.000E-02	2.000E-02	RTF(11,1)
D-34	Np-237+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(11,2)
D-34	Np-237+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(11,3)
D-34				

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
D-34	Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(12,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(12,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(12,3)
D-34				
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(13,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(13,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(13,3)
D-34				
D-34	Pu-238 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(14,1)
D-34	Pu-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(14,2)
D-34	Pu-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(14,3)
D-34				
D-34	Pu-239 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(15,1)
D-34	Pu-239 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(15,2)
D-34	Pu-239 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(15,3)
D-34				
D-34	Pu-240 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(16,1)
D-34	Pu-240 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(16,2)
D-34	Pu-240 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(16,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(17,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(17,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(17,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(18,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(18,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(18,3)
D-34				
D-34	Sr-90+D , plant/soil concentration ratio, dimensionless	3.000E-01	3.000E-01	RTF(19,1)
D-34	Sr-90+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-03	8.000E-03	RTF(19,2)
D-34	Sr-90+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(19,3)
D-34				
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(20,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(20,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(20,3)
D-34				
D-34	Th-229+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(21,1)
D-34	Th-229+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(21,2)
D-34	Th-229+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(21,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(22,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(22,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(22,3)
D-34				
D-34	Th-232 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(23,1)
D-34	Th-232 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(23,2)
D-34	Th-232 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(23,3)
D-34				

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
D-34	U-233 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(24,1)
D-34	U-233 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(24,2)
D-34	U-233 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(24,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(25,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(25,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(25,3)
D-34				
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(26,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(26,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(26,3)
D-34				
D-34	U-236 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(27,1)
D-34	U-236 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(27,2)
D-34	U-236 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(27,3)
D-34				
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(28,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(28,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(28,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
D-5				
D-5	Am-241 , fish	3.000E+01	3.000E+01	BIOFAC(2,1)
D-5	Am-241 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(2,2)
D-5				
D-5	Co-60 , fish	3.000E+02	3.000E+02	BIOFAC(3,1)
D-5	Co-60 , crustacea and mollusks	2.000E+02	2.000E+02	BIOFAC(3,2)
D-5				
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(4,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(4,2)
D-5				
D-5	Eu-152 , fish	5.000E+01	5.000E+01	BIOFAC(5,1)
D-5	Eu-152 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(5,2)
D-5				
D-5	Eu-154 , fish	5.000E+01	5.000E+01	BIOFAC(7,1)
D-5	Eu-154 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(7,2)
D-5				
D-5	Eu-155 , fish	5.000E+01	5.000E+01	BIOFAC(8,1)
D-5	Eu-155 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(8,2)
D-5				
D-5	Gd-152 , fish	2.500E+01	2.500E+01	BIOFAC(9,1)
D-5	Gd-152 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(9,2)
D-5				
D-5	H-3 , fish	1.000E+00	1.000E+00	BIOFAC(10,1)
D-5	H-3 , crustacea and mollusks	1.000E+00	1.000E+00	BIOFAC(10,2)
D-5				
D-5	Np-237+D , fish	3.000E+01	3.000E+01	BIOFAC(11,1)
D-5	Np-237+D , crustacea and mollusks	4.000E+02	4.000E+02	BIOFAC(11,2)

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
D-5	Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(12,1)
D-5	Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(12,2)
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(13,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(13,2)
D-5	Pu-238 , fish	3.000E+01	3.000E+01	BIOFAC(14,1)
D-5	Pu-238 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(14,2)
D-5	Pu-239 , fish	3.000E+01	3.000E+01	BIOFAC(15,1)
D-5	Pu-239 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(15,2)
D-5	Pu-240 , fish	3.000E+01	3.000E+01	BIOFAC(16,1)
D-5	Pu-240 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(16,2)
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(17,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(17,2)
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(18,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(18,2)
D-5	Sr-90+D , fish	6.000E+01	6.000E+01	BIOFAC(19,1)
D-5	Sr-90+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(19,2)
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(20,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(20,2)
D-5	Th-229+D , fish	1.000E+02	1.000E+02	BIOFAC(21,1)
D-5	Th-229+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(21,2)
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(22,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(22,2)
D-5	Th-232 , fish	1.000E+02	1.000E+02	BIOFAC(23,1)
D-5	Th-232 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(23,2)
D-5	U-233 , fish	1.000E+01	1.000E+01	BIOFAC(24,1)
D-5	U-233 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(24,2)
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(25,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(25,2)
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(26,1)
D-5	U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(26,2)
D-5	U-236 , fish	1.000E+01	1.000E+01	BIOFAC(27,1)
D-5	U-236 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(27,2)

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(28,1)
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(28,2)

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)	5.200E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	1.600E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	2.500E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	7.500E+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)	5.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	5.000E+01	1.000E+02	---	T(6)
R011	Times for calculations (yr)	1.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	3.000E+02	1.000E+03	---	T(8)
R011	Times for calculations (yr)	5.000E+02	0.000E+00	---	T(9)
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Am-241	1.000E+00	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Co-60	1.000E+00	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Cs-137	1.000E+00	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Eu-152	1.000E+00	0.000E+00	---	S1(5)
R012	Initial principal radionuclide (pCi/g): Eu-154	1.000E+00	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): Eu-155	1.000E+00	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): H-3	1.000E+00	0.000E+00	---	S1(10)
R012	Initial principal radionuclide (pCi/g): Pu-238	1.000E+00	0.000E+00	---	S1(14)
R012	Initial principal radionuclide (pCi/g): Pu-239	1.000E+00	0.000E+00	---	S1(15)
R012	Initial principal radionuclide (pCi/g): Pu-240	1.000E+00	0.000E+00	---	S1(16)
R012	Initial principal radionuclide (pCi/g): Ra-226	1.000E+00	0.000E+00	---	S1(17)
R012	Initial principal radionuclide (pCi/g): Sr-90	1.000E+00	0.000E+00	---	S1(19)
R012	Initial principal radionuclide (pCi/g): U-234	1.000E+00	0.000E+00	---	S1(25)
R012	Initial principal radionuclide (pCi/g): U-235	1.000E+00	0.000E+00	---	S1(26)
R012	Initial principal radionuclide (pCi/g): U-238	1.000E+00	0.000E+00	---	S1(28)
R012	Concentration in groundwater (pCi/L): Am-241	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Co-60	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): Eu-152	not used	0.000E+00	---	W1(5)
R012	Concentration in groundwater (pCi/L): Eu-154	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): Eu-155	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): H-3	not used	0.000E+00	---	W1(10)
R012	Concentration in groundwater (pCi/L): Pu-238	not used	0.000E+00	---	W1(14)
R012	Concentration in groundwater (pCi/L): Pu-239	not used	0.000E+00	---	W1(15)
R012	Concentration in groundwater (pCi/L): Pu-240	not used	0.000E+00	---	W1(16)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(17)
R012	Concentration in groundwater (pCi/L): Sr-90	not used	0.000E+00	---	W1(19)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(25)
R012	Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	---	W1(26)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(28)
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)	1.660E+00	1.500E+00	---	DENSCZ

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	3.300E-01	4.000E-01	---	TPCZ
R013	Contaminated zone effective porosity	2.400E-01	2.000E-01	---	EPCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	5.000E+03	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	4.900E+00	5.300E+00	---	BCZ
R013	Humidity in air (g/cm**3)	6.600E+00	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	4.600E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.230E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.600E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.660E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	3.300E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.400E-01	2.000E-01	---	EPSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.000E+04	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	4.800E-03	2.000E-02	---	HGWT
R014	Saturated zone b parameter	4.900E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.800E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	4.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.660E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	3.300E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.400E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	5.000E+03	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Am-241				
R016	Contaminated zone (cm**3/g)	1.900E+03	2.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	1.900E+03	2.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	1.900E+03	2.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.331E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Co-60				
R016	Contaminated zone (cm**3/g)	6.000E+01	1.000E+03	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+01	1.000E+03	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	6.000E+01	1.000E+03	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.208E-02	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	2.800E+02	1.000E+03	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	2.800E+02	1.000E+03	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	2.800E+02	1.000E+03	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.030E-03	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for Eu-152				
R016	Contaminated zone (cm**3/g)	5.800E+02	-1.000E+00	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	5.800E+02	-1.000E+00	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	5.800E+02	-1.000E+00	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.360E-03	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for Eu-154				
R016	Contaminated zone (cm**3/g)	5.800E+02	-1.000E+00	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	5.800E+02	-1.000E+00	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	5.800E+02	-1.000E+00	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.360E-03	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for Eu-155				
R016	Contaminated zone (cm**3/g)	5.800E+02	-1.000E+00	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	5.800E+02	-1.000E+00	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	5.800E+02	-1.000E+00	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.360E-03	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for H-3				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(10)
R016	Unsaturated zone 1 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(10,1)
R016	Saturated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCS(10)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.553E+01	ALEACH(10)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(10)
R016	Distribution coefficients for Pu-238				
R016	Contaminated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCC(14)
R016	Unsaturated zone 1 (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCU(14,1)
R016	Saturated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCS(14)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.598E-03	ALEACH(14)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(14)
R016	Distribution coefficients for Pu-239				
R016	Contaminated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCC(15)
R016	Unsaturated zone 1 (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCU(15,1)
R016	Saturated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCS(15)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.598E-03	ALEACH(15)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(15)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Pu-240				
R016	Contaminated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCC(16)
R016	Unsaturated zone 1 (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCU(16,1)
R016	Saturated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCS(16)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.598E-03	ALEACH(16)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(16)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	5.000E+02	7.000E+01	---	DCNUCC(17)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+02	7.000E+01	---	DCNUCU(17,1)
R016	Saturated zone (cm**3/g)	5.000E+02	7.000E+01	---	DCNUCS(17)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.057E-03	ALEACH(17)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(17)
R016	Distribution coefficients for Sr-90				
R016	Contaminated zone (cm**3/g)	3.000E+00	3.000E+01	---	DCNUCC(19)
R016	Unsaturated zone 1 (cm**3/g)	3.000E+00	3.000E+01	---	DCNUCU(19,1)
R016	Saturated zone (cm**3/g)	3.000E+00	3.000E+01	---	DCNUCS(19)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.161E-01	ALEACH(19)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(19)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCC(25)
R016	Unsaturated zone 1 (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCU(25,1)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCS(25)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.479E-01	ALEACH(25)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(25)
R016	Distribution coefficients for U-235				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCC(26)
R016	Unsaturated zone 1 (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCU(26,1)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCS(26)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.479E-01	ALEACH(26)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(26)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCC(28)
R016	Unsaturated zone 1 (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCU(28,1)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCS(28)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.479E-01	ALEACH(28)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(28)
R016	Distribution coefficients for daughter Ac-227				
R016	Contaminated zone (cm**3/g)	4.500E+02	2.000E+01	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	4.500E+02	2.000E+01	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	4.500E+02	2.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.619E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter Gd-152				
R016	Contaminated zone (cm**3/g)	-1.000E+00	-1.000E+00	5.758E+02	DCNUCC(9)
R016	Unsaturated zone 1 (cm**3/g)	-1.000E+00	-1.000E+00	5.758E+02	DCNUCU(9,1)
R016	Saturated zone (cm**3/g)	-1.000E+00	-1.000E+00	5.758E+02	DCNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.392E-03	ALEACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)
R016	Distribution coefficients for daughter Np-237				
R016	Contaminated zone (cm**3/g)	5.000E+00	-1.000E+00	---	DCNUCC(11)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+00	-1.000E+00	---	DCNUCU(11,1)
R016	Saturated zone (cm**3/g)	5.000E+00	-1.000E+00	---	DCNUCS(11)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.960E-01	ALEACH(11)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(11)
R016	Distribution coefficients for daughter Pa-231				
R016	Contaminated zone (cm**3/g)	5.500E+02	5.000E+01	---	DCNUCC(12)
R016	Unsaturated zone 1 (cm**3/g)	5.500E+02	5.000E+01	---	DCNUCU(12,1)
R016	Saturated zone (cm**3/g)	5.500E+02	5.000E+01	---	DCNUCS(12)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.598E-03	ALEACH(12)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(12)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	2.700E+02	1.000E+02	---	DCNUCC(13)
R016	Unsaturated zone 1 (cm**3/g)	2.700E+02	1.000E+02	---	DCNUCU(13,1)
R016	Saturated zone (cm**3/g)	2.700E+02	1.000E+02	---	DCNUCS(13)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.364E-03	ALEACH(13)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(13)
R016	Distribution coefficients for daughter Ra-228				
R016	Contaminated zone (cm**3/g)	5.000E+02	7.000E+01	---	DCNUCC(18)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+02	7.000E+01	---	DCNUCU(18,1)
R016	Saturated zone (cm**3/g)	5.000E+02	7.000E+01	---	DCNUCS(18)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.057E-03	ALEACH(18)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(18)
R016	Distribution coefficients for daughter Th-228				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(20)
R016	Unsaturated zone 1 (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCU(20,1)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(20)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.904E-04	ALEACH(20)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(20)
R016	Distribution coefficients for daughter Th-229				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(21)
R016	Unsaturated zone 1 (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCU(21,1)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(21)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.904E-04	ALEACH(21)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(21)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter Th-230				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(22)
R016	Unsaturated zone 1 (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCU(22,1)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(22)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.904E-04	ALEACH(22)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(22)
R016	Distribution coefficients for daughter Th-232				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(23)
R016	Unsaturated zone 1 (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCU(23,1)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(23)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.904E-04	ALEACH(23)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(23)
R016	Distribution coefficients for daughter U-233				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCC(24)
R016	Unsaturated zone 1 (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCU(24,1)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCS(24)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.479E-01	ALEACH(24)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(24)
R016	Distribution coefficients for daughter U-236				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCC(27)
R016	Unsaturated zone 1 (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCU(27,1)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCS(27)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.479E-01	ALEACH(27)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(27)
R017	Inhalation rate (m**3/yr)	7.300E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	2.000E-04	---	MLINH
R017	Dilution length for airborne dust, inhalation (m)	3.000E+00	3.000E+00	---	LM
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	8.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	5.000E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.500E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	1 shows circular AREA.	FS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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)
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)	1.600E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	1.400E+01	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)	4.380E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	7.000E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	1.000E+00	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	2.000E-01	-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

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	1.000E+00	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	0.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
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	not used	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	not used	2.000E+01	---	STOR_T(4)
STOR	Fish	not used	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	not used	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	not used	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	1.500E-01	1.500E-01	---	FLOOR
R021	Bulk density of building foundation (g/cm**3)	2.400E+00	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	1.000E-01	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	3.000E-02	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	3.000E-07	3.000E-07	---	DIFFL
R021	in contaminated zone soil	2.000E-06	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	2.000E+00	2.000E+00	---	HMIX
R021	Average annual wind speed (m/sec)	6.230E+00	2.000E+00	---	WIND
R021	Average building air exchange rate (1/hr)	5.000E-01	5.000E-01	---	REXG
R021	Height of the building (room) (m)	2.500E+00	2.500E+00	---	HRM
R021	Building interior area factor	0.000E+00	0.000E+00	code computed (time dependent)	FAI
R021	Building depth below ground surface (m)	1.000E+00	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	2.500E-01	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	1.500E-01	1.500E-01	---	EMANA(2)

Summary of Pathway Selections

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

Contaminated Zone Dimensions	
Area:	52000.00 square meters
Thickness:	0.16 meters
Cover Depth:	0.00 meters

Initial Soil Concentrations, pCi/g	
Am-241	1.000E+00
Co-60	1.000E+00
Cs-137	1.000E+00
Eu-152	1.000E+00
Eu-154	1.000E+00
Eu-155	1.000E+00
H-3	1.000E+00
Pu-238	1.000E+00
Pu-239	1.000E+00
Pu-240	1.000E+00
Ra-226	1.000E+00
Sr-90	1.000E+00
U-234	1.000E+00
U-235	1.000E+00
U-238	1.000E+00

Total Dose TDOSE(t), mrem/yr

Basic Radiation Dose Limit = 75 mrem/yr

Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	5.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
TDOSE(t):	2.895E+01	2.649E+01	1.979E+01	1.511E+01	8.684E+00	6.186E+00	3.065E+00	5.296E-04	5.383E-04	5.517E-04
M(t):	3.859E-01	3.532E-01	2.639E-01	2.014E-01	1.158E-01	8.248E-02	4.087E-02	7.061E-06	7.177E-06	7.356E-06

Maximum TDOSE(t): 2.895E+01 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 = 5.000E+01 years

x 0.508 Basement Occ/Shielding Correction Factor

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract
Am-241	2.422E-02	0.0039	9.116E-02	0.0147	0.000E+00	0.0000	1.393E-02	0.0023	0.000E+00	0.0000	0.000E+00	0.0000	7.572E-02	0.012
Co-60	1.377E-03	0.0002	8.856E-09	0.0000	0.000E+00	0.0000	1.550E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.102E-07	0.000
Cs-137	3.670E-01	0.0593	1.521E-06	0.0000	0.000E+00	0.0000	1.706E-03	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	2.416E-04	0.000
Eu-152	2.160E-01	0.0349	3.139E-06	0.0000	0.000E+00	0.0000	4.177E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.324E-06	0.000
Eu-154	6.176E-02	0.0100	1.065E-06	0.0000	0.000E+00	0.0000	1.613E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.604E-06	0.000
Eu-155	8.457E-05	0.0000	7.310E-09	0.0000	0.000E+00	0.0000	1.222E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.737E-08	0.000
H-3	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	0.000E+00	0.000
Pu-238	5.194E-05	0.0000	4.990E-02	0.0081	6.248E-12	0.0000	7.591E-03	0.0012	0.000E+00	0.0000	0.000E+00	0.0000	4.127E-02	0.006
Pu-239	1.405E-04	0.0000	8.094E-02	0.0131	0.000E+00	0.0000	1.245E-02	0.0020	0.000E+00	0.0000	0.000E+00	0.0000	6.767E-02	0.010
Pu-240	7.483E-05	0.0000	8.063E-02	0.0130	6.802E-17	0.0000	1.240E-02	0.0020	0.000E+00	0.0000	0.000E+00	0.0000	6.741E-02	0.010
Ra-226	4.351E+00	0.7034	4.632E-03	0.0007	8.737E-02	0.0141	3.463E-01	0.0560	0.000E+00	0.0000	0.000E+00	0.0000	1.221E-01	0.019
Sr-90	8.292E-21	0.0000	1.798E-22	0.0000	0.000E+00	0.0000	1.126E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.127E-21	0.000
U-234	5.889E-06	0.0000	2.382E-05	0.0000	1.143E-07	0.0000	2.378E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.065E-06	0.000
U-235	3.872E-04	0.0001	1.896E-04	0.0000	0.000E+00	0.0000	6.849E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.420E-05	0.000
U-238	4.535E-05	0.0000	1.723E-05	0.0000	1.880E-12	0.0000	1.786E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.978E-06	0.000
Total	5.022E+00	0.8119	3.075E-01	0.0497	8.737E-02	0.0141	3.944E-01	0.0638	0.000E+00	0.0000	0.000E+00	0.0000	3.745E-01	0.060

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 5.000E+01 years

Water Dependent Pathways

Radio-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract
Am-241	2.436E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.129E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.051E-01	0.033
Co-60	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	1.378E-03	0.000
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	3.689E-01	0.059
Eu-152	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	2.161E-01	0.034
Eu-154	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	6.177E-02	0.010
Eu-155	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	8.462E-05	0.000
H-3	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	0.000E+00	0.000
Pu-238	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	9.881E-02	0.016
Pu-239	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	1.612E-01	0.026
Pu-240	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	1.605E-01	0.025
Ra-226	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	4.911E+00	0.794
Sr-90	7.747E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.409E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.988E-08	0.000
U-234	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	3.727E-05	0.000
U-235	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	7.095E-04	0.000
U-238	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	6.834E-05	0.000
Total	2.444E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.154E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.186E+00	1.000

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Subtracted out annual dose from ground radiation (indoor) for the 3500 hr resident is occupying basement

Parent (i)	Product (j)	Branch Fraction	DSR(j,t) (mrem/yr)/(pCi/g) t= 0.000E+00	1.000E+00	5.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
Am-241	Am-241	1.000E+00	3.150E-01	3.139E-01	3.097E-01	3.045E-01	2.523E-01	2.050E-01	1.054E-01	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237	1.000E+00	0.000E+00	3.950E-07	9.079E-07	9.580E-07	8.339E-07	2.578E-05	2.516E-05	2.678E-06	1.948E-06	8.786E-07
Am-241	U-233	1.000E+00	0.000E+00	3.507E-14	4.024E-13	7.569E-13	9.061E-13	1.829E-11	2.034E-10	4.384E-11	2.662E-11	1.283E-11
Am-241	Th-229	1.000E+00	0.000E+00	3.496E-17	2.493E-15	1.123E-14	6.281E-14	1.188E-13	2.300E-13	3.268E-13	3.278E-13	3.437E-13
Am-241	ΣDSR(j)		3.150E-01	3.139E-01	3.097E-01	3.045E-01	2.523E-01	2.051E-01	1.055E-01	2.678E-06	1.948E-06	8.786E-07
								− 1.192E-02 / 1.93E-01				
Co-60	Co-60	1.000E+00	9.191E+00	7.713E+00	3.826E+00	1.591E+00	4.724E-02	1.378E-03	1.737E-07	0.000E+00	4.671E-32	0.000E+00
								−6.975E-04 / 7.00E-04				
Cs-137	Cs-137	1.000E+00	2.034E+00	1.968E+00	1.721E+00	1.456E+00	7.385E-01	3.689E-01	5.664E-02	0.000E+00	0.000E+00	0.000E+00
								−1.806E-01 / 1.985E-01				
Eu-152	Eu-152	7.208E-01	2.921E+00	2.757E+00	2.188E+00	1.637E+00	5.090E-01	1.557E-01	7.022E-03	0.000E+00	0.000E+00	0.000E+00
								−1.063E-01 / 4.94E-02				
Eu-152	Eu-152	2.792E-01	1.132E+00	1.068E+00	8.473E-01	6.341E-01	1.972E-01	6.032E-02	2.720E-03	0.000E+00	0.000E+00	0.000E+00
Eu-152	Gd-152	2.792E-01	0.000E+00	1.507E-16	6.680E-16	1.156E-15	1.788E-15	1.624E-15	7.643E-16	0.000E+00	0.000E+00	0.000E+00
Eu-152	ΣDSR(j)		1.132E+00	1.068E+00	8.473E-01	6.341E-01	1.972E-01	6.032E-02	2.720E-03	0.000E+00	0.000E+00	0.000E+00
Eu-154	Eu-154	1.000E+00	4.421E+00	4.062E+00	2.895E+00	1.895E+00	3.449E-01	6.177E-02	7.329E-04	0.000E+00	0.000E+00	0.000E+00
								−3.039E-02 / 3.138E-02				
Eu-155	Eu-155	1.000E+00	1.160E-01	1.004E-01	5.637E-02	2.739E-02	1.527E-03	8.462E-05	5.652E-08	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	3.816E-03	2.643E-03	1.093E-43	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pu-238	Pu-238	1.000E+00	2.529E-01	2.496E-01	2.370E-01	2.221E-01	1.499E-01	9.881E-02	2.886E-02	0.000E+00	0.000E+00	0.000E+00
Pu-238	U-234	1.000E+00	0.000E+00	1.488E-07	5.483E-07	7.749E-07	6.933E-07	4.648E-07	1.364E-07	2.736E-06	4.476E-07	8.605E-09
Pu-238	Th-230	1.000E+00	0.000E+00	1.556E-12	3.163E-11	1.004E-10	3.791E-10	5.282E-10	4.671E-10	1.183E-10	1.384E-10	1.427E-10
Pu-238	Ra-226	1.000E+00	0.000E+00	1.232E-14	1.305E-12	8.611E-12	1.213E-10	3.314E-10	8.333E-10	3.765E-10	7.135E-10	1.057E-09
Pu-238	Pb-210	1.000E+00	0.000E+00	1.306E-17	5.393E-15	6.756E-14	2.384E-12	8.895E-12	2.575E-11	3.283E-09	6.227E-09	9.240E-09
Pu-238	ΣDSR(j)		2.529E-01	2.496E-01	2.370E-01	2.221E-01	1.499E-01	9.881E-02	2.886E-02	2.740E-06	4.547E-07	1.904E-08
Pu-239	Pu-239	1.000E+00	2.783E-01	2.769E-01	2.713E-01	2.644E-01	2.089E-01	1.612E-01	6.980E-02	0.000E+00	0.000E+00	0.000E+00
Pu-239	U-235	1.000E+00	0.000E+00	4.809E-10	1.805E-09	2.617E-09	3.002E-09	2.664E-09	1.707E-09	2.670E-09	2.181E-09	2.150E-09
Pu-239	Pa-231	1.000E+00	0.000E+00	1.530E-14	3.089E-13	9.746E-13	3.834E-12	5.570E-12	5.448E-12	1.691E-11	2.834E-11	5.580E-11
Pu-239	Ac-227	1.000E+00	0.000E+00	4.453E-16	4.523E-14	2.890E-13	3.308E-12	7.391E-12	1.181E-11	2.663E-11	4.788E-11	9.417E-11
Pu-239	ΣDSR(j)		2.783E-01	2.769E-01	2.713E-01	2.644E-01	2.089E-01	1.612E-01	6.980E-02	2.714E-09	2.258E-09	2.300E-09
Pu-240	Pu-240	1.000E+00	2.782E-01	2.768E-01	2.711E-01	2.642E-01	2.084E-01	1.605E-01	6.923E-02	0.000E+00	0.000E+00	0.000E+00
Pu-240	U-236	1.000E+00	0.000E+00	1.476E-09	5.535E-09	8.028E-09	8.209E-09	6.408E-09	2.772E-09	7.999E-08	6.432E-08	6.101E-08
Pu-240	Th-232	1.000E+00	0.000E+00	4.437E-19	9.159E-18	2.952E-17	1.190E-16	1.772E-16	1.828E-16	5.292E-17	8.824E-17	1.697E-16
Pu-240	Ra-228	1.000E+00	0.000E+00	1.064E-19	1.009E-17	5.834E-17	5.225E-16	1.028E-15	1.610E-15	1.759E-16	2.964E-16	5.706E-16
Pu-240	Th-228	1.000E+00	0.000E+00	1.423E-20	5.464E-18	5.023E-17	6.988E-16	1.497E-15	2.473E-15	1.030E-16	1.066E-16	1.155E-16
Pu-240	ΣDSR(j)		2.782E-01	2.768E-01	2.711E-01	2.642E-01	2.084E-01	1.605E-01	6.923E-02	7.999E-08	6.432E-08	6.101E-08
Ra-226	Ra-226	1.000E+00	6.981E+00	6.930E+00	6.728E+00	6.480E+00	5.525E+00	4.634E+00	2.589E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	Pb-210	1.000E+00	0.000E+00	2.318E-02	9.721E-02	1.689E-01	2.874E-01	2.771E-01	1.354E-01	0.000E+00	0.000E+00	0.000E+00
Ra-226	ΣDSR(j)		6.981E+00	6.954E+00	6.826E+00	6.649E+00	5.813E+00	4.911E+00	2.725E+00	0.000E+00	0.000E+00	0.000E+00
								−2.141 / 2.770				

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Branch Fraction	DSR(j,t) (mrem/yr)/(pCi/g) t= 0.000E+00	1.000E+00	5.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
Sr-90	Sr-90	1.000E+00	3.046E-01	1.307E-01	4.436E-03	6.453E-05	2.046E-01	7.988E-08	3.749E-26	0.000E+00	0.000E+00	0.000E+00
U-234	U-234	1.000E+00	5.680E-02	4.897E-02	2.705E-02	1.288E-02	5.797E-04	2.548E-05	8.566E-09	1.757E-09	0.000E+00	0.000E+00
U-234	Th-230	1.000E+00	0.000E+00	1.073E-06	4.060E-06	5.976E-06	6.541E-06	5.517E-06	2.908E-06	7.112E-07	7.100E-07	7.068E-07
U-234	Ra-226	1.000E+00	0.000E+00	1.292E-08	2.644E-07	8.429E-07	3.704E-06	6.060E-06	8.276E-06	7.336E-07	1.714E-06	3.805E-06
U-234	Pb-210	1.000E+00	0.000E+00	1.710E-11	1.446E-09	8.870E-09	9.693E-08	2.091E-07	3.015E-07	6.400E-06	1.497E-05	3.328E-05
U-234	ΣDSR(j)		5.680E-02	4.897E-02	2.705E-02	1.288E-02	5.900E-04	3.727E-05	1.149E-05	7.846E-06	1.739E-05	3.780E-05
U-235	U-235	1.000E+00	5.267E-01	4.541E-01	2.507E-01	1.193E-01	6.016E-03	3.001E-04	1.486E-07	1.659E-09	0.000E+00	0.000E+00
U-235	Pa-231	1.000E+00	0.000E+00	3.022E-05	1.121E-04	1.607E-04	1.661E-04	1.314E-04	5.948E-05	1.929E-04	1.920E-04	1.900E-04
U-235	Ac-227	1.000E+00	0.000E+00	1.327E-06	2.564E-05	7.690E-05	2.393E-04	2.780E-04	1.782E-04	3.233E-04	3.264E-04	3.229E-04
U-235	ΣDSR(j)		5.267E-01	4.541E-01	2.509E-01	1.195E-01	6.422E-03	7.095E-04	2.378E-04	5.162E-04	5.184E-04	5.129E-04
U-238	U-238	1.000E+00	1.326E-01	1.142E-01	6.297E-02	2.991E-02	1.440E-03	6.834E-05	2.950E-08	1.672E-09	0.000E+00	0.000E+00
U-238	U-234	1.000E+00	0.000E+00	1.392E-07	3.836E-07	3.652E-07	4.931E-08	3.612E-09	2.429E-12	1.495E-12	0.000E+00	0.000E+00
U-238	Th-230	1.000E+00	0.000E+00	1.487E-12	2.529E-11	6.466E-11	1.192E-10	1.058E-10	5.604E-11	3.079E-10	3.003E-10	3.974E-10
U-238	Ra-226	1.000E+00	0.000E+00	1.191E-14	1.106E-12	6.244E-12	5.242E-11	9.973E-11	1.499E-10	2.336E-09	2.348E-09	3.334E-09
U-238	Pb-210	1.000E+00	0.000E+00	1.269E-17	4.714E-15	5.205E-14	1.187E-12	3.164E-12	5.319E-12	2.012E-08	2.023E-08	2.886E-08
U-238	ΣDSR(j)		1.326E-01	1.142E-01	6.297E-02	2.991E-02	1.440E-03	6.834E-05	2.971E-08	2.444E-08	2.288E-08	3.259E-08

Branch Fraction is the cumulative factor for the j'th principal radionuclide daughter: CUMBRF(j) = BRF(1)*BRF(2)* ... BRF(j).
The DSR includes contributions from associated (half-life ≤ 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 75 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	5.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
Am-241	2.381E+02	2.389E+02	2.422E+02	2.463E+02	2.973E+02	3.657E+02	7.112E+02	2.801E+07	3.851E+07	8.537E+07
Co-60	8.160E+00	9.723E+00	1.960E+01	4.713E+01	1.588E+03	5.441E+04	4.317E+08	*1.131E+15	*1.131E+15	*1.131E+15
Cs-137	3.687E+01	3.812E+01	4.357E+01	5.153E+01	1.016E+02	2.033E+02	1.324E+03	*8.701E+13	*8.701E+13	*8.701E+13
Eu-152	1.850E+01	1.961E+01	2.471E+01	3.303E+01	1.062E+02	3.471E+02	7.698E+03	*1.765E+14	*1.765E+14	*1.765E+14
Eu-154	1.696E+01	1.846E+01	2.590E+01	3.958E+01	2.175E+02	1.214E+03	1.023E+05	*2.639E+14	*2.639E+14	*2.639E+14
Eu-155	6.467E+02	7.470E+02	1.330E+03	2.738E+03	4.911E+04	8.863E+05	1.327E+09	*4.651E+14	*4.651E+14	*4.651E+14
H-3	1.965E+04	2.838E+04	*9.594E+15	*9.594E+15	*9.594E+15	*9.594E+15	*9.594E+15	*9.594E+15	*9.594E+15	*9.594E+15
Pu-238	2.966E+02	3.004E+02	3.165E+02	3.377E+02	5.003E+02	7.591E+02	2.599E+03	2.738E+07	1.649E+08	3.938E+09
Pu-239	2.695E+02	2.708E+02	2.764E+02	2.836E+02	3.589E+02	4.653E+02	1.074E+03	2.764E+10	3.322E+10	3.260E+10
Pu-240	2.695E+02	2.709E+02	2.766E+02	2.839E+02	3.599E+02	4.673E+02	1.083E+03	9.377E+08	1.166E+09	1.229E+09
Ra-226	1.074E+01	1.079E+01	1.099E+01	1.128E+01	1.290E+01	1.527E+01	2.753E+01	*9.882E+11	*9.882E+11	*9.882E+11
Sr-90	2.462E+02	5.737E+02	1.691E+04	1.162E+06	3.666E+02	9.389E+08	*1.365E+14	*1.365E+14	*1.365E+14	*1.365E+14
U-234	1.320E+03	1.532E+03	2.773E+03	5.821E+03	1.271E+05	2.012E+06	6.525E+06	9.559E+06	4.313E+06	1.984E+06
U-235	1.424E+02	1.652E+02	2.990E+02	6.274E+02	1.168E+04	1.057E+05	3.154E+05	1.453E+05	1.447E+05	1.462E+05
U-238	5.658E+02	6.566E+02	1.191E+03	2.508E+03	5.207E+04	*3.360E+05	*3.360E+05	*3.360E+05	*3.360E+05	*3.360E+05

*At specific activity limit

Attachment B
Calculation Package for Residual Radioactive Material in the Soil Buried under 3' of Clean Cover

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Dose Conversion Factor (and Related) Parameter Summary
File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.720E+00	6.720E+00	DCF2(1)
B-1	Am-241	4.440E-01	4.440E-01	DCF2(2)
B-1	Co-60	2.190E-04	2.190E-04	DCF2(3)
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(4)
B-1	Eu-152	2.210E-04	2.210E-04	DCF2(5)
B-1	Eu-154	2.860E-04	2.860E-04	DCF2(7)
B-1	Eu-155	4.140E-05	4.140E-05	DCF2(8)
B-1	Gd-152	2.430E-01	2.430E-01	DCF2(9)
B-1	H-3	6.400E-08	6.400E-08	DCF2(10)
B-1	Np-237+D	5.400E-01	5.400E-01	DCF2(11)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(12)
B-1	Pb-210+D	2.320E-02	2.320E-02	DCF2(13)
B-1	Pu-238	3.920E-01	3.920E-01	DCF2(14)
B-1	Pu-239	4.290E-01	4.290E-01	DCF2(15)
B-1	Pu-240	4.290E-01	4.290E-01	DCF2(16)
B-1	Ra-226+D	8.600E-03	8.600E-03	DCF2(17)
B-1	Ra-228+D	5.080E-03	5.080E-03	DCF2(18)
B-1	Sr-90+D	1.310E-03	1.310E-03	DCF2(19)
B-1	Th-228+D	3.450E-01	3.450E-01	DCF2(20)
B-1	Th-229+D	2.160E+00	2.160E+00	DCF2(21)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(22)
B-1	Th-232	1.640E+00	1.640E+00	DCF2(23)
B-1	U-233	1.350E-01	1.350E-01	DCF2(24)
B-1	U-234	1.320E-01	1.320E-01	DCF2(25)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(26)
B-1	U-236	1.250E-01	1.250E-01	DCF2(27)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(28)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.480E-02	DCF3(1)
D-1	Am-241	3.640E-03	3.640E-03	DCF3(2)
D-1	Co-60	2.690E-05	2.690E-05	DCF3(3)
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(4)
D-1	Eu-152	6.480E-06	6.480E-06	DCF3(5)
D-1	Eu-154	9.550E-06	9.550E-06	DCF3(7)
D-1	Eu-155	1.530E-06	1.530E-06	DCF3(8)
D-1	Gd-152	1.610E-04	1.610E-04	DCF3(9)
D-1	H-3	6.400E-08	6.400E-08	DCF3(10)
D-1	Np-237+D	4.440E-03	4.440E-03	DCF3(11)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(12)
D-1	Pb-210+D	7.270E-03	7.270E-03	DCF3(13)
D-1	Pu-238	3.200E-03	3.200E-03	DCF3(14)
D-1	Pu-239	3.540E-03	3.540E-03	DCF3(15)
D-1	Pu-240	3.540E-03	3.540E-03	DCF3(16)
D-1	Ra-226+D	1.330E-03	1.330E-03	DCF3(17)
D-1	Ra-228+D	1.440E-03	1.440E-03	DCF3(18)
D-1	Sr-90+D	1.530E-04	1.530E-04	DCF3(19)
D-1	Th-228+D	8.080E-04	8.080E-04	DCF3(20)
D-1	Th-229+D	4.030E-03	4.030E-03	DCF3(21)

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: DOSFAC.BIN

Menu	Parameter	Current Value	Default	Parameter Name
D-1	Th-230	5.480E-04	5.480E-04	DCF3(22)
D-1	Th-232	2.730E-03	2.730E-03	DCF3(23)
D-1	U-233	2.890E-04	2.890E-04	DCF3(24)
D-1	U-234	2.830E-04	2.830E-04	DCF3(25)
D-1	U-235+D	2.670E-04	2.670E-04	DCF3(26)
D-1	U-236	2.690E-04	2.690E-04	DCF3(27)
D-1	U-238+D	2.690E-04	2.690E-04	DCF3(28)
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
D-34	Am-241 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(2,1)
D-34	Am-241 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-05	5.000E-05	RTF(2,2)
D-34	Am-241 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-06	2.000E-06	RTF(2,3)
D-34	Co-60 , plant/soil concentration ratio, dimensionless	8.000E-02	8.000E-02	RTF(3,1)
D-34	Co-60 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-02	2.000E-02	RTF(3,2)
D-34	Co-60 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(3,3)
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(4,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(4,3)
D-34	Eu-152 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(5,1)
D-34	Eu-152 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(5,2)
D-34	Eu-152 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(5,3)
D-34	Eu-154 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(7,1)
D-34	Eu-154 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(7,2)
D-34	Eu-154 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(7,3)
D-34	Eu-155 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(8,1)
D-34	Eu-155 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(8,2)
D-34	Eu-155 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(8,3)
D-34	Gd-152 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(9,1)
D-34	Gd-152 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(9,2)
D-34	Gd-152 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(9,3)
D-34	H-3 , plant/soil concentration ratio, dimensionless	4.800E+00	4.800E+00	RTF(10,1)
D-34	H-3 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.200E-02	1.200E-02	RTF(10,2)
D-34	H-3 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-02	1.000E-02	RTF(10,3)
D-34	Np-237+D , plant/soil concentration ratio, dimensionless	2.000E-02	2.000E-02	RTF(11,1)
D-34	Np-237+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(11,2)
D-34	Np-237+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(11,3)

Dose Conversion Factor (and Related) Parameter Summary (continued)
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Menu	Parameter	Current Value	Default	Parameter Name
D-34	Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(12,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(12,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(12,3)
D-34				
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(13,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(13,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(13,3)
D-34				
D-34	Pu-238 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(14,1)
D-34	Pu-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(14,2)
D-34	Pu-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(14,3)
D-34				
D-34	Pu-239 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(15,1)
D-34	Pu-239 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(15,2)
D-34	Pu-239 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(15,3)
D-34				
D-34	Pu-240 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(16,1)
D-34	Pu-240 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(16,2)
D-34	Pu-240 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF(16,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(17,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(17,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(17,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(18,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(18,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(18,3)
D-34				
D-34	Sr-90+D , plant/soil concentration ratio, dimensionless	3.000E-01	3.000E-01	RTF(19,1)
D-34	Sr-90+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-03	8.000E-03	RTF(19,2)
D-34	Sr-90+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(19,3)
D-34				
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(20,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(20,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(20,3)
D-34				
D-34	Th-229+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(21,1)
D-34	Th-229+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(21,2)
D-34	Th-229+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(21,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(22,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(22,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(22,3)
D-34				
D-34	Th-232 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(23,1)
D-34	Th-232 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(23,2)
D-34	Th-232 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(23,3)
D-34				

Dose Conversion Factor (and Related) Parameter Summary (continued)
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Menu	Parameter	Current Value	Default	Parameter Name
D-34	U-233 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(24,1)
D-34	U-233 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(24,2)
D-34	U-233 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(24,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(25,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(25,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(25,3)
D-34				
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(26,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(26,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(26,3)
D-34				
D-34	U-236 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(27,1)
D-34	U-236 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(27,2)
D-34	U-236 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(27,3)
D-34				
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(28,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(28,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(28,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
D-5				
D-5	Am-241 , fish	3.000E+01	3.000E+01	BIOFAC(2,1)
D-5	Am-241 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(2,2)
D-5				
D-5	Co-60 , fish	3.000E+02	3.000E+02	BIOFAC(3,1)
D-5	Co-60 , crustacea and mollusks	2.000E+02	2.000E+02	BIOFAC(3,2)
D-5				
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(4,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(4,2)
D-5				
D-5	Eu-152 , fish	5.000E+01	5.000E+01	BIOFAC(5,1)
D-5	Eu-152 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(5,2)
D-5				
D-5	Eu-154 , fish	5.000E+01	5.000E+01	BIOFAC(7,1)
D-5	Eu-154 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(7,2)
D-5				
D-5	Eu-155 , fish	5.000E+01	5.000E+01	BIOFAC(8,1)
D-5	Eu-155 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(8,2)
D-5				
D-5	Gd-152 , fish	2.500E+01	2.500E+01	BIOFAC(9,1)
D-5	Gd-152 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(9,2)
D-5				
D-5	H-3 , fish	1.000E+00	1.000E+00	BIOFAC(10,1)
D-5	H-3 , crustacea and mollusks	1.000E+00	1.000E+00	BIOFAC(10,2)
D-5				
D-5	Np-237+D , fish	3.000E+01	3.000E+01	BIOFAC(11,1)
D-5	Np-237+D , crustacea and mollusks	4.000E+02	4.000E+02	BIOFAC(11,2)

Dose Conversion Factor (and Related) Parameter Summary (continued)
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Menu	Parameter	Current Value	Default	Parameter Name
D-5	Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(12,1)
D-5	Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(12,2)
D-5				
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(13,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(13,2)
D-5				
D-5	Pu-238 , fish	3.000E+01	3.000E+01	BIOFAC(14,1)
D-5	Pu-238 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(14,2)
D-5				
D-5	Pu-239 , fish	3.000E+01	3.000E+01	BIOFAC(15,1)
D-5	Pu-239 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(15,2)
D-5				
D-5	Pu-240 , fish	3.000E+01	3.000E+01	BIOFAC(16,1)
D-5	Pu-240 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(16,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(17,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(17,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(18,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(18,2)
D-5				
D-5	Sr-90+D , fish	6.000E+01	6.000E+01	BIOFAC(19,1)
D-5	Sr-90+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(19,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(20,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(20,2)
D-5				
D-5	Th-229+D , fish	1.000E+02	1.000E+02	BIOFAC(21,1)
D-5	Th-229+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(21,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(22,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(22,2)
D-5				
D-5	Th-232 , fish	1.000E+02	1.000E+02	BIOFAC(23,1)
D-5	Th-232 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(23,2)
D-5				
D-5	U-233 , fish	1.000E+01	1.000E+01	BIOFAC(24,1)
D-5	U-233 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(24,2)
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(25,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(25,2)
D-5				
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(26,1)
D-5	U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(26,2)
D-5				
D-5	U-236 , fish	1.000E+01	1.000E+01	BIOFAC(27,1)
D-5	U-236 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(27,2)
D-5				

Dose Conversion Factor (and Related) Parameter Summary (continued)
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Menu	Parameter	Current Value	Default	Parameter Name
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(28,1)
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(28,2)

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)	5.200E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	4.000E+00	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	2.500E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	7.500E+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)	5.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	5.000E+01	1.000E+02	---	T(6)
R011	Times for calculations (yr)	1.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	3.000E+02	1.000E+03	---	T(8)
R011	Times for calculations (yr)	5.000E+02	0.000E+00	---	T(9)
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Am-241	1.000E+00	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Co-60	1.000E+00	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Cs-137	1.000E+00	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Eu-152	1.000E+00	0.000E+00	---	S1(5)
R012	Initial principal radionuclide (pCi/g): Eu-154	1.000E+00	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): Eu-155	1.000E+00	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): H-3	1.000E+00	0.000E+00	---	S1(10)
R012	Initial principal radionuclide (pCi/g): Pu-238	1.000E+00	0.000E+00	---	S1(14)
R012	Initial principal radionuclide (pCi/g): Pu-239	1.000E+00	0.000E+00	---	S1(15)
R012	Initial principal radionuclide (pCi/g): Pu-240	1.000E+00	0.000E+00	---	S1(16)
R012	Initial principal radionuclide (pCi/g): Ra-226	1.000E+00	0.000E+00	---	S1(17)
R012	Initial principal radionuclide (pCi/g): Sr-90	1.000E+00	0.000E+00	---	S1(19)
R012	Initial principal radionuclide (pCi/g): U-234	1.000E+00	0.000E+00	---	S1(25)
R012	Initial principal radionuclide (pCi/g): U-235	1.000E+00	0.000E+00	---	S1(26)
R012	Initial principal radionuclide (pCi/g): U-238	1.000E+00	0.000E+00	---	S1(28)
R012	Concentration in groundwater (pCi/L): Am-241	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Co-60	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): Eu-152	not used	0.000E+00	---	W1(5)
R012	Concentration in groundwater (pCi/L): Eu-154	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): Eu-155	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): H-3	not used	0.000E+00	---	W1(10)
R012	Concentration in groundwater (pCi/L): Pu-238	not used	0.000E+00	---	W1(14)
R012	Concentration in groundwater (pCi/L): Pu-239	not used	0.000E+00	---	W1(15)
R012	Concentration in groundwater (pCi/L): Pu-240	not used	0.000E+00	---	W1(16)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(17)
R012	Concentration in groundwater (pCi/L): Sr-90	not used	0.000E+00	---	W1(19)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(25)
R012	Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	---	W1(26)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(28)
R013	Cover depth (m)	1.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	1.660E+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)	1.660E+00	1.500E+00	---	DENSCZ

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	3.300E-01	4.000E-01	---	TPCZ
R013	Contaminated zone effective porosity	2.400E-01	2.000E-01	---	EPCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	5.000E+03	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	4.900E+00	5.300E+00	---	BCZ
R013	Humidity in air (g/cm**3)	6.600E+00	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	4.600E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.230E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.600E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.660E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	3.300E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.400E-01	2.000E-01	---	EPSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.000E+04	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	4.800E-03	2.000E-02	---	HGWT
R014	Saturated zone b parameter	4.900E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.800E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	0	1	---	NS
R016	Distribution coefficients for Am-241				
R016	Contaminated zone (cm**3/g)	1.900E+03	2.000E+01	---	DCNUCC(2)
R016	Saturated zone (cm**3/g)	1.900E+03	2.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.326E-05	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Co-60				
R016	Contaminated zone (cm**3/g)	6.000E+01	1.000E+03	---	DCNUCC(3)
R016	Saturated zone (cm**3/g)	6.000E+01	1.000E+03	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.683E-03	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	2.800E+02	1.000E+03	---	DCNUCC(4)
R016	Saturated zone (cm**3/g)	2.800E+02	1.000E+03	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.612E-04	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for Eu-152				
R016	Contaminated zone (cm**3/g)	5.800E+02	-1.000E+00	---	DCNUCC(5)
R016	Saturated zone (cm**3/g)	5.800E+02	-1.000E+00	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.744E-04	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Eu-154				
R016	Contaminated zone (cm**3/g)	5.800E+02	-1.000E+00	---	DCNUCC(7)
R016	Saturated zone (cm**3/g)	5.800E+02	-1.000E+00	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.744E-04	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for Eu-155				
R016	Contaminated zone (cm**3/g)	5.800E+02	-1.000E+00	---	DCNUCC(8)
R016	Saturated zone (cm**3/g)	5.800E+02	-1.000E+00	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.744E-04	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for H-3				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(10)
R016	Saturated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCS(10)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.021E+00	ALEACH(10)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(10)
R016	Distribution coefficients for Pu-238				
R016	Contaminated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCC(14)
R016	Saturated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCS(14)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.839E-04	ALEACH(14)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(14)
R016	Distribution coefficients for Pu-239				
R016	Contaminated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCC(15)
R016	Saturated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCS(15)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.839E-04	ALEACH(15)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(15)
R016	Distribution coefficients for Pu-240				
R016	Contaminated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCC(16)
R016	Saturated zone (cm**3/g)	5.500E+02	2.000E+03	---	DCNUCS(16)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.839E-04	ALEACH(16)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(16)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	5.000E+02	7.000E+01	---	DCNUCC(17)
R016	Saturated zone (cm**3/g)	5.000E+02	7.000E+01	---	DCNUCS(17)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.023E-04	ALEACH(17)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(17)
R016	Distribution coefficients for Sr-90				
R016	Contaminated zone (cm**3/g)	3.000E+00	3.000E+01	---	DCNUCC(19)
R016	Saturated zone (cm**3/g)	3.000E+00	3.000E+01	---	DCNUCS(19)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.264E-02	ALEACH(19)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(19)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCC(25)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCS(25)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.917E-03	ALEACH(25)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(25)
R016	Distribution coefficients for U-235				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCC(26)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCS(26)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.917E-03	ALEACH(26)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(26)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCC(28)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCS(28)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.917E-03	ALEACH(28)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(28)
R016	Distribution coefficients for daughter Ac-227				
R016	Contaminated zone (cm**3/g)	4.500E+02	2.000E+01	---	DCNUCC(1)
R016	Saturated zone (cm**3/g)	4.500E+02	2.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.248E-04	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for daughter Gd-152				
R016	Contaminated zone (cm**3/g)	-1.000E+00	-1.000E+00	5.758E+02	DCNUCC(9)
R016	Saturated zone (cm**3/g)	-1.000E+00	-1.000E+00	5.758E+02	DCNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.757E-04	ALEACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)
R016	Distribution coefficients for daughter Np-237				
R016	Contaminated zone (cm**3/g)	5.000E+00	-1.000E+00	---	DCNUCC(11)
R016	Saturated zone (cm**3/g)	5.000E+00	-1.000E+00	---	DCNUCS(11)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.984E-02	ALEACH(11)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(11)
R016	Distribution coefficients for daughter Pa-231				
R016	Contaminated zone (cm**3/g)	5.500E+02	5.000E+01	---	DCNUCC(12)
R016	Saturated zone (cm**3/g)	5.500E+02	5.000E+01	---	DCNUCS(12)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.839E-04	ALEACH(12)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(12)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	2.700E+02	1.000E+02	---	DCNUCC(13)
R016	Saturated zone (cm**3/g)	2.700E+02	1.000E+02	---	DCNUCS(13)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.746E-04	ALEACH(13)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(13)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter Ra-228				
R016	Contaminated zone (cm**3/g)	5.000E+02	7.000E+01	---	DCNUCC(18)
R016	Saturated zone (cm**3/g)	5.000E+02	7.000E+01	---	DCNUCS(18)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.023E-04	ALEACH(18)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(18)
R016	Distribution coefficients for daughter Th-228				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(20)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(20)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.161E-05	ALEACH(20)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(20)
R016	Distribution coefficients for daughter Th-229				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(21)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(21)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.161E-05	ALEACH(21)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(21)
R016	Distribution coefficients for daughter Th-230				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(22)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(22)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.161E-05	ALEACH(22)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(22)
R016	Distribution coefficients for daughter Th-232				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(23)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(23)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.161E-05	ALEACH(23)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(23)
R016	Distribution coefficients for daughter U-233				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCC(24)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCS(24)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.917E-03	ALEACH(24)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(24)
R016	Distribution coefficients for daughter U-236				
R016	Contaminated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCC(27)
R016	Saturated zone (cm**3/g)	1.700E+01	5.000E+01	---	DCNUCS(27)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.917E-03	ALEACH(27)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(27)
R017	Inhalation rate (m**3/yr)	7.300E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	2.000E-04	---	MLINH
R017	Dilution length for airborne dust, inhalation (m)	3.000E+00	3.000E+00	---	LM
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	8.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	5.000E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.500E-01	2.500E-01	---	FOTD

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	1 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)
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)	1.600E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	1.400E+01	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)	4.380E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	7.000E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	1.000E+00	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	2.000E-01	-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

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	1.000E+00	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	0.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
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	not used	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	not used	2.000E+01	---	STOR_T(4)
STOR	Fish	not used	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	not used	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	not used	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	1.500E-01	1.500E-01	---	FLOOR
R021	Bulk density of building foundation (g/cm**3)	2.400E+00	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	4.000E-01	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	1.000E-01	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	5.000E-02	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	3.000E-02	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	2.000E-06	2.000E-06	---	DIFCV
R021	in foundation material	3.000E-07	3.000E-07	---	DIFFL
R021	in contaminated zone soil	2.000E-06	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	2.000E+00	2.000E+00	---	HMIX
R021	Average annual wind speed (m/sec)	6.230E+00	2.000E+00	---	WIND
R021	Average building air exchange rate (1/hr)	5.000E-01	5.000E-01	---	REXG
R021	Height of the building (room) (m)	2.500E+00	2.500E+00	---	HRM
R021	Building interior area factor	0.000E+00	0.000E+00	code computed (time dependent)	FAI
R021	Building depth below ground surface (m)	1.000E+00	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	2.500E-01	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	1.500E-01	1.500E-01	---	EMANA(2)

Summary of Pathway Selections

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

Contaminated Zone Dimensions	
Area:	52000.00 square meters
Thickness:	4.00 meters
Cover Depth:	1.00 meters

Initial Soil Concentrations, pCi/g	
Am-241	1.000E+00
Co-60	1.000E+00
Cs-137	1.000E+00
Eu-152	1.000E+00
Eu-154	1.000E+00
Eu-155	1.000E+00
H-3	1.000E+00
Pu-238	1.000E+00
Pu-239	1.000E+00
Pu-240	1.000E+00
Ra-226	1.000E+00
Sr-90	1.000E+00
U-234	1.000E+00
U-235	1.000E+00
U-238	1.000E+00

Total Dose TDOSE(t), mrem/yr

Basic Radiation Dose Limit = 75 mrem/yr

Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	5.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
TDOSE(t):	7.098E+01	7.137E+01	7.260E+01	7.370E+01	7.290E+01	7.303E+01	7.157E+01	6.742E+01	6.400E+01	5.994E+01
M(t):	9.464E-01	9.516E-01	9.680E-01	9.827E-01	9.719E-01	9.737E-01	9.543E-01	8.990E-01	8.533E-01	7.992E-01

Maximum TDOSE(t): 7.373E+01 mrem/yr at t = 10.11 ± 0.01 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 = 10.11 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.
Am-241	3.249E-15	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	0.000E+00	0.0000
Co-60	6.539E-06	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	0.000E+00	0.0000
Cs-137	2.695E-07	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	0.000E+00	0.0000
Eu-152	2.477E-06	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	0.000E+00	0.0000
Eu-154	2.826E-06	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	0.000E+00	0.0000
Eu-155	5.768E-16	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	0.000E+00	0.0000
H-3	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	0.000E+00	0.0000
Pu-238	1.506E-17	0.0000	0.000E+00	0.0000	1.308E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pu-239	3.554E-14	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	0.000E+00	0.0000
Pu-240	8.236E-21	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	0.000E+00	0.0000
Ra-226	8.002E-06	0.0000	0.000E+00	0.0000	7.081E+01	0.9605	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	2.238E-11	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	0.000E+00	0.0000
U-234	1.570E-12	0.0000	0.000E+00	0.0000	1.389E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	6.136E-11	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	0.000E+00	0.0000
U-238	1.992E-08	0.0000	0.000E+00	0.0000	1.315E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	2.013E-05	0.0000	0.000E+00	0.0000	7.081E+01	0.9605	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Branch Fraction	DSR(j,t) (mrem/yr)/(pCi/g) t= 0.000E+00	1.000E+00	5.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
Am-241	Am-241	1.000E+00	6.464E-25	6.798E-25	8.313E-25	1.069E-24	2.923E-24	7.995E-24	9.887E-23	1.712E-02	2.458E-02	7.993E-02
Am-241	Np-237	1.000E+00	0.000E+00	5.905E-07	1.382E-05	5.342E-05	3.378E-04	5.362E-04	7.587E-04	6.737E-04	4.976E-04	2.336E-04
Am-241	U-233	1.000E+00	0.000E+00	2.379E-14	2.701E-12	2.093E-11	4.512E-10	1.349E-09	4.089E-09	1.010E-08	1.018E-08	5.849E-09
Am-241	Th-229	1.000E+00	0.000E+00	1.152E-16	1.087E-15	2.091E-15	3.637E-14	1.719E-13	9.937E-13	1.591E-11	4.274E-11	9.682E-10
Am-241	ΣDSR(j)		6.464E-25	5.905E-07	1.382E-05	5.342E-05	3.378E-04	5.362E-04	7.587E-04	1.780E-02	2.508E-02	8.017E-02
Co-60	Co-60	1.000E+00	2.204E-05	1.490E-04	3.933E-04	4.002E-04	8.444E-05	9.977E-06	2.681E-08	2.515E-19	1.058E-30	0.000E+00
Cs-137	Cs-137	1.000E+00	2.913E-07	7.175E-06	3.166E-05	5.615E-05	1.057E-04	1.107E-04	6.943E-05	1.558E-05	2.866E-07	1.424E-10
Eu-152	Eu-152	7.208E-01	2.628E-06	2.530E-06	2.171E-06	1.793E-06	8.348E-07	3.886E-07	5.746E-08	4.183E-11	1.397E-14	6.947E-23
Eu-152	Eu-152	2.792E-01	1.018E-06	9.799E-07	8.410E-07	6.946E-07	3.234E-07	1.505E-07	2.226E-08	1.620E-11	5.413E-15	2.691E-23
Eu-152	Gd-152	2.792E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.018E-16	1.965E-16	2.837E-15
Eu-152	ΣDSR(j)		1.018E-06	9.799E-07	8.410E-07	6.946E-07	3.234E-07	1.505E-07	2.226E-08	1.620E-11	5.610E-15	2.837E-15
Eu-154	Eu-154	1.000E+00	5.470E-06	5.124E-06	3.946E-06	2.846E-06	7.706E-07	2.086E-07	7.958E-09	2.639E-14	3.830E-20	2.505E-34
Eu-155	Eu-155	1.000E+00	1.723E-15	1.546E-15	1.003E-15	5.838E-16	6.703E-17	7.697E-18	3.439E-20	1.732E-23	2.434E-35	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	2.210E-02	2.973E-04	1.362E-06	6.077E-16	2.639E-25	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pu-238	Pu-238	1.000E+00	2.160E-19	2.661E-06	1.289E-05	2.478E-05	6.348E-05	9.034E-05	1.217E-04	2.264E-03	8.948E-04	1.072E-04
Pu-238	U-234	1.000E+00	0.000E+00	2.932E-08	7.199E-07	2.815E-06	2.316E-05	5.887E-05	1.424E-04	1.399E-04	6.535E-05	5.299E-06
Pu-238	Th-230	1.000E+00	0.000E+00	2.709E-15	1.543E-13	1.039E-12	2.329E-11	9.838E-11	5.879E-10	4.974E-09	9.225E-09	8.025E-08
Pu-238	Ra-226	1.000E+00	0.000E+00	1.306E-13	1.610E-11	1.267E-10	3.208E-09	1.394E-08	9.553E-08	1.470E-06	4.188E-06	1.390E-05
Pu-238	Pb-210	1.000E+00	0.000E+00	1.733E-15	1.006E-13	8.455E-13	2.730E-11	1.500E-10	1.447E-09	3.668E-08	1.311E-07	5.839E-07
Pu-238	ΣDSR(j)		2.160E-19	2.690E-06	1.361E-05	2.760E-05	8.664E-05	1.492E-04	2.642E-04	2.405E-03	9.645E-04	1.271E-04
Pu-239	Pu-239	1.000E+00	2.840E-14	2.967E-06	1.483E-05	2.966E-05	8.894E-05	1.481E-04	2.958E-04	2.657E-02	5.069E-02	3.098E-01
Pu-239	U-235	1.000E+00	0.000E+00	9.636E-12	2.391E-10	9.471E-10	8.209E-09	2.197E-08	6.301E-08	1.455E-07	1.751E-07	2.599E-07
Pu-239	Pa-231	1.000E+00	0.000E+00	3.178E-16	1.203E-14	8.913E-14	2.216E-12	9.914E-12	6.704E-11	1.104E-09	3.312E-09	1.508E-08
Pu-239	Ac-227	1.000E+00	0.000E+00	3.331E-16	2.519E-15	1.938E-14	8.510E-13	5.462E-12	5.912E-11	1.070E-09	2.924E-09	1.865E-08
Pu-239	ΣDSR(j)		2.840E-14	2.967E-06	1.483E-05	2.966E-05	8.894E-05	1.482E-04	2.959E-04	2.657E-02	5.069E-02	3.098E-01
Pu-240	Pu-240	1.000E+00	5.473E-21	2.967E-06	1.483E-05	2.964E-05	8.873E-05	1.476E-04	2.936E-04	2.596E-02	4.877E-02	2.867E-01
Pu-240	U-236	1.000E+00	0.000E+00	2.918E-10	7.238E-09	2.867E-08	2.484E-07	6.646E-07	1.902E-06	4.348E-06	5.167E-06	5.500E-06
Pu-240	Th-232	1.000E+00	0.000E+00	2.104E-37	7.130E-19	2.022E-18	1.750E-17	2.947E-17	2.431E-16	2.818E-15	7.851E-15	1.400E-13
Pu-240	Ra-228	1.000E+00	0.000E+00	4.717E-26	2.287E-18	6.143E-18	4.666E-17	5.823E-17	6.860E-16	2.258E-14	8.327E-14	1.065E-12
Pu-240	Th-228	1.000E+00	0.000E+00	2.155E-19	1.206E-18	2.748E-18	1.176E-17	2.517E-17	7.658E-17	8.152E-16	3.325E-15	1.207E-12
Pu-240	ΣDSR(j)		5.473E-21	2.967E-06	1.484E-05	2.967E-05	8.898E-05	1.482E-04	2.955E-04	2.596E-02	4.877E-02	2.867E-01
Ra-226	Ra-226	1.000E+00	7.098E+01	7.096E+01	7.090E+01	7.081E+01	7.048E+01	7.015E+01	6.928E+01	6.610E+01	6.270E+01	5.756E+01
Ra-226	Pb-210	1.000E+00	0.000E+00	1.925E-05	4.446E-04	1.613E-03	9.998E-03	1.965E-02	3.732E-02	5.321E-01	9.051E-01	1.594E+00
Ra-226	ΣDSR(j)		7.098E+01	7.096E+01	7.090E+01	7.082E+01	7.049E+01	7.017E+01	6.932E+01	6.663E+01	6.361E+01	5.916E+01

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Branch Fraction	DSR(j,t) (mrem/yr)/(pCi/g) t= 0.000E+00	1.000E+00	5.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
Sr-90	Sr-90	1.000E+00	3.238E-11	3.229E-01	1.403E+00	2.305E+00	7.458E-01	2.460E-01	1.476E-02	2.070E-07	2.833E-12	1.971E-24
U-234	U-234	1.000E+00	1.951E-18	2.071E-02	1.024E-01	2.019E-01	5.725E-01	9.028E-01	7.694E-01	2.412E-01	7.808E-02	4.607E-03
U-234	Th-230	1.000E+00	0.000E+00	2.218E-09	2.976E-08	1.055E-07	8.415E-07	2.214E-06	6.248E-06	1.988E-05	2.919E-05	2.289E-04
U-234	Ra-226	1.000E+00	0.000E+00	1.382E-07	3.430E-06	1.360E-05	1.182E-04	3.172E-04	1.167E-03	7.821E-03	1.695E-02	4.507E-02
U-234	Pb-210	1.000E+00	0.000E+00	3.676E-10	3.326E-09	1.778E-08	4.985E-07	2.266E-06	1.532E-05	1.945E-04	5.333E-04	1.897E-03
U-234	ΣDSR(j)		1.951E-18	2.071E-02	1.024E-01	2.019E-01	5.726E-01	9.032E-01	7.706E-01	2.492E-01	9.559E-02	5.181E-02
U-235	U-235	1.000E+00	5.143E-11	1.954E-02	9.660E-02	1.905E-01	5.401E-01	8.519E-01	7.261E-01	2.277E-01	7.377E-02	5.649E-03
U-235	Pa-231	1.000E+00	0.000E+00	3.148E-07	6.661E-06	2.582E-05	2.205E-04	5.886E-04	1.685E-03	6.287E-03	9.802E-03	1.867E-02
U-235	Ac-227	1.000E+00	0.000E+00	4.850E-09	5.626E-07	4.291E-06	9.695E-05	3.809E-04	1.843E-03	7.102E-03	9.564E-03	2.404E-02
U-235	ΣDSR(j)		5.143E-11	1.954E-02	9.660E-02	1.905E-01	5.405E-01	8.529E-01	7.296E-01	2.411E-01	9.314E-02	4.836E-02
U-238	U-238	1.000E+00	1.813E-08	1.969E-02	9.732E-02	1.919E-01	5.442E-01	8.583E-01	7.315E-01	2.294E-01	7.433E-02	4.616E-03
U-238	U-234	1.000E+00	0.000E+00	5.898E-08	1.453E-06	5.727E-06	4.869E-05	1.280E-04	2.182E-04	2.052E-04	1.107E-04	1.307E-05
U-238	Th-230	1.000E+00	0.000E+00	4.029E-12	1.051E-11	3.877E-11	1.487E-10	4.056E-10	1.112E-09	7.574E-09	1.304E-08	1.104E-07
U-238	Ra-226	1.000E+00	0.000E+00	1.117E-11	4.299E-11	2.255E-10	3.604E-09	1.516E-08	1.018E-07	1.678E-06	5.044E-06	1.799E-05
U-238	Pb-210	1.000E+00	0.000E+00	8.423E-11	2.084E-10	8.443E-10	2.728E-09	6.225E-09	1.181E-08	8.256E-08	1.917E-07	8.073E-07
U-238	ΣDSR(j)		1.813E-08	1.969E-02	9.732E-02	1.919E-01	5.442E-01	8.584E-01	7.317E-01	2.297E-01	7.444E-02	4.648E-03

Branch Fraction is the cumulative factor for the j'th principal radionuclide daughter: CUMBRF(j) = BRF(1)*BRF(2)* ... BRF(j).
The DSR includes contributions from associated (half-life ≤ 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 75 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	5.000E+00	1.000E+01	3.000E+01	5.000E+01	1.000E+02	3.000E+02	5.000E+02	1.000E+03
Am-241	*3.430E+12	1.270E+08	5.428E+06	1.404E+06	2.220E+05	1.399E+05	9.885E+04	4.214E+03	2.990E+03	9.356E+02
Co-60	3.403E+06	5.035E+05	1.907E+05	1.874E+05	8.882E+05	7.517E+06	2.797E+09	*1.131E+15	*1.131E+15	*1.131E+15
Cs-137	2.574E+08	1.045E+07	2.369E+06	1.336E+06	7.099E+05	6.776E+05	1.080E+06	4.814E+06	2.617E+08	5.267E+11
Eu-152	2.057E+07	2.137E+07	2.490E+07	3.015E+07	6.476E+07	1.391E+08	9.407E+08	1.292E+12	*1.765E+14	*1.765E+14
Eu-154	1.371E+07	1.464E+07	1.901E+07	2.635E+07	9.733E+07	3.595E+08	9.425E+09	*2.639E+14	*2.639E+14	*2.639E+14
Eu-155	*4.651E+14	*4.651E+14	*4.651E+14	*4.651E+14	*4.651E+14	*4.651E+14	*4.651E+14	*4.651E+14	*4.651E+14	*4.651E+14
H-3	*9.594E+15	3.393E+03	2.523E+05	5.508E+07	*9.594E+15	*9.594E+15	*9.594E+15	*9.594E+15	*9.594E+15	*9.594E+15
Pu-238	*1.711E+13	2.788E+07	5.510E+06	2.718E+06	8.656E+05	5.026E+05	2.839E+05	3.118E+04	7.776E+04	5.901E+05
Pu-239	*6.212E+10	2.528E+07	5.056E+06	2.528E+06	8.432E+05	5.062E+05	2.535E+05	2.823E+03	1.480E+03	2.421E+02
Pu-240	*2.277E+11	2.528E+07	5.056E+06	2.528E+06	8.429E+05	5.060E+05	2.538E+05	2.889E+03	1.538E+03	2.616E+02
Ra-226	1.057E+00	1.057E+00	1.058E+00	1.059E+00	1.064E+00	1.069E+00	1.082E+00	1.126E+00	1.179E+00	1.268E+00
Sr-90	2.316E+12	2.323E+02	5.345E+01	3.254E+01	1.006E+02	3.049E+02	5.081E+03	3.623E+08	2.648E+13	*1.365E+14
U-234	*6.245E+09	3.621E+03	7.325E+02	3.715E+02	1.310E+02	8.304E+01	9.733E+01	3.009E+02	7.846E+02	1.448E+03
U-235	*2.160E+06	3.838E+03	7.764E+02	3.937E+02	1.388E+02	8.794E+01	1.028E+02	3.110E+02	8.053E+02	1.551E+03
U-238	*3.360E+05	3.809E+03	7.706E+02	3.908E+02	1.378E+02	8.737E+01	1.025E+02	3.266E+02	1.007E+03	1.614E+04

*At specific activity limit

Attachment C
Calculation Package for Residual Radioactive Material under the Basement and 2' Along the Sides

Resident in Basement
Short Wall Calculation

Dose Point

Location	Units
X	374'
Y	14'
Z	14'

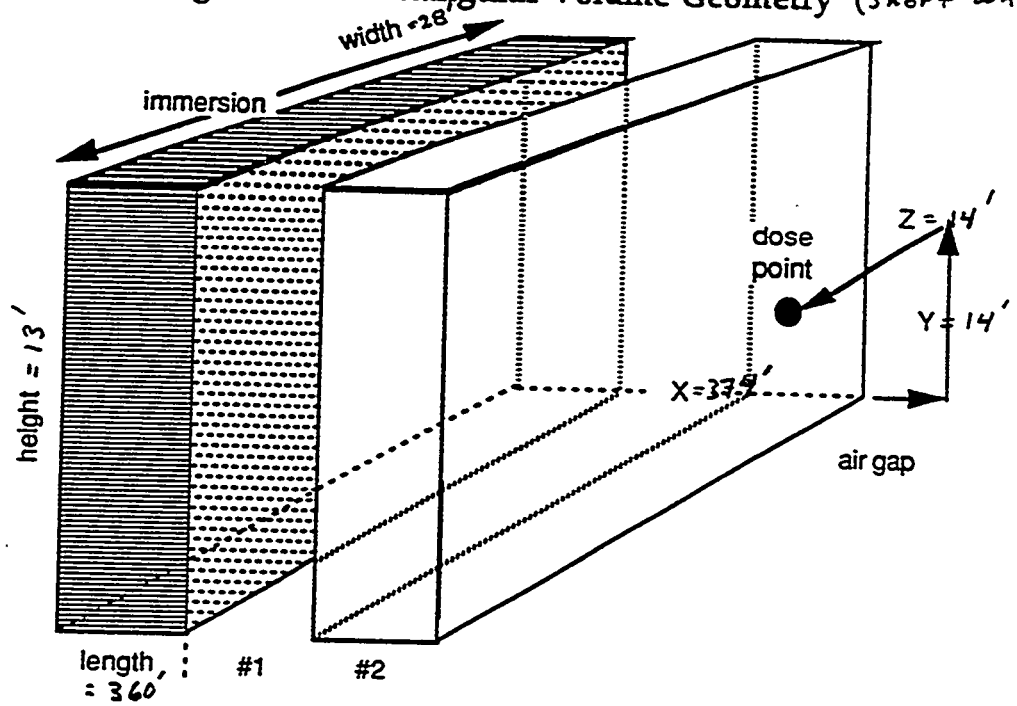
Source Dimension

Height	13'
Width	28'
Length	360'

Quadrature Order

Height	
Width	
Length	

Figure 4-14. Rectangular Volume Geometry (Short Wall)



Shields & Materials

Shield Number or Name:	# Short Wall	#	#	#	#	immers'n
Thickness in units of Feet:	0.75'					
√ Buildup Reference:	✓	☐	☐	☐	☐	✓

Densities (Use √ to indicate default value or enter a partial or alternate density)

Material	Density (g/cc)						immers'n
Air	0.00122						0.00122
Tin	7.3						
Aluminum	2.702						
Titanium	4.5						
Concrete	2.35						
Tungsten	19.3						
Iron	7.86						
Uranium	18.75						
Lead	11.3						
Water	1.0						
Nickel	8.9						
Zirconium	6.5						
RNL Soil	1.67	1.67					

1 of 20

BJ Dionne

DEC 4 1996

MicroShield 4.21 - Serial #4.21-00972

Page : 1 of 3
DOS File: OU4CSSW.MS4
Run Date: December 4, 1996
Run Time: 11:51 a.m. Wednesday
Duration: 0:01:55

File Ref: MS4/OER/OUII
Date: 12/4/96
By: R J Dreams
Checked:

Case Title: Inadvertent Future Intruder w OU I Soil: Basement (Short)

GEOMETRY 13 - Rectangular Volume

	centimeters	feet	and inches
Dose point coordinate X:	11399.52	374.0	.0
Dose point coordinate Y:	426.72	14.0	.0
Dose point coordinate Z:	426.72	14.0	.0
Rectangular volume width :	853.44	28.0	.0
Rectangular volume length:	10972.8	359.0	12.0
Rectangular volume height:	396.24	13.0	.0
Shield 1:	22.86	0.0	9.0
Air Gap:	403.86	13.0	3.0

Source Volume: 3.71064e+9 cm^3 131040. cu ft. 226437120 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Shield 1 Slab	Air Gap	Immersion Shield
Air			0.00122	0.00122
Concrete		2.35		
BNL Soil	1.67			

BUILDUP
Method: Buildup Factor Tables
The material reference is Source

INTEGRATION PARAMETERS

	Quadrature Order
X Direction	20
Y Direction	20
Z Direction	20

SOURCE NUCLIDES

Nuclide	curies	µCi/cm^3	Nuclide	curies	µCi/cm^3
Ba-137m	5.8621e-003	1.5798e-006	Cs-137	6.1968e-003	1.6700e-006

DOS File: OU4CSSW.MS4
Run Date: December 4, 1996
Run Time: 11:51 a.m. Wednesday
Title : Inadvertent Future Intruder w OU I' Soil: Basement (Short)

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0318	4.490e+006	4.538e-039	1.293e-028	3.780e-041	1.077e-030
0.0322	8.285e+006	7.123e-038	2.554e-028	5.732e-040	2.056e-030
0.0364	3.015e+006	2.423e-030	2.390e-028	1.377e-032	1.358e-030
0.6616	1.952e+008	1.058e-005	3.385e-004	2.051e-008	6.563e-007
TOTAL:	2.110e+008	1.058e-005	3.385e-004	2.051e-008	6.563e-007

CONVERSION OF CALCULATED EXPOSURE IN AIR TO DOSE
FILE: OU4CSSW.MS4
Case Title: Inadvertent Future Intruder w OU I. Soil: Basement (Short)
This case was run on Wednesday, December 4, 1996 at 11:51 a.m.

Results (Summed over energies)	Units	Without Buildup	With Buildup
Photon Fluence Rate (flux)	Photons/cm²/sec	1.599e-005	5.117e-004
Photon Energy Fluence Rate	MeV/cm²/sec	1.058e-005	3.385e-004
Exposure Rate in Air	mR/hr	2.051e-008	6.563e-007
Absorbed Dose Rate in Air	mGy/hr	1.791e-010	5.730e-009
"	mrad/hr	1.791e-008	5.730e-007
Deep Dose Equivalent Rate (ICRP 51 - 1987)			
o Parallel Geometry	mSv/hr	2.120e-010	6.784e-009
o Opposed "	"	1.698e-010	5.431e-009
o Rotational "	"	1.698e-010	5.431e-009
o Isotropic "	"	1.501e-010	4.803e-009
Shallow Dose Equivalent Rate (ICRP 51 - 1987)			
o Parallel Geometry	mSv/hr	2.253e-010	7.210e-009
o Opposed "	"	2.140e-010	6.848e-009
o Rotational "	"	2.140e-010	6.848e-009
o Isotropic "	"	1.605e-010	5.134e-009
Effective Dose Equivalent Rate (ICRP 51 - 1987)			
o Anterior/Posterior Geometry	mSv/hr	1.875e-010	5.998e-009
o Posterior/Anterior "	"	1.655e-010	5.294e-009
o Lateral "	"	1.227e-010	3.926e-009
o Rotational "	"	1.479e-010	4.731e-009 ←
o Isotropic "	"	1.259e-010	4.028e-009

Resident in Basement
Long Wall Calculation

Dose Point

Location	Units
X	374'
Y	14'
Z	19'

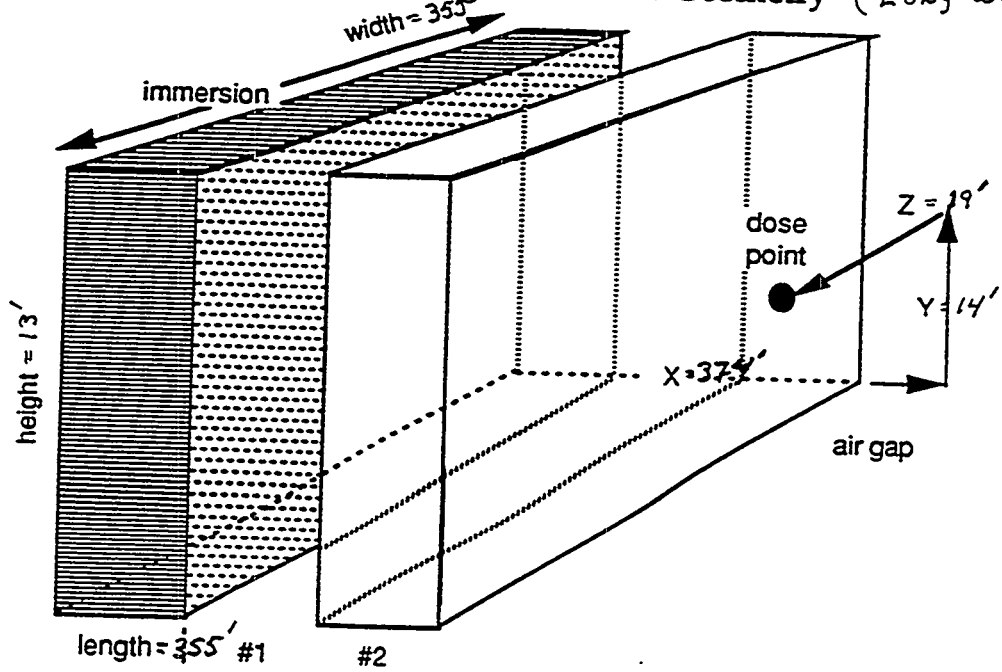
Source Dimension

Height	13'
Width	38'
Length	355'

Quadrature Order

Height	
Width	
Length	

Figure 4-14. Rectangular Volume Geometry (LONG WALL)



Shields & Materials

Shield Number or Name:	# LongWall	#	#	#	#	immers'n
Thickness in units of Feet:	0.75					
√ Buildup Reference:	☑	☐	☐	☐	☐	☑

Densities (Use √ to indicate default value or enter a partial or alternate density)

Material	Density (g/cc)						immers'n
Air	0.00122						0.00122
Tin	7.3						
Aluminum	2.702						
Titanium	4.5						
Concrete	2.35						
Tungsten	19.3						
Iron	7.86						
Uranium	18.75						
Lead	11.3						
Water	1.0						
Nickel	8.9						
Zirconium	6.5						
BNL Soil	1.67	1.67					

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BJ Dionne
DEC 4 1996

MicroShield 4.21 - Serial #4.21-00972

Page : 1 of 3
DOS File: OU4CSLW.MS4
Run Date: December 4, 1996
Run Time: 12:52 p.m. Wednesday
Duration: 0:01:55

File Ref: MS4/DER/OUI
Date: 12/4/96
By: BJ Devine
Checked:

Case Title: Inadvertent Future Intruder w OU I Soil Basement (Long)

GEOMETRY 13 - Rectangular Volume

	centimeters	feet	and inches
Dose point coordinate X:	11399.52	374.0	.0
Dose point coordinate Y:	426.72	14.0	.0
Dose point coordinate Z:	579.12	19.0	.0
Rectangular volume width :	1158.24	38.0	.0
Rectangular volume length:	10820.4	355.0	.0
Rectangular volume height:	396.24	13.0	.0
Shield 1:	22.86	0.0	9.0
Air Gap:	556.26	18.0	3.0

Source Volume: 4.96593e+9 cm^3 175370. cu ft. 303039360 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Shield 1 Slab	Air Gap	Immersion Shield
Air			0.00122	0.00122
Concrete		2.35		
BNL Soil	1.67			

BUILDUP
Method: Buildup Factor Tables
The material reference is Source

INTEGRATION PARAMETERS

	Quadrature Order
X Direction	20
Y Direction	20
Z Direction	20

SOURCE NUCLIDES

Nuclide	curies	µCi/cm^3	Nuclide	curies	µCi/cm^3
Ba-137m	7.8453e-003	1.5798e-006	Cs-137	8.2931e-003	1.6700e-006

DOS File: OU4CSLW.MS4
Run Date: December 4, 1996
Run Time: 12:52 p.m. Wednesday
Title : Inadvertent Future Intruder w OU I, Soil Basement (Long)

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0318	6.010e+006	3.419e-042	1.317e-028	2.848e-044	1.097e-030
0.0322	1.109e+007	6.425e-041	2.602e-028	5.171e-043	2.094e-030
0.0364	4.035e+006	1.019e-032	2.066e-028	5.792e-035	1.174e-030
0.6616	2.612e+008	8.751e-006	2.997e-004	1.696e-008	5.811e-007
TOTAL:	2.823e+008	8.751e-006	2.997e-004	1.696e-008	5.811e-007

CONVERSION OF CALCULATED EXPOSURE IN AIR TO DOSE
FILE: OU4CSLW.MS4
Case Title: Inadvertent Future Intruder w OU I Soil Basement (Long)
This case was run on Wednesday, December 4, 1996 at 12:52 p.m.

Results (Summed over energies)	Units	Without Buildup	With Buildup
Photon Fluence Rate (flux)	Photons/cm²/sec	1.323e-005	4.530e-004
Photon Energy Fluence Rate	MeV/cm²/sec	8.751e-006	2.997e-004
Exposure Rate in Air	mR/hr	1.696e-008	5.811e-007
Absorbed Dose Rate in Air	mGy/hr	1.481e-010	5.073e-009
"	mrad/hr	1.481e-008	5.073e-007
Deep Dose Equivalent Rate (ICRP 51 - 1987)			
o Parallel Geometry	mSv/hr	1.753e-010	6.006e-009
o Opposed "	"	1.404e-010	4.809e-009
o Rotational "	"	1.404e-010	4.809e-009
o Isotropic "	"	1.241e-010	4.252e-009
Shallow Dose Equivalent Rate (ICRP 51 - 1987)			
o Parallel Geometry	mSv/hr	1.864e-010	6.384e-009
o Opposed "	"	1.770e-010	6.063e-009
o Rotational "	"	1.770e-010	6.063e-009
o Isotropic "	"	1.327e-010	4.546e-009
Effective Dose Equivalent Rate (ICRP 51 - 1987)			
o Anterior/Posterior Geometry	mSv/hr	1.550e-010	5.311e-009
o Posterior/Anterior "	"	1.369e-010	4.688e-009
o Lateral "	"	1.015e-010	3.476e-009
o Rotational "	"	1.223e-010	4.189e-009 ←
o Isotropic "	"	1.041e-010	3.566e-009

Resident in Basement Floor Calculation

Dose Point

Location	Units
X	14'
Y	14'
Z	19'

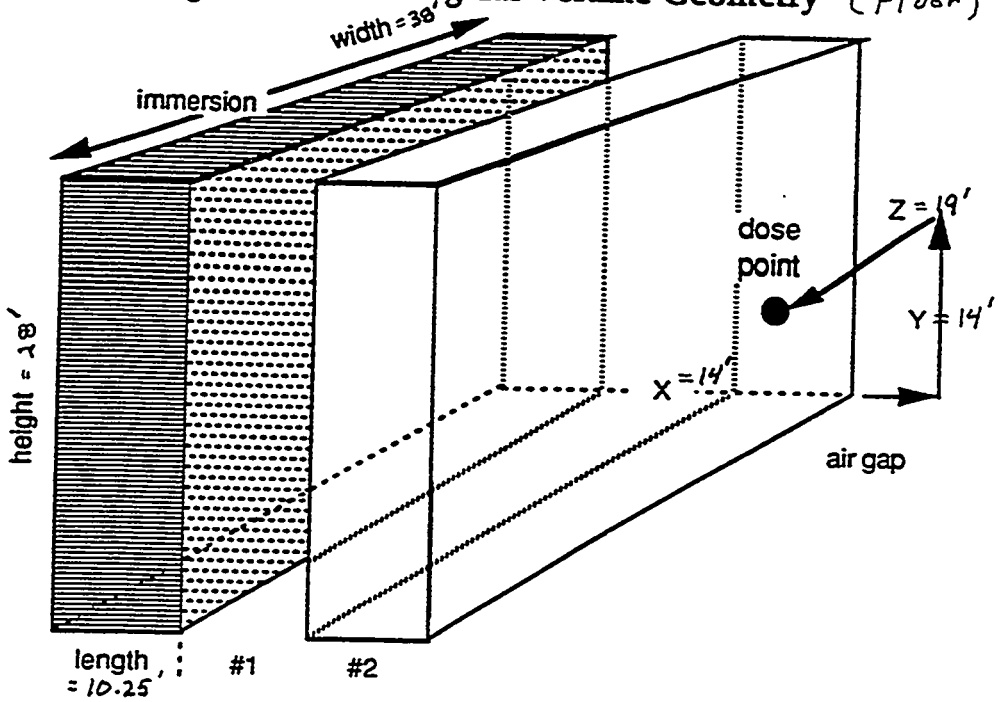
Source Dimension

Height	28'
Width	38'
Length	10.25'

Quadrature Order

Height	
Width	
Length	

Figure 4-14. Rectangular Volume Geometry (Floor)



Shields & Materials

Shield Number or Name:	# Floor	#	#	#	#	immers'n
Thickness in units of Feet:	0.33					
√ Buildup Reference:	✓	☐	☐	☐	☐	☐

Densities (Use √ to indicate default value or enter a partial or alternate density)

Material	Density (g/cc)						
Air	0.00122						
Tin	7.3						
Aluminum	2.702						
Titanium	4.5						
Concrete	2.35						
Tungsten	19.3						
Iron	7.86						
Uranium	18.75						
Lead	11.3						
Water	1.0						
Nickel	8.9						
Zirconium	6.5						
BNL Soil	1.67	1.67					

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B J Dionne

DEC 4 1996

MicroShield 4.21 - Serial #4.21-00972

Page : 1 of 3
DOS File: OU4CSFL.MS4
Run Date: December 4, 1996
Run Time: 2:01 p.m. Wednesday
Duration: 0:01:49

File Ref: MS4/OER/OU1
Date: 12/4/96
By: B J Drouin
Checked: _____

Case Title: Inadvertent Future Intruder w OU I Soil Basement (Floor)

GEOMETRY 13 - Rectangular Volume

	centimeters	feet and inches	
Dose point coordinate X:	426.72	14.0	.0
Dose point coordinate Y:	426.72	14.0	.0
Dose point coordinate Z:	579.12	19.0	.0
Rectangular volume width :	1158.24	38.0	.0
Rectangular volume length:	312.42	10.0	3.0
Rectangular volume height:	853.44	28.0	.0
Shield 1:	10.0584	0.0	4.0
Air Gap:	104.2416	3.0	5.0

Source Volume: 3.08824e+8 cm^3 10906 cu ft. 18845568 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Shield 1 Slab	Air Gap
Air			0.00122
Concrete		2.35	
BNL Soil	1.67		

BUILDUP
Method: Buildup Factor Tables
The material reference is Source

INTEGRATION PARAMETERS

	Quadrature Order
X Direction	20
Y Direction	20
Z Direction	20

SOURCE NUCLIDES

Nuclide	curies	µCi/cm^3	Nuclide	curies	µCi/cm^3
Ba-137m	4.8789e-004	1.5798e-006	Cs-137	5.1574e-004	1.6700e-006

DOS File: OU4CSFL.MS4
Run Date: December 4, 1996
Run Time: 2:01 p.m. Wednesday
Title : Inadvertent Future Intruder w OU I' Soil Basement (Floor)

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0318	3.737e+005	5.518e-017	3.193e-016	4.596e-019	2.660e-018
0.0322	6.895e+005	2.172e-016	1.293e-015	1.748e-018	1.041e-017
0.0364	2.509e+005	5.579e-014	4.516e-013	3.170e-016	2.566e-015
0.6616	1.624e+007	6.163e-003	4.716e-002	1.195e-005	9.142e-005
TOTAL:	1.756e+007	6.163e-003	4.716e-002	1.195e-005	9.142e-005

CONVERSION OF CALCULATED EXPOSURE IN AIR TO DOSE
FILE: OU4CSFL.MS4
Case Title: Inadvertent Future Intruder w OU I Soil Basement (Floor)
This case was run on Wednesday, December 4, 1996 at 2:01 p.m.

Results (Summed over energies)	Units	Without Buildup	With Buildup
Photon Fluence Rate (flux)	Photons/cm²/sec	9.315e-003	7.127e-002
Photon Energy Fluence Rate	MeV/cm²/sec	6.163e-003	4.716e-002
Exposure Rate in Air	mR/hr	1.195e-005	9.142e-005
Absorbed Dose Rate in Air	mGy/hr	1.043e-007	7.981e-007
"	mrad/hr	1.043e-005	7.981e-005
Deep Dose Equivalent Rate (ICRP 51 - 1987)			
o Parallel Geometry	mSv/hr	1.235e-007	9.449e-007
o Opposed "	"	9.888e-008	7.565e-007
o Rotational "	"	9.888e-008	7.565e-007
o Isotropic "	"	8.744e-008	6.690e-007
Shallow Dose Equivalent Rate (ICRP 51 - 1987)			
o Parallel Geometry	mSv/hr	1.313e-007	1.004e-006
o Opposed "	"	1.247e-007	9.538e-007
o Rotational "	"	1.247e-007	9.538e-007
o Isotropic "	"	9.347e-008	7.151e-007
Effective Dose Equivalent Rate (ICRP 51 - 1987)			
o Anterior/Posterior Geometry	mSv/hr	1.092e-007	8.355e-007
o Posterior/Anterior "	"	9.639e-008	7.375e-007
o Lateral "	"	7.148e-008	5.469e-007
o Rotational "	"	8.614e-008	6.590e-007 ←
o Isotropic "	"	7.333e-008	5.610e-007

Spreadsheet
for OU I Hot Spot Calculation:
Summation of
Dose to Source Ratios
for
the Two Short and Two Long Walls
and the Basement Floor

HWMF Summation of Dose to Source Ratios for Basement Walls and Floors

BNL Operable Unit I: AOC 1	Loss of Active Controls Scenario					File: C: OU1HSPOT.wb1
	Effective Dose Equivalent Rate (mrem/hr)	Effective Dose Equivalent Rate (mrem/hr)	Effective Dose Equivalent Rate (mrem/hr)	Effective Dose Equivalent Rate	Annual Effective Dose Equivalent Rate	Annual Effective Dose Equivalent Rate
Nuclide	Short Wall	Long Wall	Floor	Basement (mrem/hr per pCi/g)	Basement (mrem/yr per pCi/g)	Basement @ T=50 yrs. (mrem/yr per pCi/g)
Cs-137	4.73E-07	4.19E-07	6.59E-05	6.77E-05	2.37E-01	7.51E-02
Am-241	1.24E-15	1.50E-16	1.05E-10	1.05E-10	3.66E-07	3.38E-07

Attachment D
Spreadsheet for Failure of Institutional Controls: Dose to Source Ratios for OU I Soils
&
Topsoil and Buried Soils Concentrations to Obtain 75 mrem/yr

HWMF Loss of Active Control Scenario: Dose to Source Ratios and Concentrations for 75 mrem/yr

HWMF Loss of Active Controls Scenario - Dose to Source Ratios and Concentrations			Resident (Adjusted for - Basement Occupancy) 6" Topsoil	Resident (Adjusted for - 40% Dilution & Basement Occupancy) 6" Topsoil	Resident Soil Below 3' Cover	Basement Resident Annual Effective Dose	Resident Total Corrected	OU I Soil Buried under 3' Cover			File: HWMFact.wb1 Single Radionuclide
Radionuclide	Vol. Weighted Avg. Conc. (pCi/g)	Concentration Ratio OU IV Rad. Soil Mixture	Dose to Source Ratio @ 50 yrs (mrem/yr per pCi/g)	Dose to Source Ratio @ 50 yrs (mrem/yr per pCi/g)	Dose to Source Ratio @ 50 yrs (mrem/yr per pCi/g)	Equivalent Rate@50yrs (mrem/yr per pCi/g))	Dose to Source Ratio @ 50 yrs (mrem/yr per pCi/g)	Conc. for 75 mrem/yr (pCi/g)	40% Diluted Soil Conc. for 75 mrem/yr (pCi/g)	75 rem/yr mix Dose per Nuclide (mrem/yr)	Soil Burial Cutoff Level 75 mrem/yr @ 50 yrs (pCi/g)
Sr-90	4.09E+01	2.77E-03	7.99E-08	3.20E-08	2.46E-01	0.00E+00	2.46E-01	2.25E+00	9.00E-01	5.53E-01	3.05E+02
Cs-137	1.47E+04	9.97E-01	1.68E-01	7.53E-02	1.11E-04	7.51E-02	1.51E-01	4.95E+02	1.98E+02	7.45E+01	4.98E+02
U-235	2.60E-01	1.90E-05	7.10E-04	2.84E-04	8.53E-01	0.00E+00	8.53E-01	6.34E-02	2.14E-02	4.56E-02	8.79E+01
Am-241	4.60E+00	3.05E-04	1.93E-01	7.72E-02	5.36E-04	3.38E-07	7.77E-02	7.82E-02	3.13E-02	6.08E-03	9.65E+02
Total Soil Conc	14755	1.00					1			75	

Appendix J

Hazardous Waste Management Facility (HWMF): RADS Net-Benefit Analysis Worksheets and Excavation/Disposal Cost Spreadsheets

Hazardous Waste Management Facility (HWMF): RADS Net-Benefit Analysis Worksheets

NET-BENEFIT ANALYSIS WORKSHEETS

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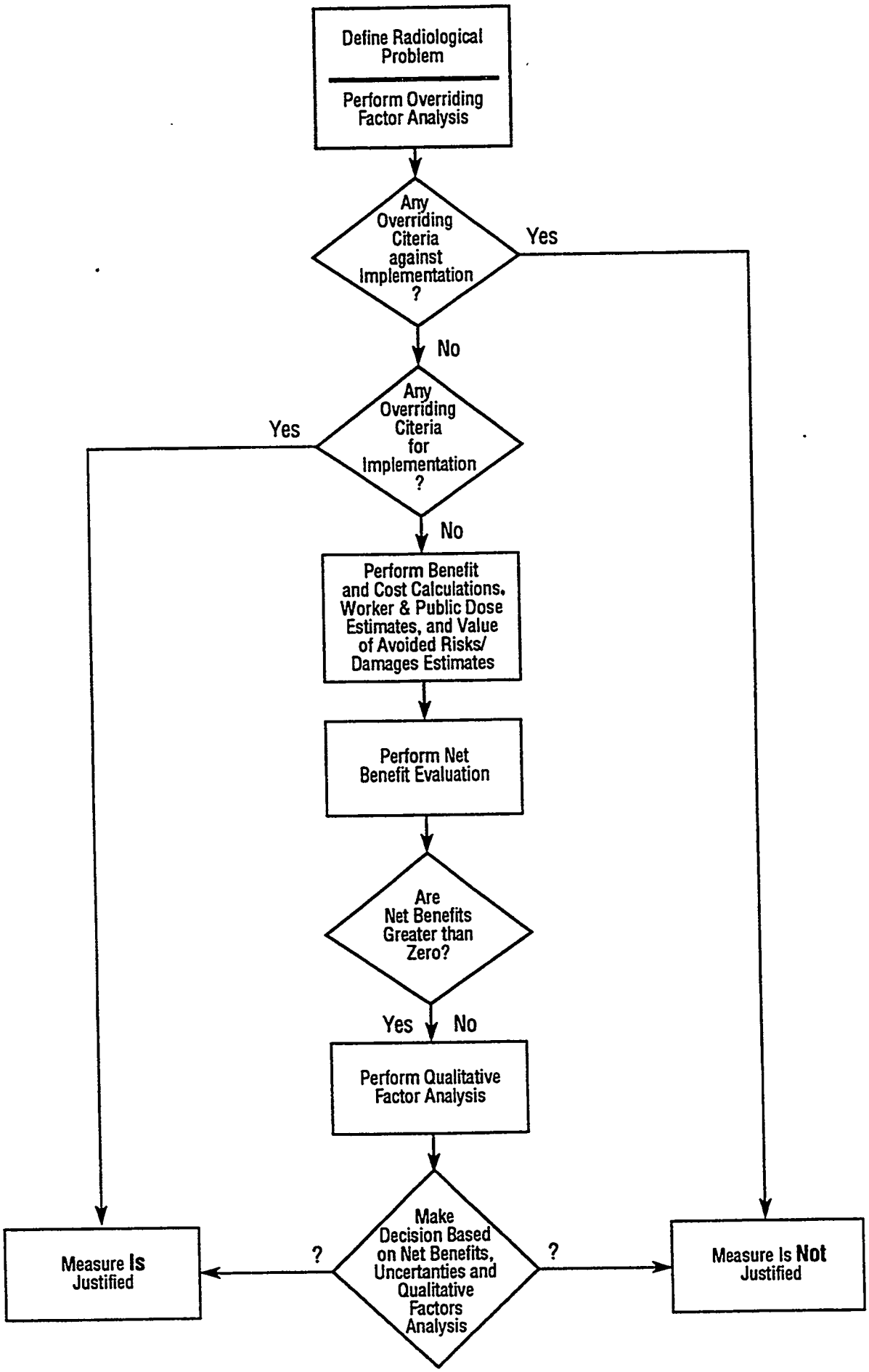
ATTACHMENT 2. OVERRIDING FACTOR ANALYSIS	J-8
ATTACHMENT 3. ALARA PROTECTIVE MEASURE BENEFIT CALCULATION	J-9
ATTACHMENT 4. ALARA PROTECTIVE MEASURE COST CALCULATION	J-10
ATTACHMENT 5. ESTIMATED RADIATION DOSE TO BE AVOIDED	J-12
ATTACHMENT 6. ESTIMATED VALUE OF AVOIDED RISKS AND DAMAGES	J-14
ATTACHMENT 7. NET BENEFIT EVALUATION	J-15
ATTACHMENT 8. QUALITATIVE FACTOR ANALYSIS	J-16

ALARA Protective Measure Analysis - Flow Chart



ATTACHMENT 1. RADIOLOGICAL PROBLEM DEFINITION WORKSHEET

A1. Describe the facility, its present radiological conditions, and the radiological activity of concern.

From 1947 to 1997, the HWMF,, released radioactive material to the environment through accidental spills and overflows of radioactive waste, runoff from activated/contaminated equipment and from leaking waste containers, as well as, local radioactive fallout. As a result of these past operations, the soil was contaminated with long-lived mixed fission and activation products (see Appendix C for contaminated soil volumes and radionuclide concentrations). Dose rates at at 1 meter above the ground are as high as 6 mR/hr. Under the excavation and off-site disposal alternative all contaminated soil above the various risk based soil cleanup guidelines will be excavated and disposed of at off-site low-level waste facilities. The area has been fenced to prevent access to the radiological area. The area was assumed to be under institutional control for 50 more years. The future use for the area was assumed to be undeveloped open-space.

A2. Describe the proposed ALARA protective measure (APM).

The remedial alternative to be evaluated against the no action alternative was the large scale excavation of the volumes of soil containing predominately Cs 137 and Sr 90 shown in Appendix C. The soil that was above 2,800 pCi/g was stabilized by mixing it with Portland cement and poring it into a B-25 steel container. The remaining contaminated soil was loaded into approved packages(B-25 steel containers) that were then were then safely stored at an on-site low-level waste storage facility. Subsequently, the low level soil was transported by truck to the Envirocare TSD facility located in Givens, Utah(waste concentrations from 67 pCi/g to 2,800 pCi/g) and the stabilized waste by sole-source vehicle to Fluro Daniels - Hanford in Richland, Washington(waste concentrations greater than 2,800 pCi/g) for off-site disposal. The relevant time frame for estimating cost elements and radiation exposure was 270 years. The property was assumed to be under the institutional control of BNL until 2047. From 2047 to 2317, the property was assumed to be undeveloped open space and was assumed to have 30 visitors annually to the former HWMF site.

A3. Determine the relevant time frame for estimating the cost elements and exposure impact.

The relevant time frame for estimating cost elements and radiation exposure was 270 years. The property will be under the Federal control of the DOE until 2047 during which routine monitoring of wells and security/safety inspections will continue. From 2047 to 2317 the property will be assumed to be occupied .by visitors to this undeveloped open-space.

A4. Identify the cost savings associated with the implementation of the APM, e.g., maintenance labor, operation labor, inspection labor, production, processing, salvage, reduced chemicals, reduced consumables, and reduced radwaste.

There were two main expected cost-savings resulting from removing the radioactive soil. The first was the sampling of three wells may not have to be performed after 5 years following remediation. If remediation occurs in 1999, and after 5 years, radiochemical analysis results indicate that groundwater levels are low and decreasing, post-closure monitoring could be terminated; there would be no monitoring for the 43 remaining years of federal control and the 30 year NYS required post-closure monitoring. Monitoring and reporting for three wells at $ 1,000 per well per year for 73 years; saves $ 219,000. The second main savings would be the potential real-estate proceeds from the sale of the property to the Pine Barren Preserve Association or Suffolk County. In this area of the Brookhaven township, real estate is selling for approximately $ 50,000 per acre (Newsday, 1996). It was assumed that if no remedial action was taken that no person or entity would purchase the contaminated property. The 12-acres HWMF site land could have a post-remediation value or savings of $ 600,000.

A5. Identify the cost elements for implementation of the APM, e.g., design and engineering, equipment procurement, fabrication, installation or construction labor, operation, maintenance, associated training and procedure, additional chemicals, additional consumables, special tools, additional radwaste, as well as the costs to decontaminate decommission, dispose of and restore the environment during facility/system closure.

The estimated capital cost plus the present(1997) worth of operating and maintenance expenses for excavation and off-site disposal was $64,728,029 to cleanup to the 1 mrem/yr risk-based remediation goal, $28,650,610 to 15 mrem/yr, $24,826,661 to 25 mrem/yr, $17,102,971 to 75 mrem/yr, and $16,420,861 to the 100 mrem/yr limit. Periodic operating and maintenance expenses were included in this total and were converted to present worth in 1997 dollars using a 3.0% discount rate(USDOE 1996). The present worth for long term radiological environmental and ecological monitoring programs/reports, the CERCLA/RCRA post closure monitoring program/reports, and HWMF site maintenance and security inspections was $457,641.

A6. Estimate the collective dose without the protective measure, with the protective measure, to implement the protective measure, and to decommission and restore the environment during facility/system closure. Determine, if possible, the maximum individual dose for the present or existing radiological activity.

The dose to the present BNL workers to sample at the three monitoring wells and for grounds security/safety inspections at the HWMF were estimated to be about 4.34 person-rem with no environmental remediation i.e., existing radiological conditions. The collective doses to sample at the monitoring wells and grounds security/safety inspections (0.018 person-rem) following the remedial actions were estimated to be 0.245 person-rem at 1 mrem/yr cleanup goal, 0.285 person-rem at 15 mrem/yr, 0.328 person-rem at 25 mrem/yr , 0.456 person-rem at 75 mrem/yr and 0.525 person-rem at the 100 mrem/yr dose limit. The collective doses to workers from excavation, transport, and temporary storage of the contaminated soil from the HWMF were estimated using the volume-weighted arithmetic average concentrations. These upper-limit dose assessments, show that: 203 person-rem would be received at 1 mrem/yr risk based cleanup goal; 199 person-rem at 15 mrem/yr; 199 person-rem at 25 mrem/yr, 195 person-rem at 75 mrem/yr, and 194 person-rem at the 100 mrem/yr dose limit. The collective dose impacts to drivers/workers from waste handling, transporting and disposing was 19.6 person-rem at 1 mrem/yr risk based cleanup goal; 19.2 person-rem at 15 mrem/yr; 19.1 person-rem at 25 mrem/yr; 18.4 person-rem at 75 mrem/yr, and 18.3 person-rem at the 100 mrem/yr dose limit. It was assumed that the value of the radiation detriment avoided was $2,000 per person-rem for workers.

The collective dose to 30 visitors to this open space over this 270 year future use period associated with existing radiological conditions i.e., without remediation, was estimated to be 8.55 person rem. The 270 year collective doses to the future visitors who frequent the former HWMF site were estimated to be 0.004 at the 1 mrem/yr risk based cleanup goal, 0.060 at 15 mrem/yr, 0.100 at 25 mrem/yr, 0.302 at 75 mrem/yr, and 0.402 person-rem at the 100 mrem/yr limit. Population doses resulting from site remediation, expressed in terms of collective dose for the first year of exposure following the excavation were 6.20 E-04 person-rem for cleanup to 1 mrem/yr risk based cleanup goal, 4.68 E-04 person-rem for the 15 mrem/yr, 4.70 E-04 person-rem for the 25 mrem/yr, 4.56 E-04 person-rem for the 75 mrem/yr, and 4.54 E-04 person-rem for the 100 mrem/yr limit. The collective dose impact to the public resulting from off-site transporting and disposing was 6.68 person-rem at 1 mrem/yr risk based cleanup goal; 6.54 person-rem at 15 mrem/yr; 6.50 person-rem at 25 mrem/yr, 6.31 person-rem at 75 mrem/yr and 6.28 person-rem at 100 mrem/yr dose limit. It was assumed that the value of the radiation detriment avoided was $2,000 per person-rem for the public.

A7. Estimate the potential value of the risks and damages to be avoided as a result of the protection measure; e.g., injury and death to workers excluding radiation, environmental damage, public/worker concerns, litigation costs and civil penalties, facility shutdown, etc. Determine, if possible, or estimate the probability of these damages occurring.

The value of these risks and damages from no action must be subtracted from the value of the risks and damages that may be caused by the remedial action. These included the 1) damages to wildlife habitat, 2) loss of future sale of real property, 3) accidental injury to worker during excavation, packaging and storage; 4) accidental deaths resulting from the transportation of waste to Envirocare and to Hanford; and 5) public concern associated with the transport of the waste to Envirocare and to Hanford.

The following risks and damages were expected if no remedial action and if remedial actions occurred:

1) Wetland contamination and prevention of use by wildlife: probability 1.0 and a value of $5,000 (with no action);

2) Worker and public concern for no remedial action: probability of 0.9 and an estimated value of $120,000 (with no action);

3) Accidental injury to remediation workers was estimated using a value of 4.2×10^{-8} fatal injuries per hour of work(NRC 1994). Multiplying the various volumes by 1.62 hrs./m^3 (NRC 1994)translated to 59,862 m^3 x 1.62 hrs./m^3 = 96,980 hrs or 0.004 fatalities, 31,895 hrs or 0.001 fatalities, 25,020 hrs or 0.001 fatalities, 11,136 hrs or 0.0005 fatalities, and 9,910 hrs or 0.0004 fatalities. This yields at $ 4 M per life: $16,300, $5,360, $4,200, $2,000 and $ 1,600 for the 1, 15, 25, 75 mrem/yr remediation goals and the 100 mrem/yr limit ,respectively (with remedial action);

4) Accidental injury to the workers and public from the transporting the contaminated soil to Envirocare and Hanford was estimated using a value of 4×10^{-9} occupant deaths per vehicle mile(USDOT 1991). This was multiplied by the total mileage to transport the various volumes of contaminated soil, namely 14,925,758 miles or 0.06 fatalities, 5,097,148 miles or 0.02 fatalities, 4,057,713 miles or 0.016 fatalities, 1,958,638 miles or 0.008 fatalities, and 1,774,548 miles or 0.007 fatalities. This yields, at $ 4 M per life, $240,000, $80,000, $64,000, 32,000 and $28,000 for the 1, 15, 25, 75 mrem/yr remediation goals and the 100 mrem/yr limit ,respectively (with remedial action).

ATTACHMENT 2. OVERRIDING FACTOR ANALYSIS WORKSHEET
For the 15 mrem/year Risk-based Remediation Goal

Overriding Factors	Check One:		
	If APM Implemented	If APM Not Implemented	Neither
B1. Will a violation of a DOE order, federal regulation, or state law occur?		X	
B2. Will significant quantities of radioactive materials be added to the site?			X
B3. Will a violation of a collective bargaining agreement occur?			X
B4. Will the worker administrative dose control level(s) be exceeded?			X
B5. Will a safety-related activity not be completed because of the unavailability of a specially trained, skilled, or certified worker?			X
B6. Other factor(s) (please describe).			None
B7. Other factor(s) (please describe).			None
B8. Conclusion (Explain how answers are overriding factors).		Overriding factors for this remedial alternative due to EPA's CERCLA rule.	
B9. Discussion (basis and references)			OU I Feasibility Study (CDM, 1996)

ATTACHMENT 3. APM BENEFIT CALCULATION WORKSHEET
For the 15 mrem/year Risk-based Remediation Goal

Task	Quantity	Unit Cost	Cost	Item(s)
C1. Maintenance Labor Enter the total estimated labor savings for the protective measure. Obtain the estimated total maintenance hours saved. Obtain the appropriate dollar/hour rate from the Cost Control Group. Enter the product(s) on line(s) for items C1.	_____ _____ _____	_____ _____ _____	_____ _____ _____	C1
C2. Operations/Production Labor Enter the total estimated operation/production labor savings for the protective measure. Obtain the estimated total operation hours saved. Obtain the appropriate dollar/hour rate from the Cost Control Group. Enter the product(s) on line(s) for items C2.	72 years _____	$3,000 _____ _____	$219,000 3 MWs _____ _____	C2
C3. Inspection/Surveillance Labor Enter the total estimated inspection/surveillance labor savings for the protective measure. Obtain the estimated total inspection hours saved. Obtain the appropriate dollar/hour rate for inspection from the Cost Control Group. Enter the product(s) on line(s) for items C3.	_____ _____ _____	_____ _____ _____	_____ _____ _____	C3
C4. Efficiency and/or Reliability Savings Enter the total estimated savings associated with production or processing improvements provided by the protective measure. Enter the dollar amount of these savings on line(s) for items C4.	_____ _____ _____	_____ _____ _____	_____ _____ _____	C4
C5. Miscellaneous Savings Enter estimated savings from miscellaneous items (e.g., salvage value of old equipment, reduced chemical and consumable materials, reduced radwaste). Enter the dollar amount of these savings on line(s) for items C5.	12 acres _____ _____	$ 50,000 _____ _____	$600,000 real estate _____ _____	C5

TOTAL ECONOMIC BENEFITS
Enter the total estimated benefits of the protec- tive measure. Add all savings from lines for items C1 through C5, and enter total into Box C.

Grand Total → $819,000

Box C

ATTACHMENT 4. APM COST CALCULATION WORKSHEET
For the 15 mrem/year Risk-based Remediation Goal

Task	Quantity	Unit Cost	Cost	Item(s)
D1. Design and Engineering Enter the total estimated design engineering cost for the protective measure. Obtain the estimated hours to design and engineer the protective measure. Obtain the appropriate dollar/hour rate from the Cost Control Group. Enter the product(s) on line(s) for item(s) D1.	_____ _____ _____	_____ _____ _____	_____ _____ _____	D1
D2. Capital Equipment, Fabrication, Material Enter the total estimated capital costs of equipment, fabrication, and materials for the new technique. Include "up front" hidden costs such as R&D, certification, patent rights, auxiliary construction facilities, etc. Enter product(s) on line(s) for item(s) D2.	_____ _____ _____	_____ _____ _____	_____ _____ _____	D2
D3. Installation and Construction Enter the total estimated labor costs to install the protective measure including start up, testing, and operational readiness reviews. Obtain the estimated total hours of facility and contractor personnel to install and test. Obtain the appropriate dollar/hour rate for facility and contractor labor. Enter the product(s) on line(s) for item(s) D3.	_____ _____ _____	_____ _____ _____	$28,650,610 _____ _____	D3
D4. Implementation: Procedure, Training, Administrative Costs Enter the estimated costs for training, procedure development, and additional administrative and technical services associated with the protective measure (additional O&M being a negative savings obtained in lines C1, C2, and C3 above from the difference between the existing and the protective technique costs for operations, maintenance, and inspection). Enter the product(s) on line(s) for item(s) D4.	_____ _____ _____	_____ _____ _____	_____ _____ _____	D4
D5. Operation and Maintenance Enter the total estimated costs to operate and maintain the protective measure. Obtain the estimated hours to maintain and operate. Obtain the appropriate dollar/hour rate for each work group. Enter the product(s) on line(s) for item(s) D5.	_____ _____ _____	_____ _____ _____	_____ _____ _____	D5
D6. Miscellaneous Costs Enter the estimated total costs for miscellaneous items, e.g., chemicals, consumable materials, special tools, additional radwaste. Enter the product(s) on line(s) for item(s) D6.	_____ _____ _____	_____ _____ _____	_____ _____ _____	D6

Task	Quantity	Unit Cost	Cost	Item(s)
D7. Decontamination, Decommissioning, Disposal and Environmental Restoration Costs Enter the total estimated costs associated with the D&D, disposal, and environmental restoration of the protective measure during facility/system closure. Obtain estimated labor and materials cost to decontaminate, decommissioning, dispose of, and restore the environment during closure. Enter the product(s) on line(s) for item(s) D7.	_____ _____ _____	_____ _____ _____	_____ _____ _____	D7

TOTAL ECONOMIC COST

Enter the total estimated costs of the protective measure. Add all the costs from lines for items D1 through D7 and enter the total into Box D.

Grand Total →

$28,650,610

Box D

ATTACHMENT 5. ESTIMATED RADIATION DOSES TO BE AVOIDED
For the 15 mrem/year Risk-based Remediation Goal

Description of Radiological Activity	Number Exposed	Exp. Hours	Average Dose Rate (mrem/hr)	Collective Dose (Person-Rem)	Item(s)
E1. Dose to workers from existing or present radiological activity	Enter the existing number of workers and person-hours to perform activity, e.g., maintenance, operate, inspect, process, or produce. Enter the average working dose rate for each activity. Enter the product(s) on line(s) for item(s) E1.				
Present sampling of monitoring wells before				4.34	E1
E2. Dose to workers to perform radiological activity with APM implemented	Enter the expected number of workers and person-hours with the protective measure to perform activity, e.g., maintenance, operation, inspection, processing, and production. Enter the average working dose rate for each activity. Enter the product(s) on line(s) for item(s) E2.				
Present sampling of monitoring wells after				0.285	E2
E3. Dose to workers to install and implement APM	Enter the number of workers and person-hours to install APM. Enter the total estimated dose to implement or install the protective measure which will result from it, i.e., negative result from the person-rem to operate, maintain, inspect old technique minus person-rem to operate, inspect new technique. Enter the average working dose rate for each activity. Enter the product(s) on line(s) for item(s) E3.				
None				0	E3
E4. Dose to workers from decommissioning/restoration of APM during closure	Enter the number of workers and person-hours to decommission the APM/restore the environment during facility/system closure. Enter the average working dose rate for each activity. Enter the product(s) on line(s) for item(s) E4.				
Excavation,Packaging & On-site Storage				199	
Off-Site Transport, Handling & Disposal				19.2	E4

ATTACHMENT 5. ESTIMATED RADIATION DOSE TO BE AVOIDED (Cont.)

For the 15 mrem/year Risk-based Remediation Goal

Task	Location (sector)	Number Exposed	Maximum Individual Dose (mrem)	Average Dose/Person (mrem)	Collective Dose (Person-rem)	Item
E5. Dose to public from existing or present radiological activity	Enter the description of the exposure pathways to the public, its sector location, the number of persons, maximum individual dose, average dose per person, and the estimated cumulative dose to the public within 50 miles. These doses should be based on calculations with actual or estimated release data, historical meteorological and hydrological data, most recent population distributions and approved models/software.					
Visitors to Open Space Before Cleanup					8.550	E5
E6. Dose to public from radiological activity with APM implemented	Enter the description of the exposure pathways to the public, its sector location, the number of persons, maximum individual dose, average dose per person, and the estimated cumulative dose to the public within 50 miles. These doses should be based on calculations with actual or estimated release data, historical meteorological and hydrological data, most recent population distributions and approved models/software.					
Visitors After Cleanup to 15 mrem/yr					0.060	E6
E7. Dose to public from decommissioning/restoration of APM during closure	Enter the description of the exposure pathways to the public, its sector location, the number of persons, maximum individual dose, average dose per person, and the estimated cumulative dose to the public within 50 miles. These doses should be based on calculations with actual or estimated release data, historical meteorological and hydrological data, most recent population distributions and approved models/software.					
Impact to Public from Excavation					.000468	
Impact to Public Transport /Disposal					6.54	E7

TOTAL WORKER DOSE AVOIDED $E_1-E_2-E_3-E_4=$ **-214**

Box E'

TOTAL PUBLIC DOSE AVOIDED $E_5-E_6-E_7=$ **1.95**

Box E"

ATTACHMENT 6. ESTIMATED VALUE OF AVOIDED RISKS AND DAMAGES
For the 15 mrem/year Risk-based Remediation Goal

Task	Prob.	Value of Damages	Product	Item(s)
F1. Estimated Value of Potential Injury or Deaths to Workers Avoided Enter the probability of an injury or death occurring. Enter the estimated value of potential injury or deaths to workers avoided from other risks (i.e., toxic chemicals, industrial hazards, fire, etc.). Enter the product(s) on line(s) for item F1.	1.0 1.0	$5,360 Worker Injury $80,000 Transport Accidents	-$5,360 -$80,000	F1
F2. Estimated Value of Potential Damages to the Environment to be Avoided Enter the probability of damages occurring to the environment. Enter estimated value of potential damages to the environment to be avoided (i.e., endangered species, national monument, wetland contamination, land contamination, odors, etc.). Enter the product(s) on line(s) for item F2.	1.0	$5,000 endangered species habitat	$5,000	F2
F3. Estimated Value of Potential Public/Worker Concerns to be Avoided. Enter the probability of public or worker concerns occurring. Enter the estimated value of potential public/worker concerns (i.e., press releases, news releases, public hearings, union negotiations, employee morale, etc.) and associated corrective actions to be avoided. Enter the product(s) on line(s) for item F3.	0.9	$120,000 public/worker concern	$108,000	F3
F4. Estimated Value of Impacts Associated with Noncompliance to be Avoided Enter the probability of a violation or civil penalty being levied. Enter the estimated value of impacts associated with noncompliance with federal, state, or local laws and rules (i.e., fines, civil penalties, legal expenses, cost of corrective actions, regulatory curtailment of programs, etc.) to be avoided. Enter the product(s) on line(s) for item F4.		Civil Liability, NYS Fine(s) & Legal Costs	?	F4
F5. Estimated Damages Associated with Shutdown to be Avoided Enter the probability of a facility shutdown or severe impact to the facility mission occurring. Enter the estimated value for the damages associated with shutdown of a facility program or its operation and its impact on long term facility mission objectives that could be avoided. Enter the product(s) on line(s) for item F5.			$0	F5
F6. Other Risks/Damages to be Avoided			$0	F6

ESTIMATED VALUE OF AVOIDED RISKS AND DAMAGES F1+ ...+ F6 = $27,640

Box F

ATTACHMENT 7. NET BENEFIT EVALUATION WORKSHEET
For the 15 mrem/year Risk-based Remediation Goal

Cost/Benefit	Dollars	Item(s)
G1. Estimated Economic Benefits Enter the results from Box C on line for item G1.	$819,000	G1
G2. Estimated Economic Costs Enter the results from Box D on line for item G2.	$28,650,610	G2
G3 Net Economic Benefit (Costs) Estimated benefit on line for item G1 minus estimated cost on line for item G2. Enter (G1) - (G2) on line G3.	-$27,831,610	G3

Value of Net Dose Savings	Person-Rem	Dollars/ Person-Rem	Dollars	Item(s)
G4. Value of Worker Net Dose Avoided Enter the result from Box E' and multiply by 1,000 $/person-rem. Enter result on line for item G4.	-214	x $2,000=	-$428,000	G4
G5. Value of Public Net Dose Avoided Enter the result from Box E" and multiply by 1,000 $/person-rem. Enter result on line for item G5.	1.95	x $2,000=	$3,900	G5

Value of Avoid Risks and Damages	Dollars	Item(s)
G6. Estimated Value of Avoided Risks and Damages	$27,640	G6

Net Benefit
Net benefit on line G3 plus the dollar value of the net dose savings on line for item G4 + G5 plus avoided risks and damages G6, i.e., (G3) + ... (G6).

-$28,227,970

Box G

Net Benefit Decision Index

1. If the net benefit is greater than 0, proceed to Worksheet H and perform the Qualitative Factor Analysis, then decide whether or not to accept the protective measure.

2. **If the net benefit is less than or equal to 0, proceed to Worksheet H and perform the Qualitative Factor Analysis, and either reject the protective measure or reevaluate the $/person-rem values using a case-specific value for the radiation detriment instead of the value used above.**

ATTACHMENT 8. QUALITATIVE FACTOR ANALYSIS WORKSHEET
For the 15 mrem/year Risk-based Remediation Goal

Questions on Qualitative Factors

H1. Worker Health and Safety Risks	Group Weighting Factor: _____

H1.1. How well will the implementation of the APM be in either preventing or reducing the radiation exposure to workers over the expected lifetime of the facility/protective measure?

Exposure to other health risks (not Quantified previously) by workers are not expected to be significant. Other hazardous substances are present at the HWMF, such as mercury and lead. Mercury concentrations at the former 445-3 underground storage tank (UST) were above the risk remediation goal for a child resident of 23 mg/kg. One soil sample (boring 36A = 429 mg/kg) was above the EPA lead-screening level of 400 mg/kg for soil ingestion using a residential scenario.

No Remedial Action: Workers who sample the HWMF monitoring wells could be exposed to the residual levels from these hazardous substances if no remedial actions were taken. However, the risk to present workers was considered minimal since the area that is contaminated is such a small fraction of the site.

With Remedial Action: Remedial workers intakes of hazardous materials during remediation was considered minimal, since all workers involved are required to wear protective clothing and half-face respirators. If remedial action was taken, since the radionuclide concentration in this soil is above the DCGL value, this soil that also contains lead and mercury will be removed and the mixed waste disposed of off-site. Therefore, the risk to workers from hazardous substances would eventually be eliminated.

H1.2. How well will the implementation of the APM be in either preventing or reducing the potential impacts on workers during its installation or during its decommissioning/remediation?

See H.1.1 above.

H2. Public Health and Safety Risks	Group Weighting Factor: _____

H2.1. How well will the implementation of the APM be in either preventing or reducing the current level of public exposure to other risks over the expected lifetime of the facility/protective measure?

Exposure to other health risks (not quantified previously) by the public are not expected to be significant.

No Remedial Action: The public who may use this open-space site in future could be exposed to the residual levels from the hazardous substances (mercury and lead). However, the risk to future visitors was considered minimal since the area that is contaminated is such a small fraction of the site and the amount of time spent is small.

With Remedial Action: As indicated in Section 2.2.3, exposure of the public to the fugitive dust during remedial actions was considered negligible. However, public health and safety risks are expected to be minimal since only trace levels of the hazardous materials exist and only a small percentage of the area is contaminated.

H2.2. How well will the implementation of the APM be in either preventing or reducing the potential impact on public health from other risks during its installation or during its decommissioning/remediation?

See H.2.1 above.

H3. Environmental Risks	Group Weighting Factor:

H3.1 How well will the implementation of the APM be in either preventing or reducing a potential adverse impact on the natural environment over the expected lifetime of the facility/protective measure?

The environmental risks have the most significant uncertainty.

No Remedial Action: If no remedial action is taken, the radiological risks to the wildlife and the risk from hazardous chemical is not really well known. Since no national monuments or cultural artifacts exist at the HWMF site there are no impacts to these environmental assets expected from no action.

With Remedial Action: If remedial actions are taken in the HWMF wetlands, the potential damage to the wetlands and its impact on local wildlife is unknown. The remediation of the wetland habitat could impact the endangered tiger salamander. Because the HWMF wetlands is a sensitive habitat, timing of the remediation and other precautions will be taken to avoid disturbing the tiger salamander.

H3.2 How well will the implementation of the APM be in either preventing or reducing the destruction of national monuments or cultural artifacts?

No national monuments or cultural artifacts exist.

H4. Community/Worker Concerns	Group Weighting Factor:

H4.1. How large a segment of the public or worker population will be aware or concerned about the problem addressed by the APM?

Most BNL workers and the public are aware of the radioactive contamination at the HWMF.

No Remedial Action: If no remedial action is taken, both groups of stakeholders would be outraged.

With Remedial Action: If remedial actions are taken the concerns of BNL's workers, the public, and politicians would be appeased. The public and politicians appear to be endorsing the option of large-scale excavation and off-site disposal.

H4.2. How much acceptance or interest will the community or worker population be expressing for the implementation of the APM?

The BNL workers, members of the public and politicians have endorsed the large scale excavation and offsite disposal option.

H5. Regulatory Compliance	Group Weighting Factor:

Questions on Qualitative Factors

H5.1. To what degree will the implementation of the APM prevent a violation of a requirement from the DOE orders, federal regulations, or state/local laws?

Remediation of the HWMF site is required by both Federal and State regulations. In addition, an interagency agreement has established the framework for the environmental restoration activities across the site. The U.S. Department of Energy (DOE) is required to comply with the terms and conditions of the associated Federal Facilities Agreement (Administrative Docket Number: II-CERCLA - FFA-00201) which became effective in May 1992.

No Remedial Action: If no remedial action is taken, current legal suits could be jeopardized and additional suits could be filed. Litigation is currently being pursued via a class action suit for civil claims for damages from breast cancer. This suit has been filed with Suffolk County Court by residents from Mastic Beach and Shirley. NYS-DEC and USEPA have taken administrative actions against DOE due to the damage to a natural resource, namely, the sole-source aquifer. Additional liabilities in the range of millions of dollars could result.

With Remedial Action: If remedial actions are taken, the CERCLA rule in 40 CFR 300, to remediate when individual lifetime cancer risks are greater than 1 in 10,000 will be complied. In addition, the DOE rule 10 CFR 834 proposed public dose limit of 100 mrem/yr will also be complied with if excavation and disposal were carried out The interagency agreement between DOE, EPA and NYS would be met, in part. This potential source of exposure could be argued as being minimal by the defense at trial.

H5.2. How likely is it that the problem to be addressed by the APM, or the implementation of the APM, will be resulting in an allegation from local, state, or regulatory authorities that its personnel are legally liable and subject to civil or criminal penalties?

Litigation is currently being pursued. A class action suit for increased incidences of breast cancer has been filed with Suffolk County Court. NYS - DEC has taken administrative actions against DOE due to the damage to a natural resource namely, the sole source aquifer.

H6. Long Term Effectiveness and Permanence	Group Weighting Factor: _____

H6.1. How effective and permanent will the implementation of the APM be in providing protection against the radiation hazard and/or the spread of radioactive materials during the expected life of the facility/protective measure?

This factor relates to the ability of the remedial action to produce an effective and permanent reduction in radiological and hazardous chemical risk.

No Remedial Action: If no remedial action is taken, effectiveness would be poor and the hazard would not be permanently removed.

With Remedial Action: If remedial actions are taken, very effective and permanent protection is afforded by excavation and disposal. Only minor leaching of residual radioactive material in the soil is expected to occur. Minimal residual risk is expected after the closure of BNL; the estimated dose from residual activity to the reasonable maximum-exposed person is expected to be much less than 15 mrem/yr.

H6.2 How effective and permanent will the implementation of the APM be in producing a minimal residual risk from the radiation hazard and/or the spread of radioactive materials following the conclusion of the expected activities?

Minimal residual risk was expected after the closure of BNL. The estimated dose from residual activity to the reasonable maximum exposed person is expected to be much less than 15 mrem/yr after the closure of BNL.

H7. Reduction of Toxicity, Mobility, or Volume through Treatment	Group Weighting Factor: _____

Questions on Qualitative Factors	
H7.1. How well will the implementation of the APM be in reducing the amount of radioactive materials that will be decontaminated, treated, reused, or recycled? No decontamination, soil washing, recycling or other treatment will be used. Some treatment and recycle options were evaluated during the feasibility study but were considered not to be cost-effective.	
H8. Miscellaneous Concerns	Group Weighting Factor: _____
H8.1. How well will the implementation of the APM be in increasing the flexibility of personnel or other resources? No impacts on personnel or other resources were expected.	
H8.2. How well will the implementation of the APM be in improving or maintaining the current level of quality and operation of the facility? No impacts on facility operations were expected. A new Hazardous Waste Storage Facility has been built and will replace the old HWMF before remedial actions are started.	

Hazardous Waste Management Facility (HWMF): Excavation/Disposal Cost Spreadsheets

HWMF Rad Soils Remediation Capitol & OM Costs*:									
Excavation to 100 mrem/yr Limit (Cs 137 >1500 pCi/g) and Offsite Disposal									
Created By: Bruce Dionne			C:HWMFSDIG.wb3						
Date Created: 3/1/97									
Date Revised: 4/01/97									
					Unit				
TASK	Totals	Item Costs	CDM Item Description	Quantity	Cost	Units	Capitol Costs		
Phase 1 Excavate/Backfill	$1,136,045								
Mobilization	$260,000	$260,000	(1) Remedial Design Sampling , Analysis & Inspections						
OU I HWMF	$876,045								
		22,220	(2a) Excavate LSA soils 1,500 - 2,800 pCi/g	2,020	$11	CY	$22,220		
		65,780	(2b) Excavate LLW soils > 2,800 pCi/g	5,980	$11	CY	$65,780		
		30,300	(2a3) Backfill LSA ditch with onsite soil	2,020	$15	CY	$30,300		
		242,400	(2a4) Verification Sampling for Blending	673	$360	Sample	$242,400		
		89,700	(2b5) Backfill LLW ditch with onsite soil	5,980	$15	CY	$89,700		
		1,595	(2f) Excavate Mixed Wastes	145	$11	CY	$1,595		
		2,175	(2f8) Backfill Mixed Waste ditch with onsite soil	145	$15	CY	$2,175		
		162,900	(2g) Excavate clean soil on-site and use for backfill	8,145	$20	CY	$162,900		
		250,000	(3) Volume reduction system						
		6,225	(4a) Backfill Wetland						
		2,750	(4b) Replace Vegetation						
Phase 2 Stabilize and Pack Waste	$2,669,015								
		325,220	(2a2) B-25s for LSA (3CY/B-25)	673	$483	Container	$325,220		
		1,283,771	(2b3) B-25s for LLW (3 CY/B-25)	2,658	$483	Container	$1,283,771		
		20,826	(2f6) B-25 Boxes for Mixed Waste						
		1,020,638	(2b1) Stabilization of LLW (1.3334 x soil vol.)	7,974	$128	CY	$1,020,638		
		18,560	(2f1&4) Stabilization of Mixed Waste						
Phase 3 Dispose Mixed Waste	$163,706								
		21,830	(2f2) Transport OU I Mixed Waste to Envirocare						
		19,982	(2f3) Disposal of OUI Mixed Waste at Envirocare						
		62,123	(2f5) Transport OU I Mixed Waste to Hanford						
		59,771	(2f7) Dispose of OU I Mixed Waste at Hanford						
Phase 4 Dispose LSA & LLW	$8,585,366								
Envirocare	$731,240	381,780	(2a1) Transport OU I LSA to Envirocare	2,020	$189	CY	$381,780		
		349,460	(2a2) Disposal of OUI LSA at Envirocare	2,020	$173	CY	$349,460		
Hanford	$7,854,126	4,002,813	(2b2) Transport OU I LLW to Hanford	7,974	$502	CY	$4,002,813		
		3,851,313	(2b4) Disposal of OU I LLW at Hanford	7,974	$483	CY	$3,851,313		
Management & Oversight	$2,609,445								
		304,091	Contractor Health and Safety						
		337,541	Permitting and Legal						
		1,687,703	Engineering Construction Services						
		280,110	BNL Oversight and Tech Support						
Planning and Design	$620,543	620,543	A/E Engineering/Cost Assessment						
Chemical Sampling & Analysis	$179,100								
		179,100	(5) Remedial Action & Termination Surveys/Analyses						
Operating & Maintenence Costs	$457,641						O&M	O&M	O&M
		194,828	(6) Long Term Rad. Monitoring @ 8 MW (O&M)				Annualized Cost	Frequency	Present Worth
			(6a1) Semiannual Sampling Frequency for yrs 1 to 5	80	$65	Sample	$5,200	10	$23,992
			(6a2) Annual Sampling Frequency for yrs 6 to 50 (5MH	40	$65	Sample	$2,600	44	$63,749
			(6b1) Semiannual Analysis Frequency for yrs 1 to 5	16	$360	Analysis	$5,760	10	$26,575
			(6b2) Annual Analysis Frequency for yrs 6 to 50	8	$360	Analysis	$2,880	44	$70,613
			(6c1) Termination Survey Labor @ 50 y	200	$65	Hr	$260	1	$2,965
			(6c2) Portable Radiation Monitoring Equipment @ 50 y	8	$3,800	Det/Meter	$608	1	$6,934
		175,480	(7) Long Term Rad/Eco. Monitoring Reports (O&M)						
			(7a1) Semiannual Reporting Frequency for yrs 1 to 5	160	$65	Report	$10,400	10	$47,983
			(7a2) Annual Reporting Frequency for yrs 6 to 50	80	$65	Report	$5,200	44	$127,497
		74,876	(8) CERCLA 5 yr Monitoring Reports (O&M)	1	$15,000	Report	$3,000	9	$74,876
		12,457	HWMF Maintenence & Security Inspections (O&M)	12	$40	Hr	$480	48	$12,457
								Total O&M >	$457,641
TOTAL >	$16,420,861								
* CDM's OU I FS Appendix I									
Cost Estimates for Alternative 3B:									
Large Scale Excavation/Disposal									

HWMF Rad Soils Remediation Capitol & OM Costs*:									
Excavation to 75 mrem/yr Limit (Cs 137 >1135 pCi/g) and Offsite Disposal									
Created By: Bruce Dionne			C:HWMFSDIG.wb3						
Date Created: 3/1/97									
Date Revised: 4/01/97									
					Unit				
TASK	Totals	Item Costs	CDM Item Description	Quantity	Cost	Units	Capitol Costs		
Phase 1 Excavate/Backfill	$1,300,385								
Mobilization	$260,000	$260,000	(1) Remedial Design Sampling , Analysis & Inspections						
OU I HWMF	$1,040,385								
		33,110	(2a) Excavate LSA soils 1,135 - 2,800 pCi/g	3,010	$11	CY	$33,110		
		65,780	(2b) Excavate LLW soils > 2,800 pCi/g	5,980	$11	CY	$65,780		
		45,150	(2a3) Backfill LSA ditch with onsite soil	3,010	$15	CY	$45,150		
		361,200	(2a4) Verification Sampling for Blending	1,003	$360	Sample	$361,200		
		89,700	(2b5) Backfill LLW ditch with onsite soil	5,980	$15	CY	$89,700		
		1,595	(2f) Excavate Mixed Wastes	145	$11	CY	$1,595		
		2,175	(2f8) Backfill Mixed Waste ditch with onsite soil	145	$15	CY	$2,175		
		182,700	(2g) Excavate clean soil on-site and use for backfill	9,135	$20	CY	$182,700		
		250,000	(3) Volume reduction system						
		6,225	(4a) Backfill Wetland						
		2,750	(4b) Replace Vegetation						
Phase 2 Stabilize and Pack Waste	$2,828,405								
		484,610	(2a2) B-25s for LSA (3CY/B-25)	1,003	$483	Container	$484,610		
		1,283,771	(2b3) B-25s for LLW (3 CY/B-25)	2,658	$483	Container	$1,283,771		
		20,826	(2f6) B-25 Boxes for Mixed Waste						
		1,020,638	(2b1) Stabilization of LLW (1.3334 x soil vol.)	7,974	$128	CY	$1,020,638		
		18,560	(2f1&4) Stabilization of Mixed Waste						
Phase 3 Dispose Mixed Waste	$163,706								
		21,830	(2f2) Transport OU I Mixed Waste to Envirocare						
		19,982	(2f3) Disposal of OUI Mixed Waste at Envirocare						
		62,123	(2f5) Transport OU I Mixed Waste to Hanford						
		59,771	(2f7) Dispose of OU I Mixed Waste at Hanford						
Phase 4 Dispose LSA & LLW	$8,943,746								
Envirocare	$1,089,620	568,890	(2a1) Transport OU I LSA to Envirocare	3,010	$189	CY	$568,890		
		520,730	(2a2) Disposal of OUI LSA at Envirocare	3,010	$173	CY	$520,730		
Hanford	$7,854,126	4,002,813	(2b2) Transport OU I LLW to Hanford	7,974	$502	CY	$4,002,813		
		3,851,313	(2b4) Disposal of OU I LLW at Hanford	7,974	$483	CY	$3,851,313		
Management & Oversight	$2,609,445								
		304,091	Contractor Health and Safety						
		337,541	Permitting and Legal						
		1,687,703	Engineering Construction Services						
		280,110	BNL Oversight and Tech Support						
Planning and Design	$620,543	620,543	A/E Engineering/Cost Assessment						
Chemical Sampling & Analysis	$179,100								
		179,100	(5) Remedial Action & Termination Surveys/Analyses						
Operating & Maintenence Costs	$457,641						O&M	O&M	
		194,828	(6) Long Term Rad. Monitoring @ 8 MW (O&M)				Annualized Cost	Frequency	Present Worth
			(6a1) Semiannual Sampling Frequency for yrs 1 to 5	80	$65	Sample	$5,200	10	$23,992
			(6a2) Annual Sampling Frequency for yrs 6 to 50 (5MH)	40	$65	Sample	$2,600	44	$63,749
			(6b1) Semiannual Analysis Frequency for yrs 1 to 5	16	$360	Analysis	$5,760	10	$26,575
			(6b2) Annual Analysis Frequency for yrs 6 to 50	8	$360	Analysis	$2,880	44	$70,613
			(6c1) Termination Survey Labor @ 50 y	200	$65	Hr	$260	1	$2,965
			(6c2) Portable Radiation Monitoring Equipment @ 50 y	8	$3,800	Det/Meter	$608	1	$6,934
		175,480	(7) Long Term Rad/Eco. Monitoring Reports (O&M)						
			(7a1) Semiannual Reporting Frequency for yrs 1 to 5	160	$65	Report	$10,400	10	$47,983
			(7a2) Annual Reporting Frequency for yrs 6 to 50	80	$65	Report	$5,200	44	$127,497
		74,876	(8) CERCLA 5 yr Monitoring Reports (O&M)	1	$15,000	Report	$3,000	9	$74,876
		12,457	HWMF Maintenence & Security Inspections (O&M)	12	$40	Hr	$480	48	$12,457
								Total O&M >	$457,641
TOTAL >	$17,102,971								
* CDM's OU I FS Appendix I									
Cost Estimates for Alternative 3B:									
Large Scale Excavation/Disposal									

HWMF Rad Soils Remediation Capitol & OM Costs*:									
Excavation to 25 mrem/yr Limit (Cs 137 >378 pCi/g) and Offsite Disposal									
Created By: Bruce Dionne			C:HWMFSDIG.wb3						
Date Created: 3/1/97									
Date Revised: 4/01/97									
					Unit				
TASK	Totals	Item Costs	CDM Item Description	Quantity	Cost	Units	Capitol Costs		
Phase 1 Excavate/Backfill	$3,161,245								
Mobilization	$260,000	$260,000	(1) Remedial Design Sampling , Analysis & Inspections						
OU I HWMF	$2,901,245								
		156,420	(2a) Excavate LSA soils 378 - 2,800 pCi/g	14,220	$11	CY	$156,420		
		65,780	(2b) Excavate LLW soils > 2,800 pCi/g	5,980	$11	CY	$65,780		
		213,300	(2a3) Backfill LSA ditch with onsite soil	14,220	$15	CY	$213,300		
		1,706,400	(2a4) Verification Sampling for Blending	4,740	$360	Sample	$1,706,400		
		89,700	(2b5) Backfill LLW ditch with onsite soil	5,980	$15	CY	$89,700		
		1,595	(2f) Excavate Mixed Wastes	145	$11	CY	$1,595		
		2,175	(2f8) Backfill Mixed Waste ditch with onsite soil	145	$15	CY	$2,175		
		406,900	(2g) Excavate clean soil on-site and use for backfill	20,345	$20	CY	$406,900		
		250,000	(3) Volume reduction system						
		6,225	(4a) Backfill Wetland						
		2,750	(4b) Replace Vegetation						
Phase 2 Stabilize and Pack Waste	$4,633,215								
		2,289,420	(2a2) B-25s for LSA (3CY/B-25)	4,740	$483	Container	$2,289,420		
		1,283,771	(2b3) B-25s for LLW (3 CY/B-25)	2,658	$483	Container	$1,283,771		
		20,826	(2f6) B-25 Boxes for Mixed Waste						
		1,020,638	(2b1) Stabilization of LLW (1.3334 x soil vol.)	7,974	$128	CY	$1,020,638		
		18,560	(2f1&4) Stabilization of Mixed Waste						
Phase 3 Dispose Mixed Waste	$163,706								
		21,830	(2f2) Transport OU I Mixed Waste to Envirocare						
		19,982	(2f3) Disposal of OUI Mixed Waste at Envirocare						
		62,123	(2f5) Transport OU I Mixed Waste to Hanford						
		59,771	(2f7) Dispose of OU I Mixed Waste at Hanford						
Phase 4 Dispose LSA & LLW	$13,001,766								
Envirocare	$5,147,640	2,687,580	(2a1) Transport OU I LSA to Envirocare	14,220	$189	CY	$2,687,580		
		2,460,060	(2a2) Disposal of OUI LSA at Envirocare	14,220	$173	CY	$2,460,060		
Hanford	$7,854,126	4,002,813	(2b2) Transport OU I LLW to Hanford	7,974	$502	CY	$4,002,813		
		3,851,313	(2b4) Disposal of OU I LLW at Hanford	7,974	$483	CY	$3,851,313		
Management & Oversight	$2,609,445								
		304,091	Contractor Health and Safety						
		337,541	Permitting and Legal						
		1,687,703	Engineering Construction Services						
		280,110	BNL Oversight and Tech Support						
Planning and Design	$620,543	620,543	A/E Engineering/Cost Assessment						
Chemical Sampling & Analysis	$179,100								
		179,100	(5) Remedial Action & Termination Surveys/Analyses						
Operating & Maintenence Costs	$457,641						O&M	O&M	
		194,828	(6) Long Term Rad. Monitoring @ 8 MW (O&M)				Annualized Cost	Frequency	Present Worth
			(6a1) Semiannual Sampling Frequency for yrs 1 to 5	80	$65	Sample	$5,200	10	$23,992
			(6a2) Annual Sampling Frequency for yrs 6 to 50 (5MH	40	$65	Sample	$2,600	44	$63,749
			(6b1) Semiannual Analysis Frequency for yrs 1 to 5	16	$360	Analysis	$5,760	10	$26,575
			(6b2) Annual Analysis Frequency for yrs 6 to 50	8	$360	Analysis	$2,880	44	$70,613
			(6c1) Termination Survey Labor @ 50 y	200	$65	Hr	$260	1	$2,965
			(6c2) Portable Radiation Monitoring Equipment @ 50 y	8	$3,800	Det/Meter	$608	1	$6,934
		175,480	(7) Long Term Rad/Eco. Monitoring Reports (O&M)				0	0	$0
			(7a1) Semiannual Reporting Frequency for yrs 1 to 5	160	$65	Report	$10,400	10	$47,983
			(7a2) Annual Reporting Frequency for yrs 6 to 50	80	$65	Report	$5,200	44	$127,497
		74,876	(8) CERCLA 5 yr Monitoring Reports (O&M)	1	$15,000	Report	$3,000	9	$74,876
		12,457	HWMF Maintenence & Security Inspections (O&M)	12	$40	Hr	$480	48	$12,457
								Total O&M>	$457,641
TOTAL >	$24,826,661								
* CDM's OU I FS Appendix I									
Cost Estimates for Alternative 3B:									
Large Scale Excavation/Disposal									

HWMF Rad Soils Remediation Capitol & OM Costs*:									
Excavation to 15 mrem/yr Limit (Cs 137 >227 pCi/g) and Offsite Disposal									
Created By: Bruce Dionne			C:HWMF$DIG.wb3						
Date Created: 3/1/97									
Date Revised: 4/01/97									
					Unit				
TASK	**Totals**	**Item Costs**	**CDM Item Description**	**Quantity**	**Cost**	**Units**	**Capitol Costs**		
Phase 1 Excavate/Backfill	**$4,082,545**								
Mobilization	$260,000	$260,000	(1) Remedial Design Sampling , Analysis & Inspections						
OU I HWMF	$3,822,545								
		217,470	(2a) Excavate LSA soils 227 - 2,800 pCi/g	19,770	$11	CY	$217,470		
		65,780	(2b) Excavate LLW soils > 2,800 pCi/g	5,980	$11	CY	$65,780		
		296,550	(2a3) Backfill LSA ditch with onsite soil	19,770	$15	CY	$296,550		
		2,372,400	(2a4) Verification Sampling for Blending	6,590	$360	Sample	$2,372,400		
		89,700	(2b5) Backfill LLW ditch with onsite soil	5,980	$15	CY	$89,700		
		1,595	(2f) Excavate Mixed Wastes	145	$11	CY	$1,595		
		2,175	(2f8) Backfill Mixed Waste ditch with onsite soil	145	$15	CY	$2,175		
		517,900	(2g) Excavate clean soil on-site and use for backfill	25,895	$20	CY	$517,900		
		250,000	(3) Volume reduction system						
		6,225	(4a) Backfill Wetland						
		2,750	(4b) Replace Vegetation						
Phase 2 Stabilize and Pack Waste	**$5,526,765**								
		3,182,970	(2a2) B-25s for LSA (3CY/B-25)	6,590	$483	Container	$3,182,970		
		1,283,771	(2b3) B-25s for LLW (3 CY/B-25)	2,658	$483	Container	$1,283,771		
		20,826	(2f6) B-25 Boxes for Mixed Waste						
		1,020,638	(2b1) Stabilization of LLW (1.3334 x soil vol.)	7,974	$128	CY	$1,020,638		
		18,560	(2f1&4) Stabilization of Mixed Waste						
Phase 3 Dispose Mixed Waste	**$163,706**								
		21,830	(2f2) Transport OU I Mixed Waste to Envirocare						
		19,982	(2f3) Disposal of OUI Mixed Waste at Envirocare						
		62,123	(2f5) Transport OU I Mixed Waste to Hanford						
		59,771	(2f7) Dispose of OU I Mixed Waste at Hanford						
Phase 4 Dispose LSA & LLW	**$15,010,866**								
Envirocare	$7,156,740	3,736,530	(2a1) Transport OU I LSA to Envirocare	19,770	$189	CY	$3,736,530		
		3,420,210	(2a2) Disposal of OUI LSA at Envirocare	19,770	$173	CY	$3,420,210		
Hanford	$7,854,126	4,002,813	(2b2) Transport OU I LLW to Hanford	7,974	$502	CY	$4,002,813		
		3,851,313	(2b4) Disposal of OU I LLW at Hanford	7,974	$483	CY	$3,851,313		
Management & Oversight	**$2,609,445**								
		304,091	Contractor Health and Safety						
		337,541	Permitting and Legal						
		1,687,703	Engineering Construction Services						
		280,110	BNL Oversight and Tech Support						
Planning and Design	**$620,543**	620,543	A/E Engineering/Cost Assessment						
Chemical Sampling & Analysis	**$179,100**								
		179,100	(5) Remedial Action & Termination Surveys/Analyses						
Operating & Maintenence Costs	**$457,641**						**O&M**	**O&M**	
		194,828	(6) Long Term Rad. Monitoring @ 8 MW (O&M)				**Annualized Cost**	**Frequency**	**Present Worth**
			(6a1) Semiannual Sampling Frequency for yrs 1 to 5	80	$65	Sample	$5,200	10	$23,992
			(6a2) Annual Sampling Frequency for yrs 6 to 50 (5MH	40	$65	Sample	$2,600	44	$63,749
			(6b1) Semiannual Analysis Frequency for yrs 1 to 5	16	$360	Analysis	$5,760	10	$26,575
			(6b2) Annual Analysis Frequency for yrs 6 to 50	8	$360	Analysis	$2,880	44	$70,613
			(6c1) Termination Survey Labor @ 50 y	200	$65	Hr	$260	1	$2,965
			(6c2) Portable Radiation Monitoring Equipment @ 50 y	8	$3,800	Det/Meter	$608	1	$6,934
		175,480	(7) Long Term Rad/Eco. Monitoring Reports (O&M)						
			(7a1) Semiannual Reporting Frequency for yrs 1 to 5	160	$65	Report	$10,400	10	$47,983
			(7a2) Annual Reporting Frequency for yrs 6 to 50	80	$65	Report	$5,200	44	$127,497
		74,876	(8) CERCLA 5 yr Monitoring Reports (O&M)	1	$15,000	Report	$3,000	9	$74,876
		12,457	HWMF Maintenence & Security Inspections (O&M)	12	$40	Hr	$480	48	$12,457
								Total O&M >	**$457,641**
TOTAL >	**$28,650,611**								
* CDM's OU I FS Appendix I									
Cost Estimates for Alternative 3B:									
Large Scale Excavation/Disposal									

HWMF Rad Soils Remediation Capitol & OM Costs*:									
Excavation to 1 mrem/yr Limit (Cs 137 >15 pCi/g) and Offsite Disposal									
Created By: Bruce Dionne			C:HWMF$DIG.wb3						
Date Created: 3/1/97									
Date Revised: 4/01/97									
					Unit				
TASK	**Totals**	**Item Costs**	**CDM Item Description**	**Quantity**	**Cost**	**Units**	**Capitol Costs**		
Phase I Excavate/Backfill	**$12,774,637**								
Mobilization	$260,000	$260,000	(1) Remedial Design Sampling , Analysis & Inspections						
OU I HWMF	$12,514,637								
		793,452	(2a) Excavate LSA soils 15 - 2,800 pCi/g	72,132	$11	CY	$793,452		
		65,780	(2b) Excavate LLW soils > 2,800 pCi/g	5,980	$11	CY	$65,780		
		1,081,980	(2a3) Backfill LSA ditch with onsite soil	72,132	$15	CY	$1,081,980		
		8,655,840	(2a4) Verification Sampling for Blending	24,044	$360	Sample	$8,655,840		
		89,700	(2b5) Backfill LLW ditch with onsite soil	5,980	$15	CY	$89,700		
		1,595	(2f) Excavate Mixed Wastes	145	$11	CY	$1,595		
		2,175	(2f8) Backfill Mixed Waste ditch with onsite soil	145	$15	CY	$2,175		
		1,565,140	(2g) Excavate clean soil on-site and use for backfill	78,257	$20	CY	$1,565,140		
		250,000	(3) Volume reduction system						
		6,225	(4a) Backfill Wetland						
		2,750	(4b) Replace Vegetation						
Phase 2 Stabilize and Pack Waste	**$13,957,047**								
		11,613,252	(2a2) B-25s for LSA (3CY/B-25)	24,044	$483	Container	$11,613,252		
		1,283,771	(2b3) B-25s for LLW (3 CY/B-25)	2,658	$483	Container	$1,283,771		
		20,826	(2f6) B-25 Boxes for Mixed Waste						
		1,020,638	(2b1) Stabilization of LLW (1.3334 x soil vol.)	7,974	$128	CY	$1,020,638		
		18,560	(2f1&4) Stabilization of Mixed Waste						
Phase 3 Dispose Mixed Waste	**$163,706**								
		21,830	(2f2) Transport OU I Mixed Waste to Envirocare						
		19,982	(2f3) Disposal of OUI Mixed Waste at Envirocare						
		62,123	(2f5) Transport OU I Mixed Waste to Hanford						
		59,771	(2f7) Dispose of OU I Mixed Waste at Hanford						
Phase 4 Dispose LSA & LLW	**$33,965,910**								
Envirocare	$26,111,784	13,632,948	(2a1) Transport OU I LSA to Envirocare	72,132	$189	CY	$13,632,948		
		12,478,836	(2a2) Disposal of OUI LSA at Envirocare	72,132	$173	CY	$12,478,836		
Hanford	$7,854,126	4,002,813	(2b2) Transport OU I LLW to Hanford	7,974	$502	CY	$4,002,813		
		3,851,313	(2b4) Disposal of OU I LLW at Hanford	7,974	$483	CY	$3,851,313		
Management & Oversight	**$2,609,445**								
		304,091	Contractor Health and Safety						
		337,541	Permitting and Legal						
		1,687,703	Engineering Construction Services						
		280,110	BNL Oversight and Tech Support						
Planning and Design	**$620,543**	620,543	A/E Engineering/Cost Assessment						
Chemical Sampling & Analysis	**$179,100**								
		179,100	(5) Remedial Action & Termination Surveys/Analyses						
Operating & Maintenence Costs	**$457,641**						**O&M**	**O&M**	
		194,828	(6) Long Term Rad. Monitoring @ 8 MW (O&M)				**Annualized Cost**	**Frequency**	**Present Worth**
			(6a1) Semiannual Sampling Frequency for yrs 1 to 5	80	$65	Sample	$5,200	10	$23,992
			(6a2) Annual Sampling Frequency for yrs 6 to 50 (5MH	40	$65	Sample	$2,600	44	$63,749
			(6b1) Semiannual Analysis Frequency for yrs 1 to 5	16	$360	Analysis	$5,760	10	$26,575
			(6b2) Annual Analysis Frequency for yrs 6 to 50	8	$360	Analysis	$2,880	44	$70,613
			(6c1) Termination Survey Labor @ 50 y	200	$65	Hr	$260	1	$2,965
			(6c2) Portable Radiation Monitoring Equipment @ 50 y	8	$3,800	Det/Meter	$608	1	$6,934
		175,480	(7) Long Term Rad/Eco. Monitoring Reports (O&M)						
			(7a1) Semiannual Reporting Frequency for yrs 1 to 5	160	$65	Report	$10,400	10	$47,983
			(7a2) Annual Reporting Frequency for yrs 6 to 50	80	$65	Report	$5,200	44	$127,497
		74,876	(8) CERCLA 5 yr Monitoring Reports (O&M)	1	$15,000	Report	$3,000	9	$74,876
		12,457	HWMF Maintenence & Security Inspections (O&M)	12	$40	Hr	$480	48	$12,457
								Total O&M >	$457,641
TOTAL >	$64,728,029								
* CDM's OU I FS Appendix I									
Cost Estimates for Alternative 3B:									
Large Scale Excavation/Disposal									

HWMF Rad Soils Remediation Present Worth of Future OM Costs*:												C:HWMF$DIG.wb3
				O&M	O&M	NPV						
(6) Long Term Rad. Monitoring @ 8 MW (O&M)	Quantity	Unit Cost	Unit	Annualized Cost	Frequency							
(6a1) Semiannual Sampling Frequency for yrs 1 to 5	80	$65	Sample	$5,200	10	$23,992						
(6a2) Annual Sampling Frequency for yrs 6 to 50 (5MH)	40	$65	Sample	$2,600	44	$63,749						
(6b1) Semiannual Analysis Frequency for yrs 1 to 5	16	$360	Analysis	$5,760	10	$26,575						
(6b2) Annual Analysis Frequency for yrs 6 to 50	8	$360	Analysis	$2,880	44	$70,613						
(6c1) Termination Survey Labor @ 50 y	200	$65	Hr	$260	1	$2,965						
(6c2) Portable Radiation Monitoring Equipment @ 50 y	8	$3,800	Det/Meter	$608	1	$6,934						
(7) Long Term Rad/Eco. Monitoring Reports (O&M)												
(7a1) Semiannual Reporting Frequency for yrs 1 to 5	160	$65	Report	$10,400	10	$47,983						
(7a2) Annual Reporting Frequency for yrs 6 to 50	80	$65	Report	$5,200	44	$127,497						
(8) CERCLA 5 yr Monitoring Reports (O&M)	1	$15,000	Report	$3,000	9	$74,876						
HWMF Maintenence & Security Inspections (O&M)	12	$40	Hr	$480	48	$12,457						
			(6a1)	(6a2)	(6b1)	(6b2)	(6c1)	(6c2)	(7a1)	(7a2)	(8)	Sec Insp
	1	01/01/97	2600	0	2880	0	0	0	5200	0	0	
		06/01/97	2600	0	2880	0	0	0	5200	0	0	
	2	01/01/98	2600	0	2880	0	0	0	5200	0	0	
		06/01/98	2600	0	2880	0	0	0	5200	0	0	
	3	01/01/99	2600	0	2880	0	0	0	5200	0	0	
		06/01/99	2600	0	2880	0	0	0	5200	0	0	
	4	01/01/00	2600	0	2880	0	0	0	5200	0	0	
		06/01/00	2600	0	2880	0	0	0	5200	0	0	
	5	01/01/01	2600	0	2880	0	0	0	5200	0	0	
		06/01/01	2600	0	2880	0	0	0	5200	0	0	
	1	01/01/97		0		0	0	0		0	0	480
	2	01/01/98		0		0	0	0		0	0	480
	3	01/01/99		0		0	0	0		0	0	480
	4	01/01/00		0		0	0	0		0	0	480
	5	01/01/01		0		0	0	0		0	0	480
	6	01/01/02		2600		2880	0	0		5200	0	480
	7	01/01/03		2600		2880	0	0		5200	0	480
	8	01/01/04		2600		2880	0	0		5200	0	480
	9	01/01/05		2600		2880	0	0		5200	15000	480
	10	01/01/06		2600		2880	0	0		5200	0	480
	11	01/01/07		2600		2880	0	0		5200	0	480
	12	01/01/08		2600		2880	0	0		5200	0	480
	13	01/01/09		2600		2880	0	0		5200	0	480
	14	01/01/10		2600		2880	0	0		5200	15000	480
	15	01/01/11		2600		2880	0	0		5200	0	480
	16	01/01/12		2600		2880	0	0		5200	0	480
	17	01/01/13		2600		2880	0	0		5200	0	480
	18	01/01/14		2600		2880	0	0		5200	0	480
	19	01/01/15		2600		2880	0	0		5200	15000	480
	20	01/01/16		2600		2880	0	0		5200	0	480
	21	01/01/17		2600		2880	0	0		5200	0	480
	22	01/01/18		2600		2880	0	0		5200	0	480
	23	01/01/19		2600		2880	0	0		5200	0	480
	24	01/01/20		2600		2880	0	0		5200	15000	480
	25	01/01/21		2600		2880	0	0		5200	0	480
	26	01/01/22		2600		2880	0	0		5200	0	480
	27	01/01/23		2600		2880	0	0		5200	0	480
	28	01/01/24		2600		2880	0	0		5200	0	480
	29	01/01/25		2600		2880	0	0		5200	15000	480
	30	01/01/26		2600		2880	0	0		5200	0	480
	31	01/01/27		2600		2880	0	0		5200	0	480
	32	01/01/28		2600		2880	0	0		5200	0	480
	33	01/01/29		2600		2880	0	0		5200	0	480
	34	01/01/30		2600		2880	0	0		5200	15000	480
	35	01/01/31		2600		2880	0	0		5200	0	480
	36	01/01/32		2600		2880	0	0		5200	0	480
	37	01/01/33		2600		2880	0	0		5200	0	480
	38	01/01/34		2600		2880	0	0		5200	0	480
	39	01/01/35		2600		2880	0	0		5200	15000	480
	40	01/01/36		2600		2880	0	0		5200	0	480
	41	01/01/37		2600		2880	0	0		5200	0	480
	42	01/01/38		2600		2880	0	0		5200	0	480
	43	01/01/39		2600		2880	0	0		5200	0	480
	44	01/01/40		2600		2880	0	0		5200	15000	480
	45	01/01/41		2600		2880	0	0		5200	0	480
	46	01/01/42		2600		2880	0	0		5200	0	480
	47	01/01/43		2600		2880	0	0		5200	0	480
	48	01/01/44		2600		2880	0	0		5200	0	480
	49	01/01/45		2600		2880	0	0		5200	15000	480
	50	01/01/46		2600		2880	13000	30400		5200		480

@NPV - Present Value of Future Cash Flow

Syntax
@NPV(Rate, Block, <Type>)

Rate	=	A numeric value > -1, representing the periodic interest rate (the fixed interest rate per compounding period).
Block	=	A cell block (reference or name) containing cash flow information for the investment.
Type	=	An optional numeric value that indicates whether payments or cash flows occur at the beginning (1) or the end (0) of the period; default = 0.

@NPV calculates the current value of estimated cash flow values (Block), discounted at the given interest rate (Rate). It is helpful in determining how much an investment is currently worth, based on expected earnings, although its accuracy is entirely dependent on the accuracy of the cash flow table.

The optional third argument, Type, can be 0 or 1, depending on whether the cash flows are at the beginning or the end of the period. The default value is 0, end of the period.

The formula for @NPV(Rate,Block,Type)–if Block consists of $v_1,\ldots,v_n$–is given by

If Type = 0

$$\frac{v_1}{(1+\mathrm{Rate})}+\ldots+\frac{v_n}{(1+\mathrm{Rate})^n}$$

If Type = 1

$$v_1+\frac{v_2}{(1+\mathrm{Rate})}+\ldots+\frac{v_n}{(1+\mathrm{Rate})^{n-1}}$$

The cash flow table in Block should show expected income and debits over a period of time. If Type is 0, Quattro* Pro assumes that the amounts are received at the end of regular intervals. If Type is 1, it assumes the amounts are received at the beginning of regular intervals. Quattro Pro also assumes that the length of this interval is the same as the period on which interest is compounded. In other words, if monthly cash flow is estimated, Rate needs to show monthly interest. To convert annual interest to monthly interest, simply divide by 12.

Examples

	A	B	C	D	E
1	1992	1993	1994	1995	1996
2	-5000	+2000	+2000	+2000	+2000

Suppose you are considering investing $5000 this year, and you expect a return of $2000 in each of the next four years. Put the values -5000,+2000,+2000,+2000,+2000 in the block A2..E2. The net present value, using a discount rate of 10%, is `@NPV(.1,A2..E2,1)` which equals $1,340. Or, combine the initial investment with the present value of the four returns with `+A2+@NPV(.1,B2..E2,0)`. The result is the same.

Additional examples

	A	B	C	D
1	Jan	8000	200	3500
2	Feb	9000	350	4000
3	Mar	8500	-300	3000
4	Apr	9500	600	5000

`@NPV(1.25%,B1..B4)` = $33,908.92

`@NPV(15%/12,C1..C4)` = $820.83

`@NPV(15%/12,D1..D4)` = $15,006.51

`-2000+@NPV(15%/12,D1..D4)` = $13,006.51 (assumes an initial cash outflow of $2,000)

Related Topics