

**NAVAL STATION GREAT LAKES
DEFAULT AND RECOMMENDED VALUES FOR RESRAD INPUT PARAMETERS**

RESRAD Version 6.3					Parameter Justification	
Parameter	Code	Default Value	User Input Value	Units	Comments	Reference
PATHWAY SELECTIONS						
External Gamma	N/A	Active	Active	N/A	N/A	N/A
Inhalation (without radon)	N/A	Active	Active	N/A	N/A	N/A
Plant Ingestion	N/A	Active	Inactive	N/A	Not applicable for industrial worker	N/A
Meat Ingestion	N/A	Active	Inactive	N/A	Not applicable for industrial worker	N/A
Milk Ingestion	N/A	Active	Inactive	N/A	Not applicable for industrial worker	N/A
Aquatic Foods	N/A	Active	Inactive	N/A	Not applicable for industrial worker	N/A
Drinking Water	N/A	Active	Active	N/A	N/A	N/A
Soil Ingestion	N/A	Active	Active	N/A	N/A	N/A
Radon	N/A	Inactive	Inactive	N/A	Not applicable per Federal Register, 1994, p. 43210	NRC 1994
CONTAMINATED ZONE PARAMETERS						
Area of contaminated zone	AREA	10,000	10,000	m ²	The RESRAD default is used as the base case for natural thorium.	Yu 1993 (Section 30)
Thickness of contaminated zone	THICK0	2	1	m	A conservative approach was selected to define this parameter. The thickness was determined based on previous remediation history at portions of the facility.	Yu 1993 (Section 39)
Length parallel to the aquifer	LCZPAQ	100	100	m	For all cases, the length parallel to the aquifer was calculated as the square root of the contaminated zone area.	Yu 1993 (Section 16)
Times for calculations	TI	1, 3, 10, 30, 100, 300, 1000	1, 3, 10, 30, 100, 300, 1000	yr	RESRAD defaults for calculation times.	Yu 2001
COVER AND CONTAMINATED ZONE HYDROLOGICAL DATA						
Cover depth	COVER)	0	0	m	As a conservative approach for dose modeling, no cover depth was assumed.	Yu 1993 (Section 31)
Density of cover material	DENSCV	1.5	N/A	g/cm ³	Lack of cover depth precludes an assigned value for this parameter.	Yu 1993 (Section 2)
Cover erosion rate	VCV	0.001	N/A	m/yr	Lack of cover depth precludes an assigned value for this parameter.	Yu 1993 (Section 14)

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Density of contaminated zone	DENSCZ	1.5	1.5	g/cm ³	Soil density range from samples obtained by USDA at the site was 1.2 to 1.7. The RESRAD default was chosen as a reasonable average.	USDA 2006b Yu 1993 (Section 2)
Contaminated zone erosion rate	VCZ	0.001	0.001	m/yr	RESRAD default used.	Yu 1993 (Section 14)
Contaminated zone total porosity	TPCZ	0.4	0.4	unitless	RESRAD default used as an estimate of the total porosity	Yu 1993 (Section 3)
Contaminated zone field capacity	FCCZ	0.2	0.2	unitless	RESRAD default used as an estimate of field capacity	Yu 2001
Contaminated zone hydraulic conductivity	HCCZ	10	5.36	m/yr	Assumed to be a factor of 10 less than the saturated zone hydraulic conductivity for silty clay loam from Table 5.2 of the reference.	Yu 1993 (Section 5)
Contaminated zone b parameter	BCZ	5.3	7.75	unitless	The contaminated zone b parameter was selected from Table 13.1 of the reference for silty clay loam.	Yu 1993 (Section 13)
Humidity in air	HUMID	8	N/A	g/m ³	Humidity input is only required in RESRAD when tritium is a radionuclide of concern.	Yu 2001
Evapotranspiration coefficient	EVAPTR	0.5	0.5	unitless	No site-specific data available. RESRAD default used.	Yu 1993 (Section 12)
Wind speed	WIND	2	4.65	m/sec	Per city-data.com, the wind speed for the Chicgao, IL. area averages 10.4 miles per hour (4.65 m/sec).	Yu 1993 (Section 21) Internet search
Precipitation	PRECIP	1	0.91	m/yr	Site-specific value based on reported 35.82 inches per year (0.91 m/yr)	Yu 1993 (Section 9) Internet search
Irrigation	RI	0.2	0.2	m/yr	No site-specific data available. RESRAD default used.	Yu 1993 (Section 11)
Irrigation mode	IDITCH	Overhead	Overhead	unitless	The "Overhead" and "Ditch" designations are independent of the depth of contaminated zone and have no significant impact on the RESRAD evaluation. The RESRAD default designation was selected.	Yu 2001
Runoff coefficient	RUNOFF	0.2	0.2	unitless	The RESRAD default value was selected based on reference value for intermediate combinations of clay and loam.	Yu 1993 (Section 10)

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Parameter	Code	Default Value	User Input Value	Units	Comments	Reference
Watershed area for nearby stream or pond	WAREA	1.00E6	1.00E6	m ²	RESRAD default used.	Yu 1993 (Section 17)
Accuracy for water/soil computations	EPS	0.001	0.001	unitless	RESRAD default used.	Yu 2001
SATURATED ZONE HYDROLOGICAL DATA						
Density of saturated zone	DENSAQ	1.5	1.5	g/cm ³	Soil density range from samples obtained by USDA at the site was 1.2 to 1.7. The RESRAD default was chosen as a reasonable average.	USDA 2006b Yu 1993 (Section 2)
Saturated zone total porosity	TPSZ	0.4	0.4	unitless	RESRAD default used. Equivalent to contaminated zone total porosity.	Yu 1993 (Section 3)
Saturated zone effective porosity	EPSZ	0.2	0.2	unitless	RESRAD default used.	Yu 1993 (Section 4)
Saturated zone field capacity	FCSZ	0.2	0.2	unitless	RESRAD default used.	Yu 2001
Saturated zone hydraulic conductivity	HCSZ	100	53.6	m/yr	Saturated zone hydraulic conductivity for silty clay loam taken from Table 5.2 of the reference.	Yu 1993 (Section 5)
Saturated zone hydraulic gradient	HGWT	0.02	0.02	unitless	RESRAD default used. Potable water at the Site is obtained via public water supply. Groundwater contamination is not considered a significant exposure pathway, though this parameter is "active" for conservatism.	Yu 1993 (Section 15)
Saturated zone b parameter	BSZ	5.3	7.75	unitless	The contaminated zone b parameter was selected from Table 13.1 of the reference for silty clay loam.	Yu 1993 (Section 13)
Water table drop rate	VWT	0.001	0.001	m/yr	RESRAD default used. Groundwater contamination is not considered a significant exposure pathway, though this parameter is "active" for conservatism.	Yu 1993 (Section 18)
Well pump intake depth (meters below water table)	DWIBWT	10	10	m	RESRAD default used. Groundwater contamination is not considered a significant exposure pathway, though this parameter is "active" for conservatism.	Yu 1993 (Section 19)
Model for Water Transport Parameters [Non-dispersion (ND) or Mass-Balance (MB)]	MODEL	ND	MB	unitless	Per NRC guidance, the MB model is an acceptable approach and provides a potentially more conservative dose estimate relative to the ND model. The MB model assumes a well is located at the center of the site rather than on the down gradient side of the Site boundary.	NUREG-1757, Vo. 2, App. I, page I-40

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					In addition, all radionuclides released from the contaminated zone are withdrawn through the well. Groundwater contamination is not considered a significant exposure pathway, though this parameter is "active" for conservatism.	NRC 1999b
Well pumping rate	UW	250	250	m ³ /yr	RESRAD default used. Groundwater contamination is not considered a significant exposure pathway, though this parameter is "active" for conservatism.	Yu 2001
UNCONTAMINATED UNSATURATED ZONE PARAMETERS						
Number of unsaturated zone strata	NS	1	1	unitless	RESRAD default used.	Yu 1993 (Section 25)
Unsaturated zone thickness	H(1)	4	1	m	Determined by subtracting the contaminated zone thickness (1 m) from the assumed saturated zone depth below ground surface (2 m).	Yu 1993 (Section 25)
Unsaturated zone soil density	DENSUZ(1)	1.5	1.5	g/cm ³	Soil density range from samples obtained by USDA at the site was 1.2 to 1.7. The RESRAD default was chosen as a reasonable average.	USDA 2006b Yu 1993 (Section 2)
Unsaturated zone total porosity	TPUZ(1)	0.4	0.4	unitless	RESRAD default used (equivalent to saturated and contaminated zone total porosity inputs).	Yu 1993 (Section 3)
Unsaturated zone effective porosity	EPSZ(1)	0.2	0.2	unitless	RESRAD default used.	Yu 1993 (Section 4)
Unsaturated zone field capacity	FCSZ(1)	0.2	0.2	unitless	RESRAD default used.	Yu 2001
Unsaturated zone hydraulic conductivity	HCSZ(1)	100	5.36	m/yr	Assumed to be a factor of 10 less than the saturated zone hydraulic conductivity for silty clay loam from Table 5.2 of the reference.	Yu 1993 (Section 5)
Unsaturated zone b parameter	BSZ	5.3	7.75	unitless	The unsaturated zone b parameter was selected from Table 13.1 of the reference for silty clay loam.	Yu 1993 (Section 13)
NATURAL THORIUM						
ELEMENTAL DISTRIBUTION (PARTITION) COEFFICIENTS AND LEACH RATES: THORIUM						
Contaminated zone	DCNUCC(2 & 3)	60,000	3,300	cm ³ /g	Site is predominantly silty clay loam. Value from Table 32.1 of the reference for loam selected as the input. However, for thorium, the value selected has no impact on the DCGL determination.	Yu 1993 (Section 32)

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Parameter	Code	Default Value	User Input Value	Units	Comments	Reference
Unsaturated zone	DCNUCU(2 & 3,1)	60,000	3,300	cm ³ /g	Site is predominantly silty clay loam. Value from Table 32.1 of the reference for loam selected as the input. However, for thorium, the value selected has no impact on the DCGL determination.	Yu 1993 (Section 32)
Saturated zone	DCNUCS(2 & 3)	60,000	3,300	cm ³ /g	Site is predominantly silty clay loam. Value from Table 32.1 of the reference for loam selected as the input. However, for thorium, the value selected has no impact on the DCGL determination.	Yu 1993 (Section 32)
Leach rate	ALEACH(2 & 3)	0	0	y ⁻¹	RESRAD default used.	Yu 2001
Solubility constant	SOLUBK(2 & 3)	0	0	unitless	RESRAD default used.	Yu 2001
ELEMENTAL DISTRIBUTION (PARTITION) COEFFICIENTS AND LEACH RATES: RADIUM						
Contaminated zone	DCNUCC(1)	70	36,000	cm ³ /g	Site is predominantly silty clay loam. Value from Table 32.1 of the reference for loam selected as the input.	Yu 1993 (Section 32)
Unsaturated zone	DCNUCU(1,1)	70	36,000	cm ³ /g	Site is predominantly silty clay loam. Value from Table 32.1 of the reference for loam selected as the input.	Yu 1993 (Section 32)
Saturated zone	DCNUCS(1)	70	36,000	cm ³ /g	Site is predominantly silty clay loam. Value from Table 32.1 of the reference for loam selected as the input.	Yu 1993 (Section 32)
Leach rate	ALEACH(1)	0	0	y ⁻¹	RESRAD default used.	Yu 2001
Solubility constant	SOLUBK(1)	0	0	unitless	RESRAD default used.	Yu 2001
OCCUPANCY, INHALATION AND EXTERNAL GAMMA DATA						
Inhalation rate	INHALR	8,400	11,388	m ³ /y	Based on time-weighted inhalation rate as calculated as below. = ((0.9 m ³ /hr x 2 hrs/day + 1.4 m ³ /hr x 8 hrs/day) x 8,760 hrs/year) / 10 hrs/day	NRC 1999
Mass loading for inhalation	MLINH	0.0001	2.79E-6	g/m ³	Based on time –weighted mass loading for inhalation as below: = (1.41 g/m ³ x 2 hrs/day + 3.14 g/m ³ x 8 hrs/day) / 10 hrs/day	Yu 1993 (Section 35)
Exposure duration	ED	30	25	yr	EPA RAGS value in reference was used.	EPA 1991
Inhalation shielding factor	SHF3	0.4	0.4	unitless	RESRAD default used.	Yu 1993 (Section 36)
External gamma shielding factor	SHF1	0.7	0.5512	unitless	NRC value in reference used.	NRA 1999

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Indoor time fraction	FIND	0.5	0.068	unitless	2 hours per day was assumed.	
Outdoor time fraction	FOTD	0.25	0.274	unitless	8 hours per day was assumed.	
Shape of the contaminated zone (circular or non-circular)	FS	Circular	Circular	unitless	RESRAD default used.	Yu 1993 (Section 50)
INGESTION PATHWAY (DIETARY DATA)						
Fruits, vegetables and grain consumption	DIET(1)	160	160	kg/yr	Pathway not active	N/A
Leafy vegetable consumption	DIET(2)	14	14	kg/yr	Pathway not active	N/A
Milk consumption	DIET(3)	92	N/A	L/yr	Pathway not active	N/A
Meat and poultry consumption	DIET(4)	63	N/A	kg/yr	Pathway not active	N/A
Fish consumption	DIET(5)	5.4	N/A	kg/yr	Pathway not active	N/A
Other seafood consumption	DIET(6)	0.9	N/A	kg/yr	Pathway not active	N/A
Soil ingestion rate	SOIL	36.5	143.8	g/yr	This value was calculated based on time-weighted soil ingestion rates: (50 mg/day x 2 hrs/day + 480 mg/day x 8 hrs/day) x 1 g/ 1000 mg / 10 hrs/day	EPA 1991
Drinking water intake	DWI	510	365	L/yr	EPA value in reference used.	EPA 1991
Contamination fraction of drinking water	FDW	1	1	unitless	Maximum NRC value used.	NRC 1999b Yu 2001
Contamination fraction of household water	FHHW	1	NA	unitless	Radon pathway is not selected; hence this parameter is not applicable	N/A
Contamination fraction of livestock water	FLW	1	NA	unitless	Pathway not active.	N/A
Contamination fraction of irrigation water	FIRW	1	1	unitless	Maximum NRC value used.	NRC 1999b
Contamination fraction of aquatic food	FR9	0.5	NA	unitless	Pathway not active.	N/A
Contaminated fraction of plant food	FPLANT	-1	NA	unitless	Pathway not active	N/A
Contaminated fraction of meat	FMEAT	-1	NA	unitless	Pathway not active	N/A
Contaminated fraction of milk	FMILK	-1	NA	unitless	Pathway not active	N/A

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INGESTION PATHWAY (NON-DIETARY DATA)						
Livestock fodder intake for meat	LP15	68	N/A	kg/day	Pathway not active	N/A
Livestock fodder intake for milk	LP16	55	N/A	kg/day	Pathway not active	N/A
Livestock water intake for meat	LW15	50	N/A	L/day	Pathway not active	N/A
Livestock water intake for milk	LW15	160	N/A	L/day	Pathway not active	N/A
Livestock intake of soil	LS1	0.5	N/A	kg/day	Pathway not active	N/A
Mass loading for foliar deposition	MLFD	0.0001	N/A	g/m ³	Pathway not active	N/A
Depth of soil mixing layer	DM	0.15	0.15	m	RESRAD default used.	Yu 1993 (Section 35)
Depth of roots	DROOT	0.9	N/A	m	Pathway not active	N/A
Groundwater fractional usage: Drinking water	FGWDW	1	1	unitless	RESRAD default used.	Yu 1993
Groundwater fractional usage: Household water	FGWHH	1	N/A	unitless	Radon pathway not active	N/A
Groundwater fractional usage: Livestock water	FGWLW	1	N/A	unitless	Pathway not active	N/A
Groundwater fractional usage: Irrigation water	FGWIR	1	N/A	unitless	Pathway not active	N/A
PLANT TRANSPORT FACTORS						
Wet weight crop yield: non-leafy vegetables	YV(1)	0.7	N/A	kg/m ²	Pathway not active	N/A
Wet weight crop yield: leafy vegetables	YV(2)	1.5	N/A	kg/m ²	Pathway not active	N/A
Wet weight crop yield: fodder	YV(3)	1.1	N/A	kg/m ²	Pathway not active.	N/A
Length of growing season: non-leafy vegetables	TE(1)	0.17	N/A	years	Pathway not active	N/A

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Length of growing season: leafy vegetables	TE(2)	0.25	N/A	years	Pathway not active	N/A
Length of growing season: fodder	TE(3)	0.08	N/A	years	Pathway not active	N/A
Translocation factor: non-leafy vegetables	TIV(1)	0.1	N/A	unitless	Pathway not active	N/A
Translocation factor: leafy vegetables	TIV(2)	1	N/A	unitless	Pathway not active	N/A
Translocation factor: fodder	TIV(3)	1	N/A	unitless	Pathway not active	N/A
Weathering removal constant	WLAM	20	N/A	y ⁻¹	Pathway not active	N/A
Wet foliar interception fraction: non-leafy vegetables	RWET(1)	0.25	N/A	unitless	Pathway not active	N/A
Wet foliar interception fraction: leafy vegetables	RWET(2)	0.25	N/A	unitless	Pathway not active	N/A
Wet foliar interception fraction: fodder	RWET(3)	0.25	N/A	unitless	Pathway not active.	N/A
Dry foliar interception fraction: non-leafy vegetables	RDRY(1)	0.25	N/A	unitless	Pathway not active	N/A
Dry foliar interception fraction: leafy vegetables	RDRY(2)	0.25	N/A	unitless	Pathway not active	N/A
Dry foliar interception fraction: fodder	RDRY(3)	0.25	N/A	unitless	Pathway not active.	N/A
STORAGE TIMES BEFORE USE						
Fruits, non-leafy vegetables and grain	STOR_T(1)	14	N/A	days	Pathway not active	N/A
Leafy vegetables	STOR_T(2)	1	N/A	days	Pathway not active	N/A
Milk	STOR_T(3)	1	N/A	days	Pathway not active.	N/A
Meat	STOR_T(4)	20	N/A	days	Pathway not active.	N/A
Fish	STOR_T(5)	7	N/A	days	Pathway not active.	N/A
Crustacea and mollusks	STOR_T(6)	7	N/A	days	Pathway not active.	N/A
Well water	STOR_T(7)	1	1	days	RESRAD default used.	Yu 2001 Yu 1993

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Surface water	STOR_T(8)	1	1	days	RESRAD default used.	Yu 2001 Yu 1993
Livestock fodder	STOR_T(9)	45	N/A	days	Pathway not active.	N/A