Exhibit 4

Risk Assessment, Position Statement of the Health Physics Society

HEALTH
PHYSICS
SOCIETY

RISK ASSESSMENT

POSITION STATEMENT OF THE HEALTH PHYSICS SOCIETY*

Adopted: July 1993
Revised: April 1995

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Risk assessment is the process of describing and characterizing the nature and magnitude of a particular risk and includes gathering, assembling and analyzing information on the risk. Risk assessment is a foundation of risk management and risk communication. In order to effectively manage risks and to communicate risks to the public, a clear understanding of the nature and magnitude of the risk at relevant exposure levels is necessary. The Health Physics Society has become increasingly concerned with the erratic application of risk assessment in the establishment of radiation protection regulations. These regulations are inconsistent, poorly coordinated among federal agencies, and inadequately communicated to the public. Examples of problem areas include: (1) 100 to 1000 fold discrepancies in permissible exposure levels among various regulations, all allegedly based on the same scientific risk assessment data, and (2) proposed expenditures of billions of federal and private dollars to clean up radioactively contaminated federal and commercial sites without careful consideration of the actual public health benefits to be achieved.

The Health Physics Society recognizes that there are many questions and uncertainties associated with the risk assessment process and that data may be incomplete or missing. Accordingly, limitations in risk assessment must be fully recognized and made explicit in establishing regulations for the protection of the public health. The Health Physics Society supports risk assessments that are consistent, of high technical quality, unbiased, and based on sound, objective science.

ONLY CREDIBLE SCIENCE SHOULD BE USED IN RISK ASSESSMENT

Risk assessment should employ the best available scientific and/or technical data. Credible science is characterized by: (1) objective analysis of data, including suitability of experimental design, appropriate uses of statistical tests and careful attention to the uncertainties in data collection and interpretation, (2) appropriate consideration of underlying assumptions and limitations of theories and models used in the analysis and interpretation of data, and (3) peer-review and publication in reputable scientific journals. However, it should also be recognized that credible scientific studies may lead to honest differences in data interpretation and support of

competing theories. Calculations based on the different theories may lead to risk estimates that are significantly different. For instance, the radiation protection literature is filled with differing views as to the shape of the radiation dose response curve. Some data support a linear no-threshold model, whereas other data support models that would predict lower estimates of risk and perhaps even a threshold below which no radiation health risk may exist.

RISK ASSESSMENT SHOULD INCLUDE CONSIDERATION OF UNCERTAINTIES.

The establishment and use of risk coefficients to estimate public health determinants from individual or population exposures must be considered in the context of uncertainties in the estimates. It is essential that all uncertainties, assumptions and inferences used in this assessment process be explicitly stated and that any biases incorporated into the assessments for the purpose of ensuring prudent public health protection (such as "margin of safety") be clearly noted including consideration of dose and species extrapolations and statistical uncertainties. In addition to "best guess" or central estimates of risk, ranges of risk should be provided. Any conservative assumptions, safety margins, and uncertainty factors should be clearly delineated.

LIMITATIONS OF EXTRAPOLATION OF RISK TO LOW DOSE

Health risks of radiation exposure can only be estimated with a reasonable degree of scientific certainty at radiation levels that are orders of magnitude greater than levels established by regulators for protection of the public.

Radiological risk assessment, particularly for radiogenic cancer, currently is only able to demonstrate a consistently elevated risk in those groups of the study populations that have been exposed to radiation at high doses (>100 rem). In order to estimate radiation risk in the low-dose region, typical of most occupational and environmental exposures, health effects in the high dose region are extrapolated to the low-dose region using a variety of mathematical models including the linear, no-threshold model. Cancer and other health effects have not been observed consistently at low doses (<10rem) because the existence of a risk is so low as to not be detectable by current epidemiological data and methods.

In the absence of direct observations, estimation of radiogenic health risks at low doses must be viewed with caution. In most instances, to estimate risks (e.g., cancer) of small doses of radiation, a linear extrapolation from large doses to zero is used. Extrapolation assumes that the pathway of radiogenic effects is identical at any dose, which may not be valid. At high doses (>100rem), cell killing and cell replacement occurs creating an environment favorable for tumor growth. At low doses (<10rem), cell killing and proliferation of surviving cells (which may be mutated or otherwise damaged) is much less probable. In discussing the question of the limitations of extrapolation to estimate radiogenic risk in the millirem range, the National Academy of Sciences, in its 1990 BEIR V report noted "...the possibility that there may be no risks from exposures comparable to external natural background radiation cannot be ruled out. At such low doses and dose rates, it must be acknowledged that the lower limit of the range of uncertainty in the risk estimates extends to zero." The Health Physics Society recommends that assessments of radiogenic health risks be limited to dose estimates near and above 10 rem. Below this level, only dose is credible and statements of associated risks are more speculative than credible. Thus, compliance with regulations to achieve very low levels of exposure result in enormous expenditures of money with no demonstrable public health benefits.

* The Health Physics Society is a non profit scientific professional organization whose mission is to promote the practice of radiation safety. Since its formation in 1956, the Society has grown to approximately 6,000 scientists, physicians, engineers, lawyers, and other professionals representing academia, industry, government, national laboratories, the department of defense, and other organizations. Society activities include encouraging research in radiation science, developing standards, and disseminating radiation safety information. Society members are involved in understanding, evaluating, and controlling the potential risks from radiation relative to the benefits. Official position statements are prepared and adopted in accordance with standard policies and procedures of the Society. The Society may be contacted at: 1313 Dolley Madison Blvd,. Suite 402, McLean, VA 22101; phone: 703-790-1745; FAX: 703-790-2672; email: HPS@BurkInc.com.

Exhibit 5

Ionizing Radiation – Safety Standards for the General Public, Position Statement of the Health Physics Society

HEALTH PHYSICS

IONIZING RADIATION-SAFETY STANDARDS FOR THE GENERAL PUBLIC

POSITION STATEMENT OF THE HEALTH PHYSICS SOCIETY*

Adopted: March 1993
Revised: August 2000
Reaffirmed: March 2001
Revised: June 2003

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The Health Physics Society recommends that standards and regulations for radiation safety of the general public be based on the current scientific consensus represented in recommendations of the International Commission on Radiological Protection (ICRP) and the National Council on Radiation Protection and Measurements (NCRP), i.e., ICRP (1991) and NCRP (1993).

The Society's principal recommendations about radiation-safety standards for the public are:

1. Justifiable sources of radiation exposures are those that result in an overall net benefit to society.

2. Radiation exposures of the public from controllable sources[1] should be maintained as low as reasonably achievable (ALARA), economic and social factors being taken into account. However, ALARA should not be quantified with respect to dose goals or monetary cost, e.g., dollars per person-rem.

3. Public radiation-safety standards should be based on specified values of dose rather than hypothetical estimates of risk. These standards should be expressed as an effective dose[2] resulting from all exposure pathways.

4. The sum of effective dose(s) to individual members of the public from exposure to controllable sources with the exception of occupational exposure, accidental releases, and indoor radon[3], normally should be limited to 1 mSv (100 mrem)[4] in any year. In special (infrequent) circumstances, an effective dose up to 5 mSv (500 mrem) in a year may be permitted.

5. Constraints should be applied to each controllable source of public exposure to ensure that the dose limit for an individual from all controllable sources combined will be met. An effective dose of 0.25 mSv (25 mrem) in any year to individual members of the public is a suitable source constraint in most cases. In special circumstances, an effective dose higher than 0.25 mSv in a year may be permitted.

6. The Health Physics Society supports the establishment of an acceptable dose of radiation of 1 mSv/y (100mrem/y) above the annual natural radiation background. At this dose, risks of radiation-induced health effects are either nonexistent or too small to be observed.

Footnotes

[1] A controllable source is any source of radiation exposure for which reasonable actions can be taken to limit radiation exposure without resulting in adverse effects on individuals. Examples of controllable sources include:

- Any source of man-made radiation exposure in the workplace (i.e., occupational exposure).
- Any facility or other operation that results in releases of man-made or technologically enhanced, naturally occurring radionuclides to the environment.
- Exposures from radiation-producing machines.
- Any localized areas of environmental contamination resulting from planned or accidental releases of radioactive material or disposal of radioactive waste.
- Technologically enhanced, naturally occurring radioactive material.
- Medical exposures to individuals who are not the subject of the medical procedure resulting in the exposure.
- Indoor radon.

Examples of sources that are not controllable include:

- Natural terrestrial background radiation.
- Cosmic radiation.
- Naturally occurring radioactive material present inside the body.
- Medical exposures to individuals who are the subject of the medical procedure resulting in the exposure.
- Global fallout of radionuclides from atmospheric testing of nuclear weapons.
- Regional or global radioactive contamination from accidental releases of radioactive material.

[2] The effective dose is a quantity developed by the ICRP (1991) for purposes of radiation protection. The effective dose is assumed to be related to the risk of a radiation-induced cancer or a severe hereditary effect. It takes into account: (1) the absorbed doses that will be delivered to the separate organs or tissues of the body during the lifetime of an individual due to intakes of radioactive materials; (2) the absorbed doses due to irradiation by external sources; (3) the relative effectiveness of different radiation types in inducing cancers or severe hereditary effects; (4) the susceptibility of individual organs to develop a radiation-related cancer or severe hereditary effect; (5) considerations of the relative importance of fatal and non-fatal effects; and, (6) the average years of life lost from a fatal health effect.

[3] Limits for occupational exposure to radiation workers are in addition to the exposure received as a member of the public in a non-occupational setting and are discussed in a separate Society position statement (HPS 2000). The Society has a separate position statement regarding the approach to general public protection from radon in the home (HPS 1990). Indoor radon is not, therefore, included in the scope of the sources subject to this effective dose limitation. The Society has not taken a position on exposures resulting from accidental releases of radioactive materials even though they are considered a controllable source requiring regulatory consideration. However, they require separate consideration and should not be included in the scope of the sources subject to this effective dose limitation which is intended for exposures from routine and normal use of radioactive materials.

[4] The sievert (Sv) is the special name for the international (SI) unit of effective dose. The Society endorses the use of SI units; however, because U.S. regulatory agencies continue to use traditional units in regulations, this Position Statement also gives the effective dose in rem, which is the special name for the traditional unit. The milliSievert (mSv) and millirem (mrem) are 1000th of a Sievert and rem, respectively. 100 mrem = 1 mSv.

References

Health Physics Society (HPS). "Perspectives and Recommendations On Indoor Radon: Position Statement of the Health Physics Society," McLean, VA. Adopted: October 1990

Health Physics Society (HPS). "Occupational Radiation-Safety Standards and Regulations Are Sound: Position Statement of the Health Physics Society," McLean, VA. Adopted: March 2000

International Commission on Radiological Protection (ICRP). *1990 Recommendations of the International Commission on Radiological Protection.* Oxford: Pergamon Press; ICRP Publication 60, *Ann. ICRP* 21(1-3); 1991.

National Council on Radiation Protection and Measurements (NCRP). *Limitation of Exposure to Ionizing Radiation.* Bethesda, MD: NCRP; NCRP Report No. 116; 1993.

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Exhibit 6

Radiation Risk in Perspective, Position Statement of the Health Physics Society

HEALTH PHYSICS SOCIETY

RADIATION RISK IN PERSPECTIVE

POSITION STATEMENT OF THE HEALTH PHYSICS SOCIETY*

Adopted: January 1996
Reaffirmed: March 2001
Revised: August 2004

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In accordance with current knowledge of radiation health risks, the Health Physics Society recommends against quantitative estimation of health risks below an individual dose of 5 rem[1] in one year or a lifetime dose of 10 rem above that received from natural sources. Doses from natural background radiation in the United States average about 0.3 rem per year. A dose of 5 rem will be accumulated in the first 17 years of life and about 25 rem in a lifetime of 80 years. Estimation of health risk associated with radiation doses that are of similar magnitude as those received from natural sources should be strictly qualitative and encompass a range of hypothetical health outcomes, including the possibility of no adverse health effects at such low levels.

There is substantial and convincing scientific evidence for health risks following high-dose exposures. However, below 5–10 rem (which includes occupational and environmental exposures), risks of health effects are either too small to be observed or are nonexistent.

In part because of the insurmountable intrinsic and methodological difficulties in determining if the health effects that are demonstrated at high radiation doses are also present at low doses, current radiation protection standards and practices are based on the premise that any radiation dose, no matter how small, may result in detrimental health effects, such as cancer and hereditary genetic damage. Further, it is assumed that these effects are produced in direct proportion to the dose received, that is, doubling the radiation dose results in a doubling of the effect. These two assumptions lead to a dose-response relationship, often referred to as the linear, no-threshold model, for estimating health effects at radiation dose levels of interest. There is, however, substantial scientific evidence that this model is an oversimplification. It can be rejected for a number of specific cancers, such as bone cancer and chronic lymphocytic leukemia, and heritable genetic damage has not been observed in human studies. However, the effect of biological mechanisms such as DNA repair, bystander effect, and adaptive response on the induction of cancers and genetic mutations are not well understood and are not accounted for by the linear, no-threshold model.

Radiogenic Health Effects Have Not Been Consistently Demonstrated Below 10 Rem

Radiogenic health effects (primarily cancer) have been demonstrated in humans through epidemiological studies only at doses exceeding 5–10 rem delivered at high dose rates. Below this dose, estimation of adverse health effect remains speculative. Risk estimates that are used to predict health effects in exposed individuals or populations are based on epidemiological studies of well-defined populations (for example, the Japanese survivors of the atomic bombings in 1945 and medical patients) exposed to relatively high doses delivered at high dose rates. Epidemiological studies have not demonstrated adverse health effects in individuals exposed to small doses (less than 10 rem) delivered in a period of many years.

Limit Quantitative Risk Assessment to Doses at or Above 5 Rem per Year or 10 Rem Lifetime

In view of the above, the Society has concluded that estimates of risk should be limited to individuals receiving a dose of 5 rem in one year or a lifetime dose of 10 rem in addition to natural background. In making risk estimates, specific organ doses and age-adjusted and gender-adjusted organ risk factors should be used. Below these doses, risk estimates should not be used. Expressions of risk should only be qualitative, that is, a range based on the uncertainties in estimating risk (NCRP 1997) emphasizing the inability to detect any increased health detriment (that is, zero health effects is a probable outcome).

Impact on Radiation Protection

Limiting the use of quantitative risk assessment, as described above, has the following implications for radiation protection:

(a) The possibility that health effects might occur at small doses should not be entirely discounted. The Health Physics Society also recognizes the practical advantages of the linear, no-threshold hypothesis to the practice of radiation protection. Nonetheless, risk assessment at low doses should focus on establishing a range of health outcomes in the dose range of interest and acknowledge the possibility of zero health effects. These assessments can be used to inform decision making with respect to cleanup of sites contaminated with radioactive material, disposition of slightly radioactive material, transport of radioactive material, etc.

(b) Collective dose (the sum of individual doses in a defined exposed population expressed as person-rem) has been a useful index for quantifying dose in large populations and in comparing the magnitude of exposures from different radiation sources. However, collective dose may aggregate information excessively, for example, a large dose to a small number of people is not equivalent to a small dose to many people, even if the collective doses are the same. Thus, for populations in which almost all individuals are estimated to receive a lifetime dose of less than 10 rem above background, collective dose is a highly speculative and uncertain measure of risk and should not be used for the purpose of estimating population health risks.

Footnotes

[1]The rem is the unit of effective dose. In international units, 1 rem=0.01 sievert (Sv)=10 mSv.

References

National Council on Radiation Protection and Measurements. Uncertainties in fatal cancer risk estimates used in radiation protection. Bethesda, MD: NCRP; NCRP Report No. 126; 1997.

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Exhibit 7

RESRAD Results – Recreation

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-RECREAT.RAD

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Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-RECREAT.RAD

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

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ac-228 (Source: FGR 12)	5.978E+00	5.978E+00	DCF1(1)
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(2)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(3)
A-1	Bi-212 (Source: FGR 12)	1.171E+00	1.171E+00	DCF1(4)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(5)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(6)
A-1	Pb-212 (Source: FGR 12)	7.043E-01	7.043E-01	DCF1(7)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(8)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(9)
A-1	Po-212 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(10)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(11)
A-1	Po-216 (Source: FGR 12)	1.042E-04	1.042E-04	DCF1(12)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(13)
A-1	Ra-224 (Source: FGR 12)	5.119E-02	5.119E-02	DCF1(14)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(15)
A-1	Ra-228 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(16)
A-1	Rn-220 (Source: FGR 12)	2.298E-03	2.298E-03	DCF1(17)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(18)
A-1	Th-228 (Source: FGR 12)	7.940E-03	7.940E-03	DCF1(19)
A-1	Tl-208 (Source: FGR 12)	2.298E+01	2.298E+01	DCF1(20)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(21)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(1)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(2)
B-1	Ra-228+D	5.078E-03	4.770E-03	DCF2(3)
B-1	Th-228+D	3.454E-01	3.420E-01	DCF2(4)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(1)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(2)
D-1	Ra-228+D	1.442E-03	1.440E-03	DCF3(3)
D-1	Th-228+D	8.086E-04	3.960E-04	DCF3(4)
D-34	Food transfer factors:			
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(3,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,3)
D-34				

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

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(4,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(4,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(4,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(2,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(3,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(3,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(4,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(4,2)

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

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-RECREAT.RAD

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)	1.000E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	5.000E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Ra-226	5.000E-01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Ra-228	5.000E-01	0.000E+00	---	S1(3)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---	W1(3)
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)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-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)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+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)	1.000E+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

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(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)	1.000E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.495E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Ra-228				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.495E-03	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.652E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for daughter Th-228				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.111E-05	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R017	Inhalation rate (m**3/yr)	1.400E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	0.000E+00	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	1.000E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 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)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	5.100E+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	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI

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)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	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	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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	2.000E-06	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	2.000E+00	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	code computed (time dependent)	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	code computed (time dependent)	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)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-RECREAT.RAD

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	10000.00 square meters	Ra-226	5.000E-01
Thickness:	0.50 meters	Ra-228	5.000E-01
Cover Depth:	0.00 meters		

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

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	8.664E-01	9.367E-01	9.597E-01	7.296E-01	4.168E-01	2.007E-01	2.598E-02	1.208E+00
M(t):	3.466E-02	3.747E-02	3.839E-02	2.918E-02	1.667E-02	8.027E-03	1.039E-03	4.833E-02

Maximum TDOSE(t): 1.293E+00 mrem/yr at t = 774 ñ 2 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 = 7.736E+02 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.
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	0.000E+00	0.0000
Ra-228	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
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	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 7.736E+02 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.
Ra-226	1.293E+00	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.293E+00	1.0000
Ra-228	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
Total	1.293E+00	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.293E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-RECREAT.RAD

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

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	5.219E-01	0.6024	1.056E-04	0.0001	3.138E-04	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.602E-03	0.0030
Ra-228	3.370E-01	0.3890	6.874E-04	0.0008	1.036E-03	0.0012	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.695E-03	0.0031
Total	8.590E-01	0.9914	7.929E-04	0.0009	1.350E-03	0.0016	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.297E-03	0.0061

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

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	5.250E-01	0.6059
Ra-228	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	3.415E-01	0.3941
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	8.664E-01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	5.168E-01	0.5518	1.127E-04	0.0001	3.102E-04	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.972E-03	0.0032
Ra-228	4.096E-01	0.4373	1.578E-03	0.0017	2.510E-03	0.0027	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.718E-03	0.0029
Total	9.264E-01	0.9891	1.691E-03	0.0018	2.820E-03	0.0030	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.690E-03	0.0061

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	5.202E-01	0.5554
Ra-228	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	4.164E-01	0.4446
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.367E-01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	5.068E-01	0.5280	1.259E-04	0.0001	3.031E-04	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.657E-03	0.0038
Ra-228	4.404E-01	0.4589	2.285E-03	0.0024	3.688E-03	0.0038	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.481E-03	0.0026
Total	9.472E-01	0.9869	2.411E-03	0.0025	3.991E-03	0.0042	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.138E-03	0.0064

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	5.108E-01	0.5323
Ra-228	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	4.489E-01	0.4677
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.597E-01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	4.730E-01	0.6484	1.619E-04	0.0002	2.793E-04	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.558E-03	0.0076
Ra-228	2.454E-01	0.3363	1.503E-03	0.0021	2.442E-03	0.0033	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.209E-03	0.0017
Total	7.184E-01	0.9847	1.665E-03	0.0023	2.722E-03	0.0037	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.767E-03	0.0093

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	4.790E-01	0.6566
Ra-228	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	2.505E-01	0.3434
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	7.296E-01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.884E-01	0.9320	2.050E-04	0.0005	2.210E-04	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.051E-03	0.0193
Ra-228	1.945E-02	0.0467	1.221E-04	0.0003	1.985E-04	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.349E-05	0.0002
Total	4.079E-01	0.9787	3.271E-04	0.0008	4.195E-04	0.0010	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.144E-03	0.0195

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.969E-01	0.9523
Ra-228	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	1.987E-02	0.0477
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	4.168E-01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.944E-01	0.9688	1.439E-04	0.0007	9.571E-05	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.027E-03	0.0300
Ra-228	2.167E-06	0.0000	1.360E-08	0.0000	2.212E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.041E-08	0.0000
Total	1.944E-01	0.9688	1.439E-04	0.0007	9.573E-05	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.027E-03	0.0300

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	2.007E-01	1.0000
Ra-228	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	2.213E-06	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.007E-01	1.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-RECREAT.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	2.508E-02	0.9653	2.071E-05	0.0008	6.831E-06	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.733E-04	0.0336
Ra-228	1.014E-17	0.0000	6.890E-20	0.0000	1.121E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.275E-20	0.0000
Total	2.508E-02	0.9653	2.071E-05	0.0008	6.831E-06	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.733E-04	0.0336

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	2.598E-02	1.0000
Ra-228	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	1.037E-17	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.598E-02	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	0.000E+00	0.0000
Ra-228	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
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	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.208E+00	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.208E+00	1.0000
Ra-228	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
Total	1.208E+00	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.208E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Recreationist Scenario
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Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226+D	Ra-226+D	1.000E+00	1.049E+00	1.039E+00	1.019E+00	9.510E-01	7.808E-01	3.906E-01	5.039E-02	4.917E-01
Ra-226+D	Pb-210+D	1.000E+00	4.236E-04	1.244E-03	2.771E-03	7.062E-03	1.308E-02	1.072E-02	1.567E-03	1.925E+00
Ra-226+D	ăDSR(j)		1.050E+00	1.040E+00	1.022E+00	9.581E-01	7.938E-01	4.014E-01	5.195E-02	2.416E+00
Ra-228+D	Ra-228+D	1.000E+00	5.320E-01	4.671E-01	3.602E-01	1.450E-01	1.078E-02	1.205E-06	5.799E-18	0.000E+00
Ra-228+D	Th-228+D	1.000E+00	1.509E-01	3.657E-01	5.375E-01	3.560E-01	2.895E-02	3.222E-06	1.495E-17	0.000E+00
Ra-228+D	ăDSR(j)		6.829E-01	8.329E-01	8.977E-01	5.011E-01	3.973E-02	4.427E-06	2.075E-17	0.000E+00

The DSR includes contributions from associated (half-life ó 180 days) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	2.381E+01	2.403E+01	2.447E+01	2.609E+01	3.149E+01	6.229E+01	4.812E+02	1.035E+01
Ra-228	3.661E+01	3.002E+01	2.785E+01	4.989E+01	6.292E+02	5.648E+06	*2.726E+14	*2.726E+14

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 774 ñ 2 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ra-226	5.000E-01	774 ñ 2	2.586E+00	9.666E+00	2.586E+00	9.666E+00
Ra-228	5.000E-01	2.574 ñ 0.005	9.013E-01	2.774E+01	0.000E+00	*2.726E+14

*At specific activity limit

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr							
		t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	5.247E-01	5.196E-01	5.095E-01	4.755E-01	3.904E-01	1.953E-01	2.519E-02	2.458E-01
Pb-210	Ra-226	1.000E+00	2.118E-04	6.222E-04	1.386E-03	3.531E-03	6.538E-03	5.359E-03	7.835E-04	9.623E-01
Ra-228	Ra-228	1.000E+00	2.660E-01	2.336E-01	1.801E-01	7.252E-02	5.390E-03	6.024E-07	2.900E-18	0.000E+00
Th-228	Ra-228	1.000E+00	7.547E-02	1.829E-01	2.687E-01	1.780E-01	1.448E-02	1.611E-06	7.474E-18	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g							
		t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	5.000E-01	4.951E-01	4.853E-01	4.527E-01	3.712E-01	1.853E-01	2.544E-02	2.439E-05
Pb-210	Ra-226	1.000E+00	0.000E+00	1.518E-02	4.342E-02	1.229E-01	2.348E-01	1.943E-01	2.843E-02	2.727E-05
Ra-228	Ra-228	1.000E+00	5.000E-01	4.390E-01	3.385E-01	1.362E-01	1.011E-02	1.125E-06	5.702E-18	0.000E+00
Th-228	Ra-228	1.000E+00	0.000E+00	1.419E-01	2.650E-01	1.916E-01	1.575E-02	1.755E-06	8.893E-18	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

RESCALC.EXE execution time = 1.08 seconds

Assumption 1.

- Used 0.5 pCi each of Ra-226 and Ra-228, total 1pCi of radium
- Contaminated soil: 0.5 m
- Joliet Sludge spread to a garden adjacent to a building.

  Topsoil is 0.5 meters and assumed that there is no contaminated soil under the building. Based on this assumption, building indoor area factor was calculated (Used the formula in the Resrad)

  ex) 1(100%, entire floor area was built on the contaminated area) + wall depth into contamination zone x 4(4 sides)/100(assume 100 m^2 floor area)

  0.5 x 4/100 = 0.02

- Almost all default parameters were used due to unknown destination for the topsoil.
- Indoor time fraction was put in for 1(100%), 0.75, 0.5, and 0.25.

Indoor (%)	Outdoor (%)	Maximum Dose (mrem)	
50	25	6.56	Default
100	0	8.31	
75	25	8.64	
50	50	8.97	
25	75	9.30	
0	100	9.63	

Assumption 2.

- If 10 ft (3.048 meters) of topsoil is present and a house is built on top of it, here are three possible scenarios:

  1. A house with no basement - the house will be built on top of the topsoil with a minimum foundation depth of 1.07 meters (provided by Joliet), therefore 1.07 meters of top soil around the building.

     1 + 1.07 x 4/100 = 1.043

     Maximum dose = 34.7 mrem

2. A house with a basement - soil has to be removed for the basement. Minimum foundation depth is 1.83 meters (provided by Joliet) with a basement, therefore 1.83 meters of top soil is around the building.

   1 + 1.83 x 4/100 = 1.0732

   Maximum dose = 35.52 mrem

3. A house with no foundation - there would be no top soil around the house, only top soil present under the house. Area factor = 1

   Maximum dose = 33.53 mrem

Exhibit 8

RESRAD Results – Top Soil as Fill

(Nearby Home)

Part 1

Assumption 1.

- Used 0.5 pCi each of Ra-226 and Ra-228, total 1pCi of radium
- Contaminated soil: 0.5 m
- Joliet Sludge spread to a garden adjacent to a building.

  Topsoil is 0.5 meters and assumed that there is no contaminated soil under the building. Based on this assumption, building indoor area factor was calculated (Used the formula in the Resrad)

  ex) 1(100%, entire floor area was built on the contaminated area) + wall depth into contamination zone x 4(4 sides)/100(assume 100 m^2 floor area)

  0.5 x 4/100 = 0.02

- Almost all default parameters were used due to unknown destination for the topsoil.
- Indoor time fraction was put in for 1(100%), 0.75, 0.5, and 0.25.

Indoor (%)	Outdoor (%)	Maximum Dose (mrem)	
50	25	6.56	Default
100	0	8.31	
75	25	8.64	
50	50	8.97	
25	75	9.30	
0	100	9.63	

Assumption 2.

- If 10 ft (3.048 meters) of topsoil is present and a house is built on top of it, here are three possible scenarios:

  1. A house with no basement - the house will be built on top of the topsoil with a minimum foundation depth of 1.07 meters (provided by Joliet), therefore 1.07 meters of top soil around the building.

     1 + 1.07 x 4/100 = 1.043

     Maximum dose = 34.7 mrem

2. A house with a basement - soil has to be removed for the basement. Minimum foundation depth is 1.83 meters (provided by Joliet) with a basement, therefore 1.83 meters of top soil is around the building.

   $1 + 1.83 \times 4/100 = 1.0732$

   Maximum dose = 35.52 mrem

3. A house with no foundation - there would be no top soil around the house, only top soil present under the house. Area factor = 1

   Maximum dose = 33.53 mrem

Exhibit 8

RESRAD Results – Top Soil as Fill

(Nearby Home)

Part 2

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

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Summary : RESRAD Default Parameters Recreationist Scenario
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Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ac-228 (Source: FGR 12)	5.978E+00	5.978E+00	DCF1(1)
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(2)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(3)
A-1	Bi-212 (Source: FGR 12)	1.171E+00	1.171E+00	DCF1(4)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(5)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(6)
A-1	Pb-212 (Source: FGR 12)	7.043E-01	7.043E-01	DCF1(7)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(8)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(9)
A-1	Po-212 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(10)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(11)
A-1	Po-216 (Source: FGR 12)	1.042E-04	1.042E-04	DCF1(12)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(13)
A-1	Ra-224 (Source: FGR 12)	5.119E-02	5.119E-02	DCF1(14)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(15)
A-1	Ra-228 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(16)
A-1	Rn-220 (Source: FGR 12)	2.298E-03	2.298E-03	DCF1(17)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(18)
A-1	Th-228 (Source: FGR 12)	7.940E-03	7.940E-03	DCF1(19)
A-1	Tl-208 (Source: FGR 12)	2.298E+01	2.298E+01	DCF1(20)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(21)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(1)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(2)
B-1	Ra-228+D	5.078E-03	4.770E-03	DCF2(3)
B-1	Th-228+D	3.454E-01	3.420E-01	DCF2(4)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(1)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(2)
D-1	Ra-228+D	1.442E-03	1.440E-03	DCF3(3)
D-1	Th-228+D	8.086E-04	3.960E-04	DCF3(4)
D-34	Food transfer factors:			
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,3)
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(3,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,3)

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

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(4,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(4,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(4,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(2,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(3,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(3,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(4,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(4,2)

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

Summary : RESRAD Default Parameters Recreationist Scenario
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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)	1.000E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	5.000E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Ra-226	5.000E-01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Ra-228	5.000E-01	0.000E+00	---	S1(3)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---	W1(3)
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)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-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)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+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)	1.000E+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

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(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)	1.000E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.495E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Ra-228				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.495E-03	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.652E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for daughter Th-228				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.111E-05	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
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	7.000E-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	>0 shows circular AREA.	FS

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

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)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	5.100E+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	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI

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)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	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	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
C021	Thickness of building foundation (m)	1.500E-01	1.500E-01	---	FLOOR1
C021	Bulk density of building foundation (g/cm**3)	2.400E+00	2.400E+00	---	DENSFL
C021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
C021	Total porosity of the building foundation	1.000E-01	1.000E-01	---	TPFL

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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 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	2.000E-02	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	-1.000E+00	-1.000E+00	code computed (time dependent)	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)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	10000.00 square meters	Ra-226	5.000E-01
Thickness:	0.50 meters	Ra-228	5.000E-01
Cover Depth:	0.00 meters		

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

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	5.960E+00	6.394E+00	6.533E+00	5.083E+00	3.046E+00	1.456E+00	1.789E-01	1.257E+00
M(t):	2.384E-01	2.558E-01	2.613E-01	2.033E-01	1.219E-01	5.823E-02	7.156E-03	5.027E-02

Maximum TDOSE(t): 6.561E+00 mrem/yr at t = 2.347 ñ 0.005 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 = 2.347E+00 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.060E+00	0.4664	3.287E-04	0.0001	7.224E-01	0.1101	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.581E-02	0.0039
Ra-228	2.651E+00	0.4041	5.846E-03	0.0009	7.614E-02	0.0116	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.938E-02	0.0030
Total	5.711E+00	0.8705	6.175E-03	0.0009	7.986E-01	0.1217	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.519E-02	0.0069

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.347E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.809E+00	0.5805
Ra-228	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	2.753E+00	0.4195
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	6.561E+00	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.132E+00	0.5255	2.850E-04	0.0000	7.413E-01	0.1244	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.951E-02	0.0033
Ra-228	2.022E+00	0.3393	1.856E-03	0.0003	2.262E-02	0.0038	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.022E-02	0.0034
Total	5.154E+00	0.8648	2.141E-03	0.0004	7.639E-01	0.1282	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.973E-02	0.0067

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

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.893E+00	0.6532
Ra-228	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	2.067E+00	0.3468
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	5.960E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.101E+00	0.4850	3.043E-04	0.0000	7.332E-01	0.1147	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.229E-02	0.0035
Ra-228	2.458E+00	0.3844	4.261E-03	0.0007	5.481E-02	0.0086	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.039E-02	0.0032
Total	5.559E+00	0.8694	4.566E-03	0.0007	7.880E-01	0.1232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.267E-02	0.0067

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.857E+00	0.6032
Ra-228	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	2.537E+00	0.3968
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	6.394E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.041E+00	0.4654	3.399E-04	0.0001	7.173E-01	0.1098	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.743E-02	0.0042
Ra-228	2.642E+00	0.4044	6.169E-03	0.0009	8.054E-02	0.0123	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.861E-02	0.0028
Total	5.683E+00	0.8698	6.509E-03	0.0010	7.978E-01	0.1221	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.603E-02	0.0070

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.786E+00	0.5794
Ra-228	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	2.748E+00	0.4206
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	6.533E+00	1.0000

* Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	2.838E+00	0.5583	4.370E-04	0.0001	6.642E-01	0.1307	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.169E-02	0.0082
Ra-228	1.472E+00	0.2896	4.058E-03	0.0008	5.334E-02	0.0105	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.066E-03	0.0018
Total	4.310E+00	0.8480	4.496E-03	0.0009	7.176E-01	0.1412	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.075E-02	0.0100

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.545E+00	0.6973
Ra-228	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	1.539E+00	0.3027
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	5.083E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Recreationist Scenario
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	2.331E+00	0.7650	5.536E-04	0.0002	5.328E-01	0.1749	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.038E-02	0.0198
Ra-228	1.167E-01	0.0383	3.296E-04	0.0001	4.335E-03	0.0014	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.012E-04	0.0002
Total	2.447E+00	0.8033	8.831E-04	0.0003	5.372E-01	0.1763	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.108E-02	0.0200

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract:	mrem/yr	fract.
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	2.924E+00	0.9599
Ra-228	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	1.221E-01	0.0401
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	3.046E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.166E+00	0.8013	3.886E-04	0.0003	2.436E-01	0.1674	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.520E-02	0.0311
Ra-228	1.300E-05	0.0000	3.672E-08	0.0000	4.831E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.810E-08	0.0000
Total	1.167E+00	0.8013	3.886E-04	0.0003	2.436E-01	0.1674	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.520E-02	0.0311

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	1.456E+00	1.0000
Ra-228	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	1.360E-05	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.456E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.505E-01	0.8410	5.591E-05	0.0003	2.183E-02	0.1220	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.550E-03	0.0366
Ra-228	6.084E-17	0.0000	1.860E-19	0.0000	2.447E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.957E-19	0.0000
Total	1.505E-01	0.8410	5.591E-05	0.0003	2.183E-02	0.1220	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.550E-03	0.0366

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	1.789E-01	1.0000
Ra-228	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	6.387E-17	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.789E-01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	0.000E+00	0.0000
Ra-228	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
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	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.208E+00	0.9613	0.000E+00	0.0000	4.860E-02	0.0387	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.257E+00	1.0000
Ra-228	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
Total	1.208E+00	0.9613	0.000E+00	0.0000	4.860E-02	0.0387	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.257E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Recreationist Scenario
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Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226+D	Ra-226+D	1.000E+00	7.782E+00	7.704E+00	7.551E+00	7.037E+00	5.752E+00	2.832E+00	3.462E-01	5.889E-01
Ra-226+D	Pb-210+D	1.000E+00	3.123E-03	9.175E-03	2.043E-02	5.207E-02	9.641E-02	7.902E-02	1.155E-02	1.925E+00
Ra-226+D	ãDSR(j)		7.785E+00	7.714E+00	7.571E+00	7.089E+00	5.849E+00	2.911E+00	3.578E-01	2.514E+00
Ra-228+D	Ra-228+D	1.000E+00	3.199E+00	2.809E+00	2.166E+00	8.721E-01	6.482E-02	7.244E-06	3.487E-17	0.000E+00
Ra-228+D	Th-228+D	1.000E+00	9.350E-01	2.265E+00	3.329E+00	2.205E+00	1.793E-01	1.996E-05	9.286E-17	0.000E+00
Ra-228+D	ãDSR(j)		4.134E+00	5.074E+00	5.495E+00	3.078E+00	2.442E-01	2.720E-05	1.277E-16	0.000E+00

The DSR includes contributions from associated (half-life ó 180 days) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	3.211E+00	3.241E+00	3.302E+00	3.527E+00	4.274E+00	8.587E+00	6.988E+01	9.946E+00
Ra-228	6.048E+00	4.927E+00	4.549E+00	8.123E+00	1.024E+02	9.190E+05	*2.726E+14	*2.726E+14

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 2.347 ñ 0.005 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ra-226	5.000E-01	0.000E+00	7.785E+00	3.211E+00	7.617E+00	3.282E+00
Ra-228	5.000E-01	2.607 ñ 0.005	5.514E+00	4.534E+00	5.505E+00	4.541E+00

Summary : RESRAD Default Parameters Recreationist Scenario
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Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr							
		t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	3.891E+00	3.852E+00	3.775E+00	3.518E+00	2.876E+00	1.416E+00	1.731E-01	2.944E-01
Pb-210	Ra-226	1.000E+00	1.562E-03	4.587E-03	1.022E-02	2.603E-02	4.820E-02	3.951E-02	5.776E-03	9.623E-01
Ra-228	Ra-228	1.000E+00	1.599E+00	1.405E+00	1.083E+00	4.361E-01	3.241E-02	3.622E-06	1.744E-17	0.000E+00
Th-228	Ra-228	1.000E+00	4.675E-01	1.133E+00	1.665E+00	1.103E+00	8.967E-02	9.979E-06	4.643E-17	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g							
		t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	5.000E-01	4.951E-01	4.853E-01	4.527E-01	3.712E-01	1.853E-01	2.544E-02	2.439E-05
Pb-210	Ra-226	1.000E+00	0.000E+00	1.518E-02	4.342E-02	1.229E-01	2.348E-01	1.943E-01	2.843E-02	2.727E-05
Ra-228	Ra-228	1.000E+00	5.000E-01	4.390E-01	3.385E-01	1.362E-01	1.011E-02	1.125E-06	5.702E-18	0.000E+00
Th-228	Ra-228	1.000E+00	0.000E+00	1.419E-01	2.650E-01	1.916E-01	1.575E-02	1.755E-06	8.893E-18	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

RESCALC.EXE execution time = 0.55 seconds

Exhibit 8

RESRAD Results – Top Soil as Fill

(Nearby Home)

Part 3

Summary : RESRAD Default Parameters Recreationist Scenario
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Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ac-228 (Source: FGR 12)	5.978E+00	5.978E+00	DCF1(1)
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(2)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(3)
A-1	Bi-212 (Source: FGR 12)	1.171E+00	1.171E+00	DCF1(4)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(5)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(6)
A-1	Pb-212 (Source: FGR 12)	7.043E-01	7.043E-01	DCF1(7)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(8)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(9)
A-1	Po-212 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(10)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(11)
A-1	Po-216 (Source: FGR 12)	1.042E-04	1.042E-04	DCF1(12)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(13)
A-1	Ra-224 (Source: FGR 12)	5.119E-02	5.119E-02	DCF1(14)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(15)
A-1	Ra-228 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(16)
A-1	Rn-220 (Source: FGR 12)	2.298E-03	2.298E-03	DCF1(17)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(18)
A-1	Th-228 (Source: FGR 12)	7.940E-03	7.940E-03	DCF1(19)
A-1	Tl-208 (Source: FGR 12)	2.298E+01	2.298E+01	DCF1(20)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(21)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(1)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(2)
B-1	Ra-228+D	5.078E-03	4.770E-03	DCF2(3)
B-1	Th-228+D	3.454E-01	3.420E-01	DCF2(4)
C-1	Dose conversion factors for ingestion, mrem/pCi:			
C-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(1)
C-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(2)
C-1	Ra-228+D	1.442E-03	1.440E-03	DCF3(3)
C-1	Th-228+D	8.086E-04	3.960E-04	DCF3(4)
D-34	Food transfer factors:			
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(3,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,3)
D-34				

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

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(4,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(4,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(4,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(2,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(3,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(3,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(4,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(4,2)

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

Summary : RESRAD Default Parameters Recreationist Scenario
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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)	1.000E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	5.000E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Ra-226	5.000E-01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Ra-228	5.000E-01	0.000E+00	---	S1(3)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---	W1(3)
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)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-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)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+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)	1.000E+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

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(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)	1.000E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.495E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Ra-228				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.495E-03	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.652E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for daughter Th-228				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.111E-05	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
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	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	0.000E+00	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	1.000E+00	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 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)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	5.100E+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	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI

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)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	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	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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	2.000E-06	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	2.000E+00	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	code computed (time dependent)	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)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	10000.00 square meters	Ra-226	5.000E-01
Thickness:	0.50 meters	Ra-228	5.000E-01
Cover Depth:	0.00 meters		

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

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	8.661E+00	9.360E+00	9.587E+00	7.289E+00	4.167E+00	2.006E+00	2.597E-01	1.208E+00
M(t):	3.464E-01	3.744E-01	3.835E-01	2.916E-01	1.667E-01	8.025E-02	1.039E-02	4.833E-02

Maximum TDOSE(t): 9.631E+00 mrem/yr at t = 2.362 ñ 0.005 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 = 2.362E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Nuclide														
Ra-226	5.099E+00	0.5295	7.310E-04	0.0001	3.053E-03	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.446E-02	0.0036
Ra-228	4.419E+00	0.4589	1.301E-02	0.0014	3.493E-02	0.0036	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.582E-02	0.0027
Total	9.519E+00	0.9884	1.374E-02	0.0014	3.798E-02	0.0039	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.028E-02	0.0063

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.362E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Nuclide														
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	5.138E+00	0.5335
Ra-228	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	4.493E+00	0.4665
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.631E+00	1.0000

Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	5.219E+00	0.6026	6.333E-04	0.0001	3.138E-03	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.602E-02	0.0030
Ra-228	3.370E+00	0.3891	4.124E-03	0.0005	1.036E-02	0.0012	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.695E-02	0.0031
Total	8.590E+00	0.9918	4.758E-03	0.0005	1.350E-02	0.0016	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.297E-02	0.0061

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

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	5.249E+00	0.6061
Ra-228	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	3.412E+00	0.3939
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	8.661E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	5.168E+00	0.5522	6.762E-04	0.0001	3.102E-03	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.972E-02	0.0032
Ra-228	4.096E+00	0.4376	9.469E-03	0.0010	2.510E-02	0.0027	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.718E-02	0.0029
Total	9.264E+00	0.9898	1.015E-02	0.0011	2.820E-02	0.0030	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.690E-02	0.0061

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	5.202E+00	0.5558
Ra-228	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	4.158E+00	0.4442
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.360E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	5.068E+00	0.5286	7.553E-04	0.0001	3.031E-03	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.657E-02	0.0038
Ra-228	4.404E+00	0.4594	1.371E-02	0.0014	3.688E-02	0.0038	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.481E-02	0.0026
Total	9.472E+00	0.9879	1.446E-02	0.0015	3.991E-02	0.0042	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.138E-02	0.0064

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	5.108E+00	0.5328
Ra-228	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	4.479E+00	0.4672
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.587E+00	1.0000

* Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	4.730E+00	0.6490	9.712E-04	0.0001	2.793E-03	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.558E-02	0.0076
Ra-228	2.454E+00	0.3367	9.019E-03	0.0012	2.442E-02	0.0034	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.209E-02	0.0017
Total	7.184E+00	0.9856	9.990E-03	0.0014	2.722E-02	0.0037	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.767E-02	0.0093

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	4.790E+00	0.6571
Ra-228	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	2.499E+00	0.3429
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	7.289E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+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.
Ra-226	3.884E+00	0.9323	1.230E-03	0.0003	2.210E-03	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.051E-02	0.0193
Ra-228	1.945E-01	0.0467	7.323E-04	0.0002	1.985E-03	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.349E-04	0.0002
Total	4.079E+00	0.9790	1.963E-03	0.0005	4.195E-03	0.0010	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.144E-02	0.0195

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+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.
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	3.968E+00	0.9524
Ra-228	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	1.982E-01	0.0476
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	4.167E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.944E+00	0.9690	8.635E-04	0.0004	9.571E-04	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.027E-02	0.0300
Ra-228	2.167E-05	0.0000	8.160E-08	0.0000	2.212E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.041E-07	0.0000
Total	1.944E+00	0.9691	8.636E-04	0.0004	9.573E-04	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.027E-02	0.0300

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	2.006E+00	1.0000
Ra-228	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	2.208E-05	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.006E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	2.508E-01	0.9656	1.242E-04	0.0005	6.831E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.733E-03	0.0336
Ra-228	1.014E-16	0.0000	4.134E-19	0.0000	1.121E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.275E-19	0.0000
Total	2.508E-01	0.9656	1.242E-04	0.0005	6.831E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.733E-03	0.0336

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	2.597E-01	1.0000
Ra-228	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	1.035E-16	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.597E-01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 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.
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	0.000E+00	0.0000
Ra-228	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
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	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 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.
Ra-226	1.208E+00	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.208E+00	1.0000
Ra-228	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
Total	1.208E+00	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.208E+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)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226+D	Ra-226+D	1.000E+00	1.049E+01	1.039E+01	1.019E+01	9.509E+00	7.807E+00	3.906E+00	5.038E-01	4.917E-01
Ra-226+D	Pb-210+D	1.000E+00	4.203E-03	1.234E-02	2.749E-02	7.006E-02	1.297E-01	1.063E-01	1.555E-02	1.925E+00
Ra-226+D	ΣDSR(j)		1.050E+01	1.040E+01	1.022E+01	9.579E+00	7.937E+00	4.012E+00	5.194E-01	2.416E+00
Ra-228+D	Ra-228+D	1.000E+00	5.319E+00	4.671E+00	3.602E+00	1.450E+00	1.078E-01	1.205E-05	5.798E-17	0.000E+00
Ra-228+D	Th-228+D	1.000E+00	1.504E+00	3.645E+00	5.357E+00	3.549E+00	2.886E-01	3.211E-05	1.489E-16	0.000E+00
Ra-228+D	ΣDSR(j)		6.824E+00	8.316E+00	8.959E+00	4.999E+00	3.963E-01	4.416E-05	2.069E-16	0.000E+00

The DSR includes contributions from associated (half-life > 180 days) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	2.381E+00	2.403E+00	2.447E+00	2.610E+00	3.150E+00	6.231E+00	4.814E+01	1.035E+01
Ra-228	3.664E+00	3.006E+00	2.791E+00	5.001E+00	6.308E+01	5.661E+05	*2.726E+14	*2.726E+14

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 2.362 ± 0.005 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ra-226	5.000E-01	0.000E+00	1.050E+01	2.381E+00	1.028E+01	2.433E+00
Ra-228	5.000E-01	2.568 ± 0.005	8.995E+00	2.779E+00	8.986E+00	2.782E+00

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr							
		t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	5.247E+00	5.196E+00	5.094E+00	4.755E+00	3.903E+00	1.953E-01	2.519E-01	2.458E-01
Pb-210	Ra-226	1.000E+00	2.101E-03	6.172E-03	1.375E-02	3.503E-02	6.486E-02	5.316E-02	7.773E-03	9.623E-01
Ra-228	Ra-228	1.000E+00	2.660E+00	2.336E+00	1.801E+00	7.251E-01	5.390E-02	6.023E-06	2.899E-17	0.000E+00
Th-228	Ra-228	1.000E+00	7.522E-01	1.822E+00	2.678E+00	1.774E+00	1.443E-01	1.606E-05	7.447E-17	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g							
		t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	5.000E-01	4.951E-01	4.853E-01	4.527E-01	3.712E-01	1.853E-01	2.544E-02	2.439E-05
Pb-210	Ra-226	1.000E+00	0.000E+00	1.518E-02	4.342E-02	1.229E-01	2.348E-01	1.943E-01	2.843E-02	2.727E-05
Ra-228	Ra-228	1.000E+00	5.000E-01	4.390E-01	3.385E-01	1.362E-01	1.011E-02	1.125E-06	5.702E-18	0.000E+00
Th-228	Ra-228	1.000E+00	0.000E+00	1.419E-01	2.650E-01	1.916E-01	1.575E-02	1.755E-06	8.893E-18	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

RESCALC.EXE execution time = 0.48 seconds

Exhibit 8

RESRAD Results – Top Soil as Fill

(Nearby Home)

Part 4

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

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

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ac-228 (Source: FGR 12)	5.978E+00	5.978E+00	DCF1(1)
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(2)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(3)
A-1	Bi-212 (Source: FGR 12)	1.171E+00	1.171E+00	DCF1(4)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(5)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(6)
A-1	Pb-212 (Source: FGR 12)	7.043E-01	7.043E-01	DCF1(7)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(8)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(9)
A-1	Po-212 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(10)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(11)
A-1	Po-216 (Source: FGR 12)	1.042E-04	1.042E-04	DCF1(12)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(13)
A-1	Ra-224 (Source: FGR 12)	5.119E-02	5.119E-02	DCF1(14)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(15)
A-1	Ra-228 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(16)
A-1	Rn-220 (Source: FGR 12)	2.298E-03	2.298E-03	DCF1(17)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(18)
A-1	Th-228 (Source: FGR 12)	7.940E-03	7.940E-03	DCF1(19)
A-1	Tl-208 (Source: FGR 12)	2.298E+01	2.298E+01	DCF1(20)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(21)
A-1	Dose conversion factors for inhalation, mrem/pCi:			
A-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(1)
A-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(2)
A-1	Ra-228+D	5.078E-03	4.770E-03	DCF2(3)
A-1	Th-228+D	3.454E-01	3.420E-01	DCF2(4)
A-2	Dose conversion factors for ingestion, mrem/pCi:			
A-2	Pb-210+D	7.276E-03	5.370E-03	DCF3(1)
A-2	Ra-226+D	1.321E-03	1.320E-03	DCF3(2)
A-2	Ra-228+D	1.442E-03	1.440E-03	DCF3(3)
A-2	Th-228+D	8.086E-04	3.960E-04	DCF3(4)
B-34	Food transfer factors:			
B-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
B-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
B-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
B-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
B-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
B-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,3)
B-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(3,1)
B-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,2)
B-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,3)

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

Menu	Parameter	Current Value#	Base Case*	Parameter Name
0-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(4,1)
0-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(4,2)
0-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(4,3)
0-35				
0-35	Bioaccumulation factors, fresh water, L/kg:			
0-35	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
0-35	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
0-35				
0-35	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
0-35	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(2,2)
0-35				
0-35	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(3,1)
0-35	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(3,2)
0-35				
0-35	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(4,1)
0-35	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(4,2)

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

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
011	Area of contaminated zone (m**2)	1.000E+04	1.000E+04	---	AREA
011	Thickness of contaminated zone (m)	5.000E-01	2.000E+00	---	THICK0
011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
012	Initial principal radionuclide (pCi/g): Ra-226	5.000E-01	0.000E+00	---	S1(2)
012	Initial principal radionuclide (pCi/g): Ra-228	5.000E-01	0.000E+00	---	S1(3)
012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(2)
012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---	W1(3)
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)	1.500E+00	1.500E+00	---	DENSCZ
013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
013	Irrigation (m/yr)	2.000E-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)	1.500E+00	1.500E+00	---	DENSAQ
014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
014	Saturated zone b parameter	5.300E+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)	1.000E+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

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
3015	Number of unsaturated zone strata	1	1	---	NS
3015	Unsat. zone 1, thickness (m)	4.000E+00	4.000E+00	---	H(1)
3015	Unsat. zone 1, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(1)
3015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
3015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
3015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
3015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
3015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCUZ(1)
3016	Distribution coefficients for Ra-226				
3016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(2)
3016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(2,1)
3016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(2)
3016	Leach rate (/yr)	0.000E+00	0.000E+00	9.495E-03	ALEACH(2)
3016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
3016	Distribution coefficients for Ra-228				
3016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(3)
3016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(3,1)
3016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(3)
3016	Leach rate (/yr)	0.000E+00	0.000E+00	9.495E-03	ALEACH(3)
3016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
3016	Distribution coefficients for daughter Pb-210				
3016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(1)
3016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(1,1)
3016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(1)
3016	Leach rate (/yr)	0.000E+00	0.000E+00	6.652E-03	ALEACH(1)
3016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
3016	Distribution coefficients for daughter Th-228				
3016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(4)
3016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(4,1)
3016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(4)
3016	Leach rate (/yr)	0.000E+00	0.000E+00	1.111E-05	ALEACH(4)
3016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
3017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
3017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
3017	Exposure duration	3.000E+01	3.000E+01	---	ED
3017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
3017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
3017	Fraction of time spent indoors	7.500E-01	5.000E-01	---	FIND
3017	Fraction of time spent outdoors (on site)	2.500E-01	2.500E-01	---	FOTD
3017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
2017	Radii of shape factor array (used if FS = -1):				
2017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
2017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
2017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
2017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
2017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
2017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
2017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
2017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
2017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
2017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
2017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
2017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
2017	Fractions of annular areas within AREA:				
2017	Ring 1	not used	1.000E+00	---	FRACA(1)
2017	Ring 2	not used	2.732E-01	---	FRACA(2)
2017	Ring 3	not used	0.000E+00	---	FRACA(3)
2017	Ring 4	not used	0.000E+00	---	FRACA(4)
2017	Ring 5	not used	0.000E+00	---	FRACA(5)
2017	Ring 6	not used	0.000E+00	---	FRACA(6)
2017	Ring 7	not used	0.000E+00	---	FRACA(7)
2017	Ring 8	not used	0.000E+00	---	FRACA(8)
2017	Ring 9	not used	0.000E+00	---	FRACA(9)
2017	Ring 10	not used	0.000E+00	---	FRACA(10)
2017	Ring 11	not used	0.000E+00	---	FRACA(11)
2017	Ring 12	not used	0.000E+00	---	FRACA(12)
2018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
2018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
2018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
2018	Meat and poultry consumption (kg/yr)	not used	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)	3.650E+01	3.650E+01	---	SOIL
2018	Drinking water intake (L/yr)	5.100E+02	5.100E+02	---	DWI
2018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
2018	Contamination fraction of household water	1.000E+00	1.000E+00	---	FHHW
2018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
2018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
2018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
2018	Contamination fraction of plant food	not used	-1	---	FPLANT
2018	Contamination fraction of meat	not used	-1	---	FMEAT
2018	Contamination fraction of milk	not used	-1	---	FMILK
2019	Livestock fodder intake for meat (kg/day)	not used	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)	not used	5.000E+01	---	LWI5
2019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
2019	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
2019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---	MLFD
2019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
2019	Depth of roots (m)	not used	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	1.000E+00	1.000E+00	---	FGWHH
2019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
2019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
219B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
219B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
219B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
219B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
219B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
219B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
219B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
219B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
219B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
219B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
219B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
219B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
219B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
219B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
219B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
219B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
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	1.000E+00	1.000E+00	---	STOR_T(3)
TOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
TOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
TOR	Crustacea and mollusks	7.000E+00	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	4.500E+01	4.500E+01	---	STOR_T(9)
221	Thickness of building foundation (m)	1.500E-01	1.500E-01	---	FLOOR1
221	Bulk density of building foundation (g/cm**3)	2.400E+00	2.400E+00	---	DENSFL
221	Total porosity of the cover material	not used	4.000E-01	---	TPCV
221	Total porosity of the building foundation	1.000E-01	1.000E-01	---	TPFL

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
1021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
1021	Volumetric water content of the foundation	3.000E-02	3.000E-02	---	PH2OFL
1021	Diffusion coefficient for radon gas (m/sec):				
1021	in cover material	not used	2.000E-06	---	DIFCV
1021	in foundation material	3.000E-07	3.000E-07	---	DIFFL
1021	in contaminated zone soil	2.000E-06	2.000E-06	---	DIFCZ
1021	Radon vertical dimension of mixing (m)	2.000E+00	2.000E+00	---	HMIX
1021	Average building air exchange rate (1/hr)	5.000E-01	5.000E-01	---	REXG
1021	Height of the building (room) (m)	2.500E+00	2.500E+00	---	HRM
1021	Building interior area factor	2.000E-02	0.000E+00	---	FAI
1021	Building depth below ground surface (m)	-1.000E+00	-1.000E+00	code computed (time dependent)	DMFL
1021	Emanating power of Rn-222 gas	2.500E-01	2.500E-01	---	EMANA(1)
1021	Emanating power of Rn-220 gas	1.500E-01	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	10000.00 square meters	Ra-226	5.000E-01
Thickness:	0.50 meters	Ra-228	5.000E-01
Cover Depth:	0.00 meters		

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

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	7.857E+00	8.421E+00	8.602E+00	6.714E+00	4.049E+00	1.933E+00	2.359E-01	1.281E+00
M(t):	3.143E-01	3.368E-01	3.441E-01	2.686E-01	1.620E-01	7.731E-02	9.435E-03	5.124E-02

Maximum TDOSE(t): 8.638E+00 mrem/yr at t = 2.350 ñ 0.005 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 = 2.350E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.953E+00	0.4576	4.018E-04	0.0000	1.083E+00	0.1254	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.442E-02	0.0040
Ra-228	3.425E+00	0.3964	7.147E-03	0.0008	1.099E-01	0.0127	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.584E-02	0.0030
Total	7.377E+00	0.8540	7.549E-03	0.0009	1.193E+00	0.1381	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.026E-02	0.0070

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.350E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	5.071E+00	0.5870
Ra-228	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	3.567E+00	0.4130
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	8.638E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

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

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	4.045E+00	0.5148	3.483E-04	0.0000	1.112E+00	0.1415	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.602E-02	0.0033
Ra-228	2.612E+00	0.3325	2.268E-03	0.0003	3.264E-02	0.0042	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.695E-02	0.0034
Th-232	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
Total	6.657E+00	0.8473	2.617E-03	0.0003	1.144E+00	0.1456	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.297E-02	0.0067

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

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	5.183E+00	0.6597
Ra-228	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	2.674E+00	0.3403
Th-232	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
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	7.857E+00	1.0000

* Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	4.005E+00	0.4756	3.719E-04	0.0000	1.099E+00	0.1306	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.972E-02	0.0035
Ra-228	3.175E+00	0.3770	5.208E-03	0.0006	7.907E-02	0.0094	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.718E-02	0.0032
Total	7.180E+00	0.8526	5.580E-03	0.0007	1.178E+00	0.1399	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.690E-02	0.0068

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	5.135E+00	0.6098
Ra-228	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	3.286E+00	0.3902
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	8.421E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.927E+00	0.4566	4.154E-04	0.0000	1.076E+00	0.1250	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.657E-02	0.0043
Ra-228	3.413E+00	0.3968	7.540E-03	0.0009	1.162E-01	0.0135	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.481E-02	0.0029
Total	7.340E+00	0.8534	7.955E-03	0.0009	1.192E+00	0.1386	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.138E-02	0.0071

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	5.040E+00	0.5859
Ra-228	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	3.562E+00	0.4141
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	8.602E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.666E+00	0.5460	5.341E-04	0.0001	9.960E-01	0.1483	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.558E-02	0.0083
Ra-228	1.902E+00	0.2833	4.960E-03	0.0007	7.696E-02	0.0115	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.209E-02	0.0018
Total	5.568E+00	0.8293	5.495E-03	0.0008	1.073E+00	0.1598	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.767E-02	0.0101

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	4.718E+00	0.7027
Ra-228	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	1.996E+00	0.2973
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	6.714E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.010E+00	0.7435	6.766E-04	0.0002	7.990E-01	0.1973	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.051E-02	0.0199
Th-228	1.508E-01	0.0372	4.028E-04	0.0001	6.254E-03	0.0015	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.349E-04	0.0002
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	3.161E+00	0.7807	1.079E-03	0.0003	8.052E-01	0.1989	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.144E-02	0.0201

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.891E+00	0.9609
Th-228	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	1.583E-01	0.0391
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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	4.049E+00	1.0000

* Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 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.
Ra-226	1.507E+00	0.7796	4.749E-04	0.0002	3.653E-01	0.1890	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.027E-02	0.0312
Ra-228	1.680E-05	0.0000	4.488E-08	0.0000	6.969E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.041E-07	0.0000
Total	1.507E+00	0.7796	4.750E-04	0.0002	3.653E-01	0.1890	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.027E-02	0.0312

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 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.
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	1.933E+00	1.0000
Ra-228	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	1.764E-05	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.933E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.943E-01	0.8239	6.833E-05	0.0003	3.274E-02	0.1388	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.733E-03	0.0370
Ra-228	7.858E-17	0.0000	2.274E-19	0.0000	3.531E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.275E-19	0.0000
Total	1.943E-01	0.8239	6.833E-05	0.0003	3.274E-02	0.1388	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.733E-03	0.0370

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	2.359E-01	1.0000
Ra-228	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	8.287E-17	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.359E-01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
adio-														
uclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
a-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	0.000E+00	0.0000
a-228	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
otal	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

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
adio-														
uclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
a-226	1.208E+00	0.9431	0.000E+00	0.0000	7.290E-02	0.0569	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.281E+00	1.0000
a-228	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
otal	1.208E+00	0.9431	0.000E+00	0.0000	7.290E-02	0.0569	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.281E+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)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ
Ra-226+D	Ra-226+D	1.000E+00	1.036E+01	1.026E+01	1.005E+01	9.367E+00	7.653E+00	3.760E+00	4.564E-01	6.375E-01
Ra-226+D	Pb-210+D	1.000E+00	4.160E-03	1.222E-02	2.721E-02	6.934E-02	1.284E-01	1.052E-01	1.539E-02	1.925E+00
Ra-226+D	ãDSR(j)		1.037E+01	1.027E+01	1.008E+01	9.436E+00	7.781E+00	3.866E+00	4.717E-01	2.562E+00
Ra-228+D	Ra-228+D	1.000E+00	4.133E+00	3.630E+00	2.799E+00	1.127E+00	8.376E-02	9.360E-06	4.506E-17	0.000E+00
Ra-228+D	Th-228+D	1.000E+00	1.214E+00	2.942E+00	4.324E+00	2.865E+00	2.329E-01	2.592E-05	1.207E-16	0.000E+00
Ra-228+D	ãDSR(j)		5.348E+00	6.572E+00	7.123E+00	3.991E+00	3.167E-01	3.528E-05	1.657E-16	0.000E+00
ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ

The DSR includes contributions from associated (half-life ó 180 days) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ
Ra-226	2.412E+00	2.434E+00	2.480E+00	2.649E+00	3.213E+00	6.467E+00	5.299E+01	9.757E+00
Ra-228	4.675E+00	3.804E+00	3.510E+00	6.263E+00	7.894E+01	7.085E+05	*2.726E+14	*2.726E+14
ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 2.350 ñ 0.005 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin) (pCi/g)	G(i,tmin) (pCi/g)	DSR(i,tmax) (pCi/g)	G(i,tmax) (pCi/g)
ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ
Ra-226	5.000E-01	0.000E+00	1.037E+01	2.412E+00	1.014E+01	2.465E+00
Ra-228	5.000E-01	2.613 ñ 0.005	7.147E+00	3.498E+00	7.135E+00	3.504E+00
ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr							
		t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	5.181E+00	5.129E+00	5.026E+00	4.683E+00	3.826E+00	1.880E+00	2.282E-01	3.187E-01
Pb-210	Ra-226	1.000E+00	2.080E-03	6.109E-03	1.361E-02	3.467E-02	6.420E-02	5.262E-02	7.693E-03	9.623E-01
Ra-228	Ra-228	1.000E+00	2.067E+00	1.815E+00	1.399E+00	5.635E-01	4.188E-02	4.680E-06	2.253E-17	0.000E+00
Th-228	Ra-228	1.000E+00	6.072E-01	1.471E+00	2.162E+00	1.432E+00	1.165E-01	1.296E-05	6.034E-17	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g							
		t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	5.000E-01	4.951E-01	4.853E-01	4.527E-01	3.712E-01	1.853E-01	2.544E-02	2.439E-05
Pb-210	Ra-226	1.000E+00	0.000E+00	1.518E-02	4.342E-02	1.229E-01	2.348E-01	1.943E-01	2.843E-02	2.727E-05
Ra-228	Ra-228	1.000E+00	5.000E-01	4.390E-01	3.385E-01	1.362E-01	1.011E-02	1.125E-06	5.702E-18	0.000E+00
Th-228	Ra-228	1.000E+00	0.000E+00	1.419E-01	2.650E-01	1.916E-01	1.575E-02	1.755E-06	8.893E-18	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

RESCALC.EXE execution time = 0.53 seconds

Exhibit 8

RESRAD Results – Top Soil as Fill

(Nearby Home)

Part 5

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

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Dose Conversion Factor (and Related) Parameter Summary

Dose Library: FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ac-228 (Source: FGR 12)	5.978E+00	5.978E+00	DCF1(1)
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(2)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(3)
A-1	Bi-212 (Source: FGR 12)	1.171E+00	1.171E+00	DCF1(4)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(5)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(6)
A-1	Pb-212 (Source: FGR 12)	7.043E-01	7.043E-01	DCF1(7)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(8)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(9)
A-1	Po-212 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(10)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(11)
A-1	Po-216 (Source: FGR 12)	1.042E-04	1.042E-04	DCF1(12)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(13)
A-1	Ra-224 (Source: FGR 12)	5.119E-02	5.119E-02	DCF1(14)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(15)
A-1	Ra-228 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(16)
A-1	Rn-220 (Source: FGR 12)	2.298E-03	2.298E-03	DCF1(17)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(18)
A-1	Th-228 (Source: FGR 12)	7.940E-03	7.940E-03	DCF1(19)
A-1	Tl-208 (Source: FGR 12)	2.298E+01	2.298E+01	DCF1(20)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(21)
A-1				
A-1	Dose conversion factors for inhalation, mrem/pCi:			
A-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(1)
A-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(2)
A-1	Ra-228+D	5.078E-03	4.770E-03	DCF2(3)
A-1	Th-228+D	3.454E-01	3.420E-01	DCF2(4)
A-1				
A-1	Dose conversion factors for ingestion, mrem/pCi:			
A-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(1)
A-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(2)
A-1	Ra-228+D	1.442E-03	1.440E-03	DCF3(3)
A-1	Th-228+D	8.086E-04	3.960E-04	DCF3(4)
A-1				
A-34	Food transfer factors:			
A-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
A-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
A-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
A-34				
A-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
A-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
A-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,3)
A-34				
A-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(3,1)
A-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,2)
A-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,3)
A-34				

Dose Conversion Factor (and Related) Parameter Summary (continued)

Dose Library: FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(4,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(4,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(4,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(2,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(3,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(3,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(4,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(4,2)

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

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.000E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	5.000E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Ra-226	5.000E-01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Ra-228	5.000E-01	0.000E+00	---	S1(3)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---	W1(3)
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)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-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)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+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)	1.000E+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

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(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)	1.000E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.495E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Ra-228				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.495E-03	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.652E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for daughter Th-228				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.111E-05	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
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	7.000E-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)	5.000E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
2017	Radii of shape factor array (used if FS = -1):				
2017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
2017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
2017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
2017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
2017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
2017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
2017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
2017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
2017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
2017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
2017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
2017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
2017	Fractions of annular areas within AREA:				
2017	Ring 1	not used	1.000E+00	---	FRACA(1)
2017	Ring 2	not used	2.732E-01	---	FRACA(2)
2017	Ring 3	not used	0.000E+00	---	FRACA(3)
2017	Ring 4	not used	0.000E+00	---	FRACA(4)
2017	Ring 5	not used	0.000E+00	---	FRACA(5)
2017	Ring 6	not used	0.000E+00	---	FRACA(6)
2017	Ring 7	not used	0.000E+00	---	FRACA(7)
2017	Ring 8	not used	0.000E+00	---	FRACA(8)
2017	Ring 9	not used	0.000E+00	---	FRACA(9)
2017	Ring 10	not used	0.000E+00	---	FRACA(10)
2017	Ring 11	not used	0.000E+00	---	FRACA(11)
2017	Ring 12	not used	0.000E+00	---	FRACA(12)
2018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
2018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
2018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
2018	Meat and poultry consumption (kg/yr)	not used	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)	3.650E+01	3.650E+01	---	SOIL
2018	Drinking water intake (L/yr)	5.100E+02	5.100E+02	---	DWI
2018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
2018	Contamination fraction of household water	1.000E+00	1.000E+00	---	FHHW
2018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
2018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
2018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
2018	Contamination fraction of plant food	not used	-1	---	FPLANT
2018	Contamination fraction of meat	not used	-1	---	FMEAT
2018	Contamination fraction of milk	not used	-1	---	FMILK
2019	Livestock fodder intake for meat (kg/day)	not used	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)	not used	5.000E+01	---	LWI5
2019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
2019	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)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	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	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
S021	Thickness of building foundation (m)	1.500E-01	1.500E-01	---	FLOOR1
S021	Bulk density of building foundation (g/cm**3)	2.400E+00	2.400E+00	---	DENSFL
S021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
S021	Total porosity of the building foundation	1.000E-01	1.000E-01	---	TPFL

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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 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	2.000E-02	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	-1.000E+00	-1.000E+00	code computed (time dependent)	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)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

Summary : RESRAD Default Parameters Recreationist Scenario
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Contaminated Zone Dimensions
Area: 10000.00 square meters
Thickness: 0.50 meters
Cover Depth: 0.00 meters

Initial Soil Concentrations, pCi/g
Ra-226 5.000E-01
Ra-228 5.000E-01

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

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	8.125E+00	8.734E+00	8.930E+00	6.906E+00	4.088E+00	1.957E+00	2.438E-01	1.257E+00
M(t):	3.250E-01	3.494E-01	3.572E-01	2.762E-01	1.635E-01	7.829E-02	9.752E-03	5.027E-02

Maximum TDOSE(t): 8.969E+00 mrem/yr at t = 2.351 ñ 0.005 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 = 2.351E+00 years

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.
Ra-226	4.335E+00	0.4833	5.114E-04	0.0001	7.232E-01	0.0806	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.442E-02	0.0038
Ra-228	3.756E+00	0.4188	9.098E-03	0.0010	8.489E-02	0.0095	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.584E-02	0.0029
Total	8.091E+00	0.9021	9.609E-03	0.0011	8.081E-01	0.0901	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.026E-02	0.0067

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.351E+00 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.
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	5.093E+00	0.5679
Ra-228	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	3.876E+00	0.4321
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	8.969E+00	1.0000

Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	4.436E+00	0.5460	4.433E-04	0.0001	7.421E-01	0.0913	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.602E-02	0.0032
Ra-228	2.865E+00	0.3526	2.887E-03	0.0004	2.521E-02	0.0031	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.695E-02	0.0033
Total	7.301E+00	0.8986	3.330E-03	0.0004	7.673E-01	0.0944	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.297E-02	0.0065

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

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	5.205E+00	0.6406
Ra-228	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	2.920E+00	0.3594
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	8.125E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Recreationist Scenario
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	4.393E+00	0.5030	4.733E-04	0.0001	7.340E-01	0.0840	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.972E-02	0.0034
Ra-228	3.482E+00	0.3987	6.629E-03	0.0008	6.108E-02	0.0070	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.718E-02	0.0031
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Total	7.875E+00	0.9016	7.102E-03	0.0008	7.951E-01	0.0910	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.690E-02	0.0065

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	5.157E+00	0.5905
Ra-228	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	3.577E+00	0.4095
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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	8.734E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	4.307E+00	0.4823	5.287E-04	0.0001	7.181E-01	0.0804	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.657E-02	0.0041
Ra-228	3.743E+00	0.4192	9.596E-03	0.0011	8.976E-02	0.0101	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.481E-02	0.0028
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Total	8.051E+00	0.9015	1.012E-02	0.0011	8.078E-01	0.0905	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.138E-02	0.0069

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	5.063E+00	0.5669
Ra-228	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	3.868E+00	0.4331
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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	8.930E+00	1.0000

Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	4.021E+00	0.5822	6.798E-04	0.0001	6.649E-01	0.0963	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.558E-02	0.0080
Ra-228	2.086E+00	0.3020	6.313E-03	0.0009	5.945E-02	0.0086	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.209E-02	0.0018
Total	6.107E+00	0.8843	6.993E-03	0.0010	7.244E-01	0.1049	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.767E-02	0.0098

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	4.742E+00	0.6867
Ra-228	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	2.164E+00	0.3133
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	6.906E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.302E+00	0.8076	8.611E-04	0.0002	5.334E-01	0.1305	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.051E-02	0.0197
Ra-228	1.653E-01	0.0404	5.126E-04	0.0001	4.831E-03	0.0012	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.349E-04	0.0002
Total	3.467E+00	0.8481	1.374E-03	0.0003	5.382E-01	0.1317	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.144E-02	0.0199

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.916E+00	0.9580
Ra-228	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	1.716E-01	0.0420
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	4.088E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.653E+00	0.8443	6.045E-04	0.0003	2.439E-01	0.1246	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.027E-02	0.0308
Ra-228	1.842E-05	0.0000	5.712E-08	0.0000	5.384E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.041E-07	0.0000
Total	1.653E+00	0.8443	6.045E-04	0.0003	2.439E-01	0.1246	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.027E-02	0.0308

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	1.957E+00	1.0000
Ra-228	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	1.912E-05	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.957E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 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.
Ra-226	2.131E-01	0.8742	8.697E-05	0.0004	2.185E-02	0.0896	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.733E-03	0.0358
Ra-228	8.619E-17	0.0000	2.894E-19	0.0000	2.727E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.275E-19	0.0000
Total	2.131E-01	0.8742	8.697E-05	0.0004	2.185E-02	0.0896	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.733E-03	0.0358

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 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.
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	2.438E-01	1.0000
Ra-228	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	8.973E-17	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.438E-01	1.0000

* Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 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.
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	0.000E+00	0.0000
Ra-228	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
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	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 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.
Ra-226	1.208E+00	0.9613	0.000E+00	0.0000	4.860E-02	0.0387	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.257E+00	1.0000
Ra-228	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
Total	1.208E+00	0.9613	0.000E+00	0.0000	4.860E-02	0.0387	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.257E+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)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226+D	Ra-226+D	1.000E+00	1.041E+01	1.030E+01	1.010E+01	9.414E+00	7.704E+00	3.809E+00	4.722E-01	5.889E-01
Ra-226+D	Pb-210+D	1.000E+00	4.174E-03	1.226E-02	2.731E-02	6.958E-02	1.288E-01	1.056E-01	1.544E-02	1.925E+00
Ra-226+D	ΣDSR(j)		1.041E+01	1.031E+01	1.013E+01	9.484E+00	7.833E+00	3.915E+00	4.876E-01	2.514E+00
Ra-228+D	Ra-228+D	1.000E+00	4.529E+00	3.977E+00	3.067E+00	1.235E+00	9.177E-02	1.026E-05	4.937E-17	0.000E+00
Ra-228+D	Th-228+D	1.000E+00	1.311E+00	3.177E+00	4.669E+00	3.093E+00	2.515E-01	2.799E-05	1.301E-16	0.000E+00
Ra-228+D	ΣDSR(j)		5.840E+00	7.153E+00	7.735E+00	4.327E+00	3.432E-01	3.824E-05	1.795E-16	0.000E+00

The DSR includes contributions from associated (half-life ó 180 days) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	2.402E+00	2.424E+00	2.469E+00	2.636E+00	3.192E+00	6.386E+00	5.127E+01	9.946E+00
Ra-228	4.281E+00	3.495E+00	3.232E+00	5.777E+00	7.284E+01	6.537E+05	*2.726E+14	*2.726E+14

At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 2.351 ñ 0.005 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ra-226	5.000E-01	0.000E+00	1.041E+01	2.402E+00	1.019E+01	2.454E+00
Ra-228	5.000E-01	2.594 ñ 0.005	7.763E+00	3.220E+00	7.752E+00	3.225E+00

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr							
		t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	5.203E+00	5.151E+00	5.049E+00	4.707E+00	3.852E+00	1.904E+00	2.361E-01	2.944E-01
Pb-210	Ra-226	1.000E+00	2.087E-03	6.130E-03	1.365E-02	3.479E-02	6.442E-02	5.280E-02	7.720E-03	9.623E-01
Ra-228	Ra-228	1.000E+00	2.264E+00	1.988E+00	1.533E+00	6.174E-01	4.588E-02	5.128E-06	2.469E-17	0.000E+00
Th-228	Ra-228	1.000E+00	6.555E-01	1.588E+00	2.334E+00	1.546E+00	1.257E-01	1.399E-05	6.505E-17	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g							
		t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	5.000E-01	4.951E-01	4.853E-01	4.527E-01	3.712E-01	1.853E-01	2.544E-02	2.439E-05
Pb-210	Ra-226	1.000E+00	0.000E+00	1.518E-02	4.342E-02	1.229E-01	2.348E-01	1.943E-01	2.843E-02	2.727E-05
Ra-228	Ra-228	1.000E+00	5.000E-01	4.390E-01	3.385E-01	1.362E-01	1.011E-02	1.125E-06	5.702E-18	0.000E+00
Th-228	Ra-228	1.000E+00	0.000E+00	1.419E-01	2.650E-01	1.916E-01	1.575E-02	1.755E-06	8.893E-18	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

RESCALC.EXE execution time = 0.53 seconds

Exhibit 8

RESRAD Results – Top Soil as Fill

(Nearby Home)

Part 6

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

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Dose Conversion Factor (and Related) Parameter Summary

Dose Library: FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ac-228 (Source: FGR 12)	5.978E+00	5.978E+00	DCF1(1)
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(2)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(3)
A-1	Bi-212 (Source: FGR 12)	1.171E+00	1.171E+00	DCF1(4)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(5)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(6)
A-1	Pb-212 (Source: FGR 12)	7.043E-01	7.043E-01	DCF1(7)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(8)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(9)
A-1	Po-212 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(10)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(11)
A-1	Po-216 (Source: FGR 12)	1.042E-04	1.042E-04	DCF1(12)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(13)
A-1	Ra-224 (Source: FGR 12)	5.119E-02	5.119E-02	DCF1(14)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(15)
A-1	Ra-228 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(16)
A-1	Rn-220 (Source: FGR 12)	2.298E-03	2.298E-03	DCF1(17)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(18)
A-1	Th-228 (Source: FGR 12)	7.940E-03	7.940E-03	DCF1(19)
A-1	Tl-208 (Source: FGR 12)	2.298E+01	2.298E+01	DCF1(20)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(21)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(1)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(2)
B-1	Ra-228+D	5.078E-03	4.770E-03	DCF2(3)
B-1	Th-228+D	3.454E-01	3.420E-01	DCF2(4)
C-1	Dose conversion factors for ingestion, mrem/pCi:			
C-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(1)
C-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(2)
C-1	Ra-228+D	1.442E-03	1.440E-03	DCF3(3)
C-1	Th-228+D	8.086E-04	3.960E-04	DCF3(4)
D-34	Food transfer factors:			
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(3,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,3)
D-34				

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

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(4,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(4,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(4,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(2,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(3,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(3,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(4,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(4,2)

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

Summary : RESRAD Default Parameters Recreationist Scenario
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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)	1.000E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	5.000E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Ra-226	5.000E-01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Ra-228	5.000E-01	0.000E+00	---	S1(3)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---	W1(3)
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)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-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)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+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)	1.000E+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

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
2015	Number of unsaturated zone strata	1	1	---	NS
2015	Unsat. zone 1, thickness (m)	4.000E+00	4.000E+00	---	H(1)
2015	Unsat. zone 1, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(1)
2015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
2015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
2015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
2015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
2015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCUZ(1)
2016	Distribution coefficients for Ra-226				
2016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(2)
2016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(2,1)
2016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(2)
2016	Leach rate (/yr)	0.000E+00	0.000E+00	9.495E-03	ALEACH(2)
2016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
2016	Distribution coefficients for Ra-228				
2016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(3)
2016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(3,1)
2016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(3)
2016	Leach rate (/yr)	0.000E+00	0.000E+00	9.495E-03	ALEACH(3)
2016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
2016	Distribution coefficients for daughter Pb-210				
2016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(1)
2016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(1,1)
2016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(1)
2016	Leach rate (/yr)	0.000E+00	0.000E+00	6.652E-03	ALEACH(1)
2016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
2016	Distribution coefficients for daughter Th-228				
2016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(4)
2016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(4,1)
2016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(4)
2016	Leach rate (/yr)	0.000E+00	0.000E+00	1.111E-05	ALEACH(4)
2016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
2017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
2017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
2017	Exposure duration	3.000E+01	3.000E+01	---	ED
2017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
2017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
2017	Fraction of time spent indoors	2.500E-01	5.000E-01	---	FIND
2017	Fraction of time spent outdoors (on site)	7.500E-01	2.500E-01	---	FOTD
2017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS

Summary : RESRAD Default Parameters Recreationist Scenario
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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)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	5.100E+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	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI

Summary : RESRAD Default Parameters Recreationist Scenario
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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)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	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	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	1.500E-01	1.500E-01	---	FLOOR1
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

Summary : RESRAD Default Parameters Recreationist Scenario
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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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 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	2.000E-02	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	-1.000E+00	-1.000E+00	code computed (time dependent)	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)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

Summary : RESRAD Default Parameters Recreationist Scenario
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Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	10000.00 square meters	Ra-226	5.000E-01
Thickness:	0.50 meters	Ra-228	5.000E-01
Cover Depth:	0.00 meters		

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

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	8.393E+00	9.047E+00	9.259E+00	7.097E+00	4.127E+00	1.982E+00	2.517E-01	1.232E+00
M(t):	3.357E-01	3.619E-01	3.703E-01	2.839E-01	1.651E-01	7.927E-02	1.007E-02	4.930E-02

Maximum TDOSE(t): 9.300E+00 mrem/yr at t = 2.357 ñ 0.005 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 = 2.357E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	4.717E+00	0.5072	6.212E-04	0.0001	3.631E-01	0.0390	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.444E-02	0.0037
Ra-228	4.088E+00	0.4395	1.105E-02	0.0012	5.993E-02	0.0064	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.583E-02	0.0028
Total	8.805E+00	0.9468	1.168E-02	0.0013	4.230E-01	0.0455	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.027E-02	0.0065

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.357E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	5.115E+00	0.5501
Ra-228	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	4.184E+00	0.4499
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.300E+00	1.0000

* Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	4.828E+00	0.5752	5.383E-04	0.0001	3.726E-01	0.0444	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.602E-02	0.0031
Ra-228	3.118E+00	0.3715	3.506E-03	0.0004	1.778E-02	0.0021	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.695E-02	0.0032
Total	7.946E+00	0.9467	4.044E-03	0.0005	3.904E-01	0.0465	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.297E-02	0.0063

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	5.227E+00	0.6228
Ra-228	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	3.166E+00	0.3772
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	8.393E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Recreationist Scenario
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	4.781E+00	0.5284	5.748E-04	0.0001	3.685E-01	0.0407	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.972E-02	0.0033
Ra-228	3.789E+00	0.4188	8.049E-03	0.0009	4.309E-02	0.0048	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.718E-02	0.0030
Total	8.570E+00	0.9473	8.624E-03	0.0010	4.116E-01	0.0455	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.690E-02	0.0063

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	5.179E+00	0.5725
Ra-228	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	3.867E+00	0.4275
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.047E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	4.688E+00	0.5063	6.420E-04	0.0001	3.605E-01	0.0389	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.657E-02	0.0040
Ra-228	4.074E+00	0.4400	1.165E-02	0.0013	6.332E-02	0.0068	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.481E-02	0.0027
Total	8.761E+00	0.9463	1.229E-02	0.0013	4.239E-01	0.0458	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.138E-02	0.0066

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	5.085E+00	0.5492
Ra-228	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	4.173E+00	0.4508
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.259E+00	1.0000

Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	4.376E+00	0.6165	8.255E-04	0.0001	3.339E-01	0.0470	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.558E-02	0.0078
Ra-228	2.270E+00	0.3198	7.666E-03	0.0011	4.194E-02	0.0059	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.209E-02	0.0017
Total	6.645E+00	0.9363	8.492E-03	0.0012	3.758E-01	0.0529	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.767E-02	0.0095

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	4.766E+00	0.6715
Ra-228	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	2.332E+00	0.3285
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	7.097E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.593E+00	0.8706	1.046E-03	0.0003	2.678E-01	0.0649	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.051E-02	0.0195
Ra-228	1.799E-01	0.0436	6.225E-04	0.0002	3.408E-03	0.0008	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.349E-04	0.0002
Total	3.773E+00	0.9142	1.668E-03	0.0004	2.712E-01	0.0657	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.144E-02	0.0197

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.942E+00	0.9552
Ra-228	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	1.849E-01	0.0448
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	4.127E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
adio-														
uclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
a-226	1.798E+00	0.9074	7.340E-04	0.0004	1.224E-01	0.0618	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.027E-02	0.0304
a-228	2.005E-05	0.0000	6.936E-08	0.0000	3.798E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.041E-07	0.0000
otal	1.798E+00	0.9074	7.341E-04	0.0004	1.224E-01	0.0618	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.027E-02	0.0304

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
adio-														
uclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
a-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	1.982E+00	1.0000
a-228	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	2.060E-05	0.0000
otal	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	1.982E+00	1.0000

Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	2.319E-01	0.9214	1.056E-04	0.0004	1.096E-02	0.0435	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.733E-03	0.0347
Ra-228	9.379E-17	0.0000	3.514E-19	0.0000	1.924E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.275E-19	0.0000
Total	2.319E-01	0.9214	1.056E-04	0.0004	1.096E-02	0.0435	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.733E-03	0.0347

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	2.517E-01	1.0000
Ra-228	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	9.660E-17	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.517E-01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	0.000E+00	0.0000
Ra-228	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
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	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.208E+00	0.9803	0.000E+00	0.0000	2.430E-02	0.0197	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.232E+00	1.0000
Ra-228	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
Total	1.208E+00	0.9803	0.000E+00	0.0000	2.430E-02	0.0197	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.232E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Recreationist Scenario
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Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226+D	Ra-226+D	1.000E+00	1.045E+01	1.035E+01	1.014E+01	9.462E+00	7.756E+00	3.858E+00	4.880E-01	5.403E-01
Ra-226+D	Pb-210+D	1.000E+00	4.188E-03	1.230E-02	2.740E-02	6.982E-02	1.293E-01	1.060E-01	1.549E-02	1.925E+00
Ra-226+D	ãDSR(j)		1.045E+01	1.036E+01	1.017E+01	9.532E+00	7.885E+00	3.964E+00	5.035E-01	2.465E+00
Ra-228+D	Ra-228+D	1.000E+00	4.924E+00	4.324E+00	3.334E+00	1.342E+00	9.978E-02	1.115E-05	5.368E-17	0.000E+00
Ra-228+D	Th-228+D	1.000E+00	1.408E+00	3.411E+00	5.013E+00	3.321E+00	2.700E-01	3.005E-05	1.395E-16	0.000E+00
Ra-228+D	ãDSR(j)		6.332E+00	7.735E+00	8.347E+00	4.663E+00	3.698E-01	4.120E-05	1.932E-16	0.000E+00

The DSR includes contributions from associated (half-life ó 180 days) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	2.391E+00	2.413E+00	2.458E+00	2.623E+00	3.171E+00	6.308E+00	4.965E+01	1.014E+01
Ra-228	3.948E+00	3.232E+00	2.995E+00	5.361E+00	6.761E+01	6.068E+05	*2.726E+14	*2.726E+14

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 2.357 ñ 0.005 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ra-226	5.000E-01	0.000E+00	1.045E+01	2.391E+00	1.023E+01	2.444E+00
Ra-228	5.000E-01	2.581 ñ 0.005	8.379E+00	2.984E+00	8.369E+00	2.987E+00

Summary : RESRAD Default Parameters Recreationist Scenario
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Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr							
		t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	5.225E+00	5.173E+00	5.072E+00	4.731E+00	3.878E+00	1.929E+00	2.440E-01	2.701E-01
Pb-210	Ra-226	1.000E+00	2.094E-03	6.151E-03	1.370E-02	3.491E-02	6.464E-02	5.298E-02	7.746E-03	9.623E-01
Ra-228	Ra-228	1.000E+00	2.462E+00	2.162E+00	1.667E+00	6.712E-01	4.989E-02	5.575E-06	2.684E-17	0.000E+00
Th-228	Ra-228	1.000E+00	7.039E-01	1.705E+00	2.506E+00	1.660E+00	1.350E-01	1.502E-05	6.976E-17	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g							
		t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	5.000E-01	4.951E-01	4.853E-01	4.527E-01	3.712E-01	1.853E-01	2.544E-02	2.439E-05
Pb-210	Ra-226	1.000E+00	0.000E+00	1.518E-02	4.342E-02	1.229E-01	2.348E-01	1.943E-01	2.843E-02	2.727E-05
Ra-228	Ra-228	1.000E+00	5.000E-01	4.390E-01	3.385E-01	1.362E-01	1.011E-02	1.125E-06	5.702E-18	0.000E+00
Th-228	Ra-228	1.000E+00	0.000E+00	1.419E-01	2.650E-01	1.916E-01	1.575E-02	1.755E-06	8.893E-18	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

RESCALC.EXE execution time = 0.53 seconds

Exhibit 8

RESRAD Results – Top Soil as Fill

(Nearby Home)

Part 7

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

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

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ac-228 (Source: FGR 12)	5.978E+00	5.978E+00	DCF1(1)
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(2)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(3)
A-1	Bi-212 (Source: FGR 12)	1.171E+00	1.171E+00	DCF1(4)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(5)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(6)
A-1	Pb-212 (Source: FGR 12)	7.043E-01	7.043E-01	DCF1(7)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(8)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(9)
A-1	Po-212 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(10)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(11)
A-1	Po-216 (Source: FGR 12)	1.042E-04	1.042E-04	DCF1(12)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(13)
A-1	Ra-224 (Source: FGR 12)	5.119E-02	5.119E-02	DCF1(14)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(15)
A-1	Ra-228 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(16)
A-1	Rn-220 (Source: FGR 12)	2.298E-03	2.298E-03	DCF1(17)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(18)
A-1	Th-228 (Source: FGR 12)	7.940E-03	7.940E-03	DCF1(19)
A-1	Tl-208 (Source: FGR 12)	2.298E+01	2.298E+01	DCF1(20)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(21)
A-1	Dose conversion factors for inhalation, mrem/pCi:			
A-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(1)
A-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(2)
A-1	Ra-228+D	5.078E-03	4.770E-03	DCF2(3)
A-1	Th-228+D	3.454E-01	3.420E-01	DCF2(4)
A-1	Dose conversion factors for ingestion, mrem/pCi:			
A-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(1)
A-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(2)
A-1	Ra-228+D	1.442E-03	1.440E-03	DCF3(3)
A-1	Th-228+D	8.086E-04	3.960E-04	DCF3(4)
A-34	Food transfer factors:			
A-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
A-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
A-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
A-34				
A-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
A-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
A-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,3)
A-34				
A-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(3,1)
A-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,2)
A-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,3)
A-34				

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

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(4,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(4,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(4,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(2,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(3,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(3,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(4,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(4,2)

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

ummary : RESRAD Default Parameters Recreationist Scenario
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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)	1.000E+04	1.000E+04	---	AREA
011	Thickness of contaminated zone (m)	5.000E-01	2.000E+00	---	THICK0
011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
012	Initial principal radionuclide (pCi/g): Ra-226	5.000E-01	0.000E+00	---	S1(2)
012	Initial principal radionuclide (pCi/g): Ra-228	5.000E-01	0.000E+00	---	S1(3)
012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(2)
012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---	W1(3)
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)	1.500E+00	1.500E+00	---	DENSCZ
013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
013	Irrigation (m/yr)	2.000E-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)	1.500E+00	1.500E+00	---	DENSAQ
014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
014	Saturated zone b parameter	5.300E+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)	1.000E+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

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
2015	Number of unsaturated zone strata	1	1	---	NS
2015	Unsat. zone 1, thickness (m)	4.000E+00	4.000E+00	---	H(1)
2015	Unsat. zone 1, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(1)
2015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
2015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
2015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
2015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
2015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCUZ(1)
2016	Distribution coefficients for Ra-226				
2016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(2)
2016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(2,1)
2016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(2)
2016	Leach rate (/yr)	0.000E+00	0.000E+00	9.495E-03	ALEACH(2)
2016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
2016	Distribution coefficients for Ra-228				
2016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(3)
2016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(3,1)
2016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(3)
2016	Leach rate (/yr)	0.000E+00	0.000E+00	9.495E-03	ALEACH(3)
2016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
2016	Distribution coefficients for daughter Pb-210				
2016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(1)
2016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(1,1)
2016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(1)
2016	Leach rate (/yr)	0.000E+00	0.000E+00	6.652E-03	ALEACH(1)
2016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
2016	Distribution coefficients for daughter Th-228				
2016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(4)
2016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(4,1)
2016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(4)
2016	Leach rate (/yr)	0.000E+00	0.000E+00	1.111E-05	ALEACH(4)
2016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
2017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
2017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
2017	Exposure duration	3.000E+01	3.000E+01	---	ED
2017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
2017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
2017	Fraction of time spent indoors	1.000E+00	5.000E-01	---	FIND
2017	Fraction of time spent outdoors (on site)	0.000E+00	2.500E-01	---	FOTD
2017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
2017	Radii of shape factor array (used if FS = -1):				
2017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
2017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
2017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
2017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
2017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
2017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
2017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
2017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
2017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
2017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
2017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
2017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
2017	Fractions of annular areas within ARRA:				
2017	Ring 1	not used	1.000E+00	---	FRACA(1)
2017	Ring 2	not used	2.732E-01	---	FRACA(2)
2017	Ring 3	not used	0.000E+00	---	FRACA(3)
2017	Ring 4	not used	0.000E+00	---	FRACA(4)
2017	Ring 5	not used	0.000E+00	---	FRACA(5)
2017	Ring 6	not used	0.000E+00	---	FRACA(6)
2017	Ring 7	not used	0.000E+00	---	FRACA(7)
2017	Ring 8	not used	0.000E+00	---	FRACA(8)
2017	Ring 9	not used	0.000E+00	---	FRACA(9)
2017	Ring 10	not used	0.000E+00	---	FRACA(10)
2017	Ring 11	not used	0.000E+00	---	FRACA(11)
2017	Ring 12	not used	0.000E+00	---	FRACA(12)
2018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
2018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
2018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
2018	Meat and poultry consumption (kg/yr)	not used	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)	3.650E+01	3.650E+01	---	SOIL
2018	Drinking water intake (L/yr)	5.100E+02	5.100E+02	---	DWI
2018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
2018	Contamination fraction of household water	1.000E+00	1.000E+00	---	FHHW
2018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
2018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
2018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
2018	Contamination fraction of plant food	not used	-1	---	FPLANT
2018	Contamination fraction of meat	not used	-1	---	FMEAT
2018	Contamination fraction of milk	not used	-1	---	FMILK
2019	Livestock fodder intake for meat (kg/day)	not used	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)	not used	5.000E+01	---	LWI5
2019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
2019	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
2019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---	MLFD
2019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
2019	Depth of roots (m)	not used	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	1.000E+00	1.000E+00	---	FGWHH
2019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
2019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
219B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
219B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
219B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
219B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
219B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
219B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
219B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
219B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
219B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
219B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
219B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
219B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
219B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
219B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
219B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
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
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
021	Thickness of building foundation (m)	1.500E-01	1.500E-01	---	FLOOR1
021	Bulk density of building foundation (g/cm**3)	2.400E+00	2.400E+00	---	DENSFL
021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
021	Total porosity of the building foundation	1.000E-01	1.000E-01	---	TPFL

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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 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	2.000E-02	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	-1.000E+00	-1.000E+00	code computed (time dependent)	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)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

Summary : RESRAD Default Parameters Recreationist Scenario
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Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	10000.00 square meters	Ra-226	5.000E-01
Thickness:	0.50 meters	Ra-228	5.000E-01
Cover Depth:	0.00 meters		

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

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	7.589E+00	8.108E+00	8.273E+00	6.522E+00	4.010E+00	1.908E+00	2.279E-01	1.305E+00
M(t):	3.036E-01	3.243E-01	3.309E-01	2.609E-01	1.604E-01	7.633E-02	9.117E-03	5.222E-02

Maximum TDOSE(t): 8.307E+00 mrem/yr at t = 2.350 ñ 0.005 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 = 2.350E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.570E+00	0.4298	2.922E-04	0.0000	1.443E+00	0.1737	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.442E-02	0.0041
Ra-228	3.093E+00	0.3723	5.198E-03	0.0006	1.349E-01	0.0162	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.584E-02	0.0031
Total	6.663E+00	0.8021	5.490E-03	0.0007	1.578E+00	0.1900	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.026E-02	0.0073

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.350E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	5.048E+00	0.6077
Ra-228	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	3.259E+00	0.3923
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	8.307E+00	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
adio-														
uclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
a-226	3.654E+00	0.4814	2.533E-04	0.0000	1.481E+00	0.1952	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.602E-02	0.0034
a-228	2.359E+00	0.3109	1.650E-03	0.0002	4.006E-02	0.0053	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.695E-02	0.0036
otal	6.013E+00	0.7923	1.903E-03	0.0003	1.521E+00	0.2004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.297E-02	0.0070

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

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
adio-														
uclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
a-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	5.161E+00	0.6801
a-228	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	2.428E+00	0.3199
otal	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	7.589E+00	1.0000

Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.618E+00	0.4462	2.705E-04	0.0000	1.465E+00	0.1807	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.972E-02	0.0037
Ra-228	2.867E+00	0.3536	3.788E-03	0.0005	9.706E-02	0.0120	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.718E-02	0.0034
Total	6.485E+00	0.7998	4.058E-03	0.0005	1.562E+00	0.1926	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.690E-02	0.0070

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	5.113E+00	0.6306
Ra-228	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	2.995E+00	0.3694
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	8.108E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Recreationist Scenario
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.547E+00	0.4288	3.021E-04	0.0000	1.433E+00	0.1732	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.657E-02	0.0044
Ra-228	3.083E+00	0.3726	5.483E-03	0.0007	1.426E-01	0.0172	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.481E-02	0.0030
Total	6.630E+00	0.8014	5.785E-03	0.0007	1.576E+00	0.1905	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.138E-02	0.0074

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	5.017E+00	0.6065
Ra-228	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	3.256E+00	0.3935
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	8.273E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Recreationist Scenario
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.311E+00	0.5077	3.885E-04	0.0001	1.327E+00	0.2035	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.558E-02	0.0085
Ra-228	1.718E+00	0.2634	3.608E-03	0.0006	9.447E-02	0.0145	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.209E-02	0.0019
Total	5.029E+00	0.7711	3.996E-03	0.0006	1.422E+00	0.2180	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.767E-02	0.0104

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	4.694E+00	0.7197
Ra-228	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	1.828E+00	0.2803
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	6.522E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	2.719E+00	0.6781	4.921E-04	0.0001	1.065E+00	0.2655	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.051E-02	0.0201
Ra-228	1.362E-01	0.0340	2.929E-04	0.0001	7.677E-03	0.0019	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.349E-04	0.0002
Total	2.855E+00	0.7121	7.850E-04	0.0002	1.072E+00	0.2674	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.144E-02	0.0203

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.865E+00	0.9638
Ra-228	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	1.451E-01	0.0362
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	4.010E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.361E+00	0.7132	3.454E-04	0.0002	4.868E-01	0.2551	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.027E-02	0.0316
Ra-228	1.517E-05	0.0000	3.264E-08	0.0000	8.555E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.041E-07	0.0000
Total	1.361E+00	0.7132	3.454E-04	0.0002	4.868E-01	0.2551	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.027E-02	0.0316

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	1.908E+00	1.0000
Ra-228	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	1.616E-05	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.908E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.755E-01	0.7701	4.970E-05	0.0002	4.362E-02	0.1914	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.733E-03	0.0383
Ra-228	7.098E-17	0.0000	1.654E-19	0.0000	4.334E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.275E-19	0.0000
Total	1.755E-01	0.7701	4.970E-05	0.0002	4.362E-02	0.1914	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.733E-03	0.0383

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	2.279E-01	1.0000
Ra-228	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	7.601E-17	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.279E-01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 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.
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	0.000E+00	0.0000
Ra-228	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
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	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 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.
Ra-226	1.208E+00	0.9255	0.000E+00	0.0000	9.720E-02	0.0745	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.305E+00	1.0000
Ra-228	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
Total	1.208E+00	0.9255	0.000E+00	0.0000	9.720E-02	0.0745	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.305E+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)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226+D	Ra-226+D	1.000E+00	1.032E+01	1.021E+01	1.001E+01	9.319E+00	7.601E+00	3.712E+00	4.405E-01	6.861E-01
Ra-226+D	Pb-210+D	1.000E+00	4.146E-03	1.218E-02	2.712E-02	6.910E-02	1.280E-01	1.049E-01	1.533E-02	1.925E+00
Ra-226+D	ΣDSR(j)		1.032E+01	1.023E+01	1.003E+01	9.388E+00	7.729E+00	3.817E+00	4.559E-01	2.611E+00
Ra-228+D	Ra-228+D	1.000E+00	3.738E+00	3.283E+00	2.531E+00	1.019E+00	7.575E-02	8.465E-06	4.076E-17	0.000E+00
Ra-228+D	Th-228+D	1.000E+00	1.118E+00	2.708E+00	3.980E+00	2.637E+00	2.144E-01	2.386E-05	1.113E-16	0.000E+00
Ra-228+D	ΣDSR(j)		4.856E+00	5.991E+00	6.511E+00	3.656E+00	2.901E-01	3.233E-05	1.520E-16	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	2.422E+00	2.445E+00	2.491E+00	2.663E+00	3.234E+00	6.550E+00	5.484E+01	9.576E+00
Ra-228	5.148E+00	4.173E+00	3.839E+00	6.839E+00	8.617E+01	7.734E+05	*2.726E+14	*2.726E+14

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 2.350 ñ 0.005 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ra-226	5.000E-01	0.000E+00	1.032E+01	2.422E+00	1.010E+01	2.476E+00
Ra-228	5.000E-01	2.633 ñ 0.005	6.531E+00	3.828E+00	6.518E+00	3.836E+00

Summary : RESRAD Default Parameters Recreationist Scenario
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Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr							
		t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	5.159E+00	5.107E+00	5.004E+00	4.660E+00	3.801E+00	1.856E+00	2.203E-01	3.431E-01
Pb-210	Ra-226	1.000E+00	2.073E-03	6.089E-03	1.356E-02	3.455E-02	6.398E-02	5.244E-02	7.667E-03	9.623E-01
Ra-228	Ra-228	1.000E+00	1.869E+00	1.641E+00	1.266E+00	5.096E-01	3.787E-02	4.233E-06	2.038E-17	0.000E+00
Th-228	Ra-228	1.000E+00	5.589E-01	1.354E+00	1.990E+00	1.318E+00	1.072E-01	1.193E-05	5.563E-17	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g							
		t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	5.000E-01	4.951E-01	4.853E-01	4.527E-01	3.712E-01	1.853E-01	2.544E-02	2.439E-05
Pb-210	Ra-226	1.000E+00	0.000E+00	1.518E-02	4.342E-02	1.229E-01	2.348E-01	1.943E-01	2.843E-02	2.727E-05
Ra-228	Ra-228	1.000E+00	5.000E-01	4.390E-01	3.385E-01	1.362E-01	1.011E-02	1.125E-06	5.702E-18	0.000E+00
Th-228	Ra-228	1.000E+00	0.000E+00	1.419E-01	2.650E-01	1.916E-01	1.575E-02	1.755E-06	8.893E-18	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

RESCALC.EXE execution time = 0.55 seconds

Exhibit 9

RESRAD Results – Top Soil as Fill (Under Home)

Part 1

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

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Dose Conversion Factor (and Related) Parameter Summary

Dose Library: FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ac-228 (Source: FGR 12)	5.978E+00	5.978E+00	DCF1(1)
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(2)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(3)
A-1	Bi-212 (Source: FGR 12)	1.171E+00	1.171E+00	DCF1(4)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(5)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(6)
A-1	Pb-212 (Source: FGR 12)	7.043E-01	7.043E-01	DCF1(7)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(8)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(9)
A-1	Po-212 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(10)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(11)
A-1	Po-216 (Source: FGR 12)	1.042E-04	1.042E-04	DCF1(12)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(13)
A-1	Ra-224 (Source: FGR 12)	5.119E-02	5.119E-02	DCF1(14)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(15)
A-1	Ra-228 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(16)
A-1	Rn-220 (Source: FGR 12)	2.298E-03	2.298E-03	DCF1(17)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(18)
A-1	Th-228 (Source: FGR 12)	7.940E-03	7.940E-03	DCF1(19)
A-1	Tl-208 (Source: FGR 12)	2.298E+01	2.298E+01	DCF1(20)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(21)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(1)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(2)
B-1	Ra-228+D	5.078E-03	4.770E-03	DCF2(3)
B-1	Th-228+D	3.454E-01	3.420E-01	DCF2(4)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(1)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(2)
D-1	Ra-228+D	1.442E-03	1.440E-03	DCF3(3)
D-1	Th-228+D	8.086E-04	3.960E-04	DCF3(4)
D-34	Food transfer factors:			
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,3)
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(3,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,3)

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

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(4,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(4,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(4,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(2,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(3,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(3,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(4,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(4,2)

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

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

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)	4.300E+03	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	3.000E+00	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Ra-226	5.000E-01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Ra-228	5.000E-01	0.000E+00	---	S1(3)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---	W1(3)
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)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-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)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+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)	1.000E+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

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(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)	1.000E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.582E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Ra-228				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.582E-03	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.109E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for daughter Th-228				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.852E-06	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
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	7.000E-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	>0 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)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	5.100E+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	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI

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)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	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	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	1.500E-01	1.500E-01	---	FLOOR1
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

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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 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	1.043E+00	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	-1.000E+00	-1.000E+00	code computed (time dependent)	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)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	4300.00 square meters	Ra-226	5.000E-01
Thickness:	3.00 meters	Ra-228	5.000E-01
Cover Depth:	0.00 meters		

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

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	3.414E+01	3.455E+01	3.466E+01	3.309E+01	3.043E+01	2.631E+01	1.758E+01	8.896E+00
M(t):	1.366E+00	1.382E+00	1.386E+00	1.324E+00	1.217E+00	1.053E+00	7.031E-01	3.558E-01

Maximum TDOSE(t): 3.470E+01 mrem/yr at t = 2.244 ñ 0.004 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 = 2.244E+00 years

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.
Ra-226	3.082E+00	0.0888	3.061E-04	0.0000	2.886E+01	0.8317	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.608E-02	0.0008
Ra-228	2.654E+00	0.0765	5.359E-03	0.0002	5.160E-02	0.0015	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.986E-02	0.0006
Total	5.736E+00	0.1653	5.665E-03	0.0002	2.891E+01	0.8332	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.595E-02	0.0013

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.244E+00 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.
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	3.197E+01	0.9213
Ra-228	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	2.731E+00	0.0787
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	3.470E+01	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.096E+00	0.0907	2.623E-04	0.0000	2.899E+01	0.8491	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.959E-02	0.0006
Ra-228	1.997E+00	0.0585	1.706E-03	0.0000	1.539E-02	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.029E-02	0.0006
Total	5.093E+00	0.1492	1.969E-03	0.0001	2.901E+01	0.8496	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.988E-02	0.0012

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

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.211E+01	0.9404
Ra-228	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	2.035E+00	0.0596
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	3.414E+01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.090E+00	0.0894	2.823E-04	0.0000	2.893E+01	0.8373	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.255E-02	0.0007
Ra-228	2.445E+00	0.0708	3.933E-03	0.0001	3.742E-02	0.0011	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.061E-02	0.0006
Total	5.535E+00	0.1602	4.215E-03	0.0001	2.897E+01	0.8384	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.315E-02	0.0012

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.204E+01	0.9274
Ra-228	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	2.507E+00	0.0726
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	3.455E+01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.077E+00	0.0888	3.201E-04	0.0000	2.882E+01	0.8313	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.816E-02	0.0008
Ra-228	2.661E+00	0.0768	5.747E-03	0.0002	5.551E-02	0.0016	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.905E-02	0.0005
Total	5.738E+00	0.1655	6.067E-03	0.0002	2.887E+01	0.8329	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.721E-02	0.0014

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.192E+01	0.9209
Ra-228	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	2.741E+00	0.0791
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	3.466E+01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.034E+00	0.0917	4.332E-04	0.0000	2.841E+01	0.8585	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.497E-02	0.0014
Ra-228	1.550E+00	0.0468	3.941E-03	0.0001	3.831E-02	0.0012	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.739E-03	0.0003
Total	4.585E+00	0.1385	4.374E-03	0.0001	2.845E+01	0.8597	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.471E-02	0.0017

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.149E+01	0.9516
Ra-228	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	1.602E+00	0.0484
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	3.309E+01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	2.915E+00	0.0958	6.336E-04	0.0000	2.729E+01	0.8968	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.504E-02	0.0025
Ra-228	1.430E-01	0.0047	3.721E-04	0.0000	3.621E-03	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.789E-04	0.0000
Total	3.058E+00	0.1005	1.006E-03	0.0000	2.729E+01	0.8970	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.592E-02	0.0025

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.028E+01	0.9951
Ra-228	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	1.479E-01	0.0049
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	3.043E+01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	2.532E+00	0.0962	7.507E-04	0.0000	2.369E+01	0.9002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.450E-02	0.0036
Ra-228	2.772E-05	0.0000	7.213E-08	0.0000	7.019E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.703E-07	0.0000
Total	2.532E+00	0.0962	7.508E-04	0.0000	2.369E+01	0.9002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.450E-02	0.0036

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	2.631E+01	1.0000
Ra-228	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	2.866E-05	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.631E+01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.692E+00	0.0963	5.200E-04	0.0000	1.582E+01	0.9000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.584E-02	0.0037
Ra-228	6.835E-16	0.0000	1.779E-18	0.0000	1.731E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.199E-18	0.0000
Total	1.692E+00	0.0963	5.200E-04	0.0000	1.582E+01	0.9000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.584E-02	0.0037

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	1.758E+01	1.0000
Ra-228	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	7.067E-16	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.758E+01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	4.127E-01	0.0464	1.268E-04	0.0000	3.838E+00	0.4314	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.606E-02	0.0018
Ra-228	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
Total	4.127E-01	0.0464	1.268E-04	0.0000	3.838E+00	0.4314	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.606E-02	0.0018

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	4.449E+00	0.5000	0.000E+00	0.0000	1.810E-01	0.0203	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.896E+00	1.0000
Ra-228	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
Total	4.449E+00	0.5000	0.000E+00	0.0000	1.810E-01	0.0203	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.896E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226+D	Ra-226+D	1.000E+00	6.421E+01	6.408E+01	6.382E+01	6.293E+01	6.044E+01	5.246E+01	3.504E+01	1.070E+01
Ra-226+D	Pb-210+D	1.000E+00	3.135E-03	9.263E-03	2.091E-02	5.586E-02	1.189E-01	1.633E-01	1.147E-01	7.094E+00
Ra-226+D	ãDSR(j)		6.421E+01	6.409E+01	6.384E+01	6.298E+01	6.056E+01	5.263E+01	3.516E+01	1.779E+01
Ra-228+D	Ra-228+D	1.000E+00	3.156E+00	2.793E+00	2.188E+00	9.305E-01	8.090E-02	1.567E-05	3.864E-16	0.000E+00
Ra-228+D	Th-228+D	1.000E+00	9.132E-01	2.221E+00	3.294E+00	2.274E+00	2.149E-01	4.166E-05	1.027E-15	0.000E+00
Ra-228+D	ãDSR(j)		4.069E+00	5.014E+00	5.482E+00	3.204E+00	2.958E-01	5.733E-05	1.413E-15	0.000E+00

The DSR includes contributions from associated (half-life ó 180 days) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	3.893E-01	3.901E-01	3.916E-01	3.969E-01	4.128E-01	4.750E-01	7.111E-01	1.405E+00
Ra-228	6.144E+00	4.986E+00	4.560E+00	7.802E+00	8.452E+01	4.361E+05	*2.726E+14	*2.726E+14

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 2.244 ñ 0.004 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin) (pCi/g)	G(i,tmin) (pCi/g)	DSR(i,tmax) (pCi/g)	G(i,tmax) (pCi/g)
Ra-226	5.000E-01	0.000E+00	6.421E+01	3.893E-01	6.393E+01	3.910E-01
Ra-228	5.000E-01	2.718 ñ 0.005	5.491E+00	4.553E+00	5.462E+00	4.577E+00

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr							
		t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	3.210E+01	3.204E+01	3.191E+01	3.146E+01	3.022E+01	2.623E+01	1.752E+01	5.349E+00
Pb-210	Ra-226	1.000E+00	1.567E-03	4.631E-03	1.045E-02	2.793E-02	5.944E-02	8.166E-02	5.733E-02	3.547E+00
Ra-228	Ra-228	1.000E+00	1.578E+00	1.397E+00	1.094E+00	4.653E-01	4.045E-02	7.836E-06	1.932E-16	0.000E+00
Th-228	Ra-228	1.000E+00	4.566E-01	1.110E+00	1.647E+00	1.137E+00	1.074E-01	2.083E-05	5.135E-16	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g							
		t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	5.000E-01	4.990E-01	4.970E-01	4.900E-01	4.707E-01	4.087E-01	2.731E-01	6.661E-02
Pb-210	Ra-226	1.000E+00	0.000E+00	1.528E-02	4.431E-02	1.315E-01	2.887E-01	4.004E-01	2.813E-01	6.862E-02
Ra-228	Ra-228	1.000E+00	5.000E-01	4.425E-01	3.466E-01	1.474E-01	1.282E-02	2.483E-06	6.122E-17	0.000E+00
Th-228	Ra-228	1.000E+00	0.000E+00	1.425E-01	2.685E-01	2.022E-01	1.932E-02	3.745E-06	9.235E-17	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

RESCALC.EXE execution time = 0.54 seconds

Exhibit 9

RESRAD Results – Top Soil as Fill (Under Home)

Part 2

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

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Dose Conversion Factor (and Related) Parameter Summary

Dose Library: FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ac-228 (Source: FGR 12)	5.978E+00	5.978E+00	DCF1(1)
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(2)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(3)
A-1	Bi-212 (Source: FGR 12)	1.171E+00	1.171E+00	DCF1(4)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(5)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(6)
A-1	Pb-212 (Source: FGR 12)	7.043E-01	7.043E-01	DCF1(7)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(8)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(9)
A-1	Po-212 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(10)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(11)
A-1	Po-216 (Source: FGR 12)	1.042E-04	1.042E-04	DCF1(12)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(13)
A-1	Ra-224 (Source: FGR 12)	5.119E-02	5.119E-02	DCF1(14)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(15)
A-1	Ra-228 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(16)
A-1	Rn-220 (Source: FGR 12)	2.298E-03	2.298E-03	DCF1(17)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(18)
A-1	Th-228 (Source: FGR 12)	7.940E-03	7.940E-03	DCF1(19)
A-1	Tl-208 (Source: FGR 12)	2.298E+01	2.298E+01	DCF1(20)
A-1	Tl-210 (Source: no data)	0.000E+00	2.000E+00	DCF1(21)
A-1	Dose conversion factors for inhalation, mrem/pCi:			
A-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(1)
A-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(2)
A-1	Ra-228+D	5.078E-03	4.770E-03	DCF2(3)
A-1	Th-228+D	3.454E-01	3.420E-01	DCF2(4)
A-1	Dose conversion factors for ingestion, mrem/pCi:			
A-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(1)
A-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(2)
A-1	Ra-228+D	1.442E-03	1.440E-03	DCF3(3)
A-1	Th-228+D	8.086E-04	3.960E-04	DCF3(4)
A-34	Food transfer factors:			
A-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
A-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
A-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
A-34				
A-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
A-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
A-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,3)
A-34				
A-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(3,1)
A-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,2)
A-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,3)
A-34				

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

Menu	Parameter	Current Value#	Base Case*	Parameter Name
)-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(4,1)
)-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(4,2)
)-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(4,3)
)-5	Bioaccumulation factors, fresh water, L/kg:			
)-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
)-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
)-5				
)-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
)-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(2,2)
)-5				
)-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(3,1)
)-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(3,2)
)-5				
)-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(4,1)
)-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(4,2)

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

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
C011	Area of contaminated zone (m**2)	4.300E+03	1.000E+04	---	AREA
C011	Thickness of contaminated zone (m)	3.000E+00	2.000E+00	---	THICK0
C011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
C011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
C011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
C011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
C011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
C011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
C011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
C011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
C011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
C011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
C011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
C011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
C012	Initial principal radionuclide (pCi/g): Ra-226	5.000E-01	0.000E+00	---	S1(2)
C012	Initial principal radionuclide (pCi/g): Ra-228	5.000E-01	0.000E+00	---	S1(3)
C012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(2)
C012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---	W1(3)
C013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
C013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
C013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
C013	Density of contaminated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSCZ
C013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
C013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
C013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
C013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
C013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
C013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
C013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
C013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
C013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
C013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
C013	Irrigation mode	overhead	overhead	---	IDITCH
C013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
C013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
C013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
C014	Density of saturated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSAQ
C014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
C014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
C014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
C014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
C014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
C014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
C014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
C014	Well pump intake depth (m below water table)	1.000E+01	1.000E+01	---	DWIBWT
C014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
C014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
1015	Number of unsaturated zone strata	1	1	---	NS
1015	Unsat. zone 1, thickness (m)	4.000E+00	4.000E+00	---	H(1)
1015	Unsat. zone 1, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(1)
1015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
1015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
1015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
1015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
1015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCUZ(1)
1016	Distribution coefficients for Ra-226				
1016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(2)
1016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(2,1)
1016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(2)
1016	Leach rate (/yr)	0.000E+00	0.000E+00	1.582E-03	ALEACH(2)
1016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
1016	Distribution coefficients for Ra-228				
1016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(3)
1016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(3,1)
1016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(3)
1016	Leach rate (/yr)	0.000E+00	0.000E+00	1.582E-03	ALEACH(3)
1016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
1016	Distribution coefficients for daughter Pb-210				
1016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(1)
1016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(1,1)
1016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(1)
1016	Leach rate (/yr)	0.000E+00	0.000E+00	1.109E-03	ALEACH(1)
1016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
1016	Distribution coefficients for daughter Th-228				
1016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(4)
1016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(4,1)
1016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(4)
1016	Leach rate (/yr)	0.000E+00	0.000E+00	1.852E-06	ALEACH(4)
1016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
1017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
1017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
1017	Exposure duration	3.000E+01	3.000E+01	---	ED
1017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
1017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
1017	Fraction of time spent indoors	5.000E-01	5.000E-01	---	FIND
1017	Fraction of time spent outdoors (on site)	2.500E-01	2.500E-01	---	FOTD
1017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 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)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	5.100E+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	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
2019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---	MLFD
2019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
2019	Depth of roots (m)	not used	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	1.000E+00	1.000E+00	---	FGWHH
2019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
2019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
219B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
219B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
219B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
219B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
219B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
219B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
219B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
219B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
219B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
219B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
219B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
219B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
219B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
219B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
219B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
219B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
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	1.000E+00	1.000E+00	---	STOR_T(3)
TOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
TOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
TOR	Crustacea and mollusks	7.000E+00	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	4.500E+01	4.500E+01	---	STOR_T(9)
021	Thickness of building foundation (m)	1.500E-01	1.500E-01	---	FLOOR1
021	Bulk density of building foundation (g/cm**3)	2.400E+00	2.400E+00	---	DENSFL
021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
021	Total porosity of the building foundation	1.000E-01	1.000E-01	---	TPFL

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
2021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
2021	Volumetric water content of the foundation	3.000E-02	3.000E-02	---	PH2OFL
2021	Diffusion coefficient for radon gas (m/sec):				
2021	in cover material	not used	2.000E-06	---	DIFCV
2021	in foundation material	3.000E-07	3.000E-07	---	DIFFL
2021	in contaminated zone soil	2.000E-06	2.000E-06	---	DIFCZ
2021	Radon vertical dimension of mixing (m)	2.000E+00	2.000E+00	---	HMIX
2021	Average building air exchange rate (1/hr)	5.000E-01	5.000E-01	---	REXG
2021	Height of the building (room) (m)	2.500E+00	2.500E+00	---	HRM
2021	Building interior area factor	1.073E+00	0.000E+00	---	FAI
2021	Building depth below ground surface (m)	-1.000E+00	-1.000E+00	code computed (time dependent)	DMFL
2021	Emanating power of Rn-222 gas	2.500E-01	2.500E-01	---	EMANA(1)
2021	Emanating power of Rn-220 gas	1.500E-01	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	4300.00 square meters	Ra-226	5.000E-01
Thickness:	3.00 meters	Ra-228	5.000E-01
Cover Depth:	0.00 meters		

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

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	3.496E+01	3.537E+01	3.548E+01	3.390E+01	3.120E+01	2.698E+01	1.803E+01	9.005E+00
M(t):	1.398E+00	1.415E+00	1.419E+00	1.356E+00	1.248E+00	1.079E+00	7.210E-01	3.602E-01

Maximum TDOSE(t): 3.552E+01 mrem/yr at t = 2.252 ñ 0.005 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 = 2.252E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.082E+00	0.0868	3.062E-04	0.0000	2.968E+01	0.8356	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.610E-02	0.0007
Ra-228	2.655E+00	0.0747	5.364E-03	0.0002	5.166E-02	0.0015	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.986E-02	0.0006
Total	5.736E+00	0.1615	5.670E-03	0.0002	2.973E+01	0.8370	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.596E-02	0.0013

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.252E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.279E+01	0.9231
Ra-228	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	2.731E+00	0.0769
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	3.552E+01	1.0000

* Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.096E+00	0.0885	2.623E-04	0.0000	2.981E+01	0.8527	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.959E-02	0.0006
Ra-228	1.997E+00	0.0571	1.706E-03	0.0000	1.539E-02	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.029E-02	0.0006
Total	5.093E+00	0.1457	1.969E-03	0.0001	2.983E+01	0.8531	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.988E-02	0.0011

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

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.293E+01	0.9418
Ra-228	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	2.035E+00	0.0582
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	3.496E+01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.090E+00	0.0873	2.823E-04	0.0000	2.975E+01	0.8411	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.255E-02	0.0006
Ra-228	2.445E+00	0.0691	3.933E-03	0.0001	3.742E-02	0.0011	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.061E-02	0.0006
Total	5.535E+00	0.1565	4.215E-03	0.0001	2.979E+01	0.8422	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.315E-02	0.0012

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.286E+01	0.9291
Ra-228	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	2.507E+00	0.0709
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	3.537E+01	1.0000

Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.077E+00	0.0867	3.201E-04	0.0000	2.963E+01	0.8352	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.816E-02	0.0008
Ra-228	2.661E+00	0.0750	5.747E-03	0.0002	5.551E-02	0.0016	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.905E-02	0.0005
Total	5.738E+00	0.1617	6.067E-03	0.0002	2.969E+01	0.8368	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.721E-02	0.0013

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.274E+01	0.9227
Ra-228	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	2.741E+00	0.0773
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	3.548E+01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.034E+00	0.0895	4.332E-04	0.0000	2.922E+01	0.8619	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.497E-02	0.0013
Ra-228	1.550E+00	0.0457	3.941E-03	0.0001	3.831E-02	0.0011	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.739E-03	0.0003
Total	4.585E+00	0.1352	4.374E-03	0.0001	2.925E+01	0.8630	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.471E-02	0.0016

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.230E+01	0.9527
Ra-228	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	1.602E+00	0.0473
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	3.390E+01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
adio-														
uclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
a-226	2.915E+00	0.0934	6.336E-04	0.0000	2.806E+01	0.8994	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.504E-02	0.0024
a-228	1.430E-01	0.0046	3.721E-04	0.0000	3.621E-03	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.789E-04	0.0000
otal	3.058E+00	0.0980	1.006E-03	0.0000	2.806E+01	0.8995	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.592E-02	0.0024

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
adio-														
uclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
a-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	3.105E+01	0.9953
a-228	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	1.479E-01	0.0047
otal	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	3.120E+01	1.0000

Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	2.532E+00	0.0938	7.507E-04	0.0000	2.436E+01	0.9026	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.450E-02	0.0035
Ra-228	2.772E-05	0.0000	7.213E-08	0.0000	7.019E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.703E-07	0.0000
Total	2.532E+00	0.0938	7.508E-04	0.0000	2.436E+01	0.9026	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.450E-02	0.0035

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	2.698E+01	1.0000
Ra-228	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	2.866E-05	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.698E+01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.692E+00	0.0939	5.200E-04	0.0000	1.627E+01	0.9025	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.584E-02	0.0037
Ra-228	6.835E-16	0.0000	1.779E-18	0.0000	1.731E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.199E-18	0.0000
Total	1.692E+00	0.0939	5.200E-04	0.0000	1.627E+01	0.9025	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.584E-02	0.0037

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	1.803E+01	1.0000
Ra-228	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	7.067E-16	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.803E+01	1.0000

Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-	ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ
Ra-226	4.127E-01	0.0458	1.268E-04	0.0000	3.947E+00	0.4383	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.606E-02	0.0018
Ra-228	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
ÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ
Total	4.127E-01	0.0458	1.268E-04	0.0000	3.947E+00	0.4383	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.606E-02	0.0018

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-	ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ
Ra-226	4.449E+00	0.4940	0.000E+00	0.0000	1.810E-01	0.0201	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.005E+00	1.0000
Ra-228	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
ÍÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ
Total	4.449E+00	0.4940	0.000E+00	0.0000	1.810E-01	0.0201	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.005E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Recreationist Scenario
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Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226+D	Ra-226+D	1.000E+00	6.585E+01	6.572E+01	6.545E+01	6.454E+01	6.198E+01	5.381E+01	3.594E+01	1.092E+01
Ra-226+D	Pb-210+D	1.000E+00	3.135E-03	9.263E-03	2.091E-02	5.586E-02	1.189E-01	1.633E-01	1.147E-01	7.094E+00
Ra-226+D	ãDSR(j)		6.586E+01	6.573E+01	6.548E+01	6.459E+01	6.210E+01	5.397E+01	3.605E+01	1.801E+01
Ra-228+D	Ra-228+D	1.000E+00	3.156E+00	2.793E+00	2.188E+00	9.305E-01	8.090E-02	1.567E-05	3.864E-16	0.000E+00
Ra-228+D	Th-228+D	1.000E+00	9.132E-01	2.221E+00	3.294E+00	2.274E+00	2.149E-01	4.166E-05	1.027E-15	0.000E+00
Ra-228+D	ãDSR(j)		4.069E+00	5.014E+00	5.482E+00	3.204E+00	2.958E-01	5.733E-05	1.413E-15	0.000E+00

The DSR includes contributions from associated (half-life ó 180 days) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	3.796E-01	3.804E-01	3.818E-01	3.870E-01	4.026E-01	4.632E-01	6.934E-01	1.388E+00
Ra-228	6.144E+00	4.986E+00	4.560E+00	7.802E+00	8.452E+01	4.361E+05	*2.726E+14	*2.726E+14

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 2.252 ñ 0.005 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ra-226	5.000E-01	0.000E+00	6.586E+01	3.796E-01	6.557E+01	3.813E-01
Ra-228	5.000E-01	2.718 ñ 0.005	5.491E+00	4.553E+00	5.463E+00	4.576E+00

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr							
		t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	3.293E+01	3.286E+01	3.273E+01	3.227E+01	3.099E+01	2.690E+01	1.797E+01	5.458E+00
Pb-210	Ra-226	1.000E+00	1.567E-03	4.631E-03	1.045E-02	2.793E-02	5.944E-02	8.166E-02	5.733E-02	3.547E+00
Ra-228	Ra-228	1.000E+00	1.578E+00	1.397E+00	1.094E+00	4.653E-01	4.045E-02	7.836E-06	1.932E-16	0.000E+00
Th-228	Ra-228	1.000E+00	4.566E-01	1.110E+00	1.647E+00	1.137E+00	1.074E-01	2.083E-05	5.135E-16	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g							
		t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	5.000E-01	4.990E-01	4.970E-01	4.900E-01	4.707E-01	4.087E-01	2.731E-01	6.661E-02
Pb-210	Ra-226	1.000E+00	0.000E+00	1.528E-02	4.431E-02	1.315E-01	2.887E-01	4.004E-01	2.813E-01	6.862E-02
Ra-228	Ra-228	1.000E+00	5.000E-01	4.425E-01	3.466E-01	1.474E-01	1.282E-02	2.483E-06	6.122E-17	0.000E+00
Th-228	Ra-228	1.000E+00	0.000E+00	1.425E-01	2.685E-01	2.022E-01	1.932E-02	3.745E-06	9.235E-17	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

RESCALC.EXE execution time = 0.56 seconds

Exhibit 9

RESRAD Results – Top Soil as Fill (Under Home)

Part 3

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

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Summary : RESRAD Default Parameters Recreationist Scenario
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Dose Conversion Factor (and Related) Parameter Summary

Dose Library: FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ac-228 (Source: FGR 12)	5.978E+00	5.978E+00	DCF1(1)
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(2)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(3)
A-1	Bi-212 (Source: FGR 12)	1.171E+00	1.171E+00	DCF1(4)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(5)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(6)
A-1	Pb-212 (Source: FGR 12)	7.043E-01	7.043E-01	DCF1(7)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(8)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(9)
A-1	Po-212 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(10)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(11)
A-1	Po-216 (Source: FGR 12)	1.042E-04	1.042E-04	DCF1(12)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(13)
A-1	Ra-224 (Source: FGR 12)	5.119E-02	5.119E-02	DCF1(14)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(15)
A-1	Ra-228 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(16)
A-1	Rn-220 (Source: FGR 12)	2.298E-03	2.298E-03	DCF1(17)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(18)
A-1	Th-228 (Source: FGR 12)	7.940E-03	7.940E-03	DCF1(19)
A-1	Tl-208 (Source: FGR 12)	2.298E+01	2.298E+01	DCF1(20)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(21)
A-1	Dose conversion factors for inhalation, mrem/pCi:			
A-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(1)
A-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(2)
A-1	Ra-228+D	5.078E-03	4.770E-03	DCF2(3)
A-1	Th-228+D	3.454E-01	3.420E-01	DCF2(4)
A-1	Dose conversion factors for ingestion, mrem/pCi:			
A-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(1)
A-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(2)
A-1	Ra-228+D	1.442E-03	1.440E-03	DCF3(3)
A-1	Th-228+D	8.086E-04	3.960E-04	DCF3(4)
A-34	Food transfer factors:			
A-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
A-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
A-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
A-34				
A-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
A-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
A-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,3)
A-34				
A-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(3,1)
A-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,2)
A-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,3)
A-34				

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

Menu	Parameter	Current Value#	Base Case*	Parameter Name
)-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(4,1)
)-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(4,2)
)-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(4,3)
)-5	Bioaccumulation factors, fresh water, L/kg:			
)-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
)-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
)-5				
)-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
)-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(2,2)
)-5				
)-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(3,1)
)-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(3,2)
)-5				
)-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(4,1)
)-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(4,2)

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

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
2011	Area of contaminated zone (m**2)	4.300E+03	1.000E+04	---	AREA
2011	Thickness of contaminated zone (m)	3.000E+00	2.000E+00	---	THICK0
2011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
2011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
2011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
2011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
2011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
2011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
2011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
2011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
2011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
2011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
2011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
2011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
2012	Initial principal radionuclide (pCi/g): Ra-226	5.000E-01	0.000E+00	---	S1(2)
2012	Initial principal radionuclide (pCi/g): Ra-228	5.000E-01	0.000E+00	---	S1(3)
2012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(2)
2012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---	W1(3)
2013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
2013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
2013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
2013	Density of contaminated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSCZ
2013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
2013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
2013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
2013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
2013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
2013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
2013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
2013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
2013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
2013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
2013	Irrigation mode	overhead	overhead	---	IDITCH
2013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
2013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
2013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
2014	Density of saturated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSAQ
2014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
2014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
2014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
2014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
2014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
2014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
2014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
2014	Well pump intake depth (m below water table)	1.000E+01	1.000E+01	---	DWIBWT
2014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
2014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
2015	Number of unsaturated zone strata	1	1	---	NS
2015	Unsat. zone 1, thickness (m)	4.000E+00	4.000E+00	---	H(1)
2015	Unsat. zone 1, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(1)
2015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
2015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
2015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(1)
2015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
2015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCUZ(1)
2016	Distribution coefficients for Ra-226				
2016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(2)
2016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(2,1)
2016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(2)
2016	Leach rate (/yr)	0.000E+00	0.000E+00	1.582E-03	ALEACH(2)
2016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
2016	Distribution coefficients for Ra-228				
2016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(3)
2016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(3,1)
2016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(3)
2016	Leach rate (/yr)	0.000E+00	0.000E+00	1.582E-03	ALEACH(3)
2016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
2016	Distribution coefficients for daughter Pb-210				
2016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(1)
2016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(1,1)
2016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(1)
2016	Leach rate (/yr)	0.000E+00	0.000E+00	1.109E-03	ALEACH(1)
2016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
2016	Distribution coefficients for daughter Th-228				
2016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(4)
2016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(4,1)
2016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(4)
2016	Leach rate (/yr)	0.000E+00	0.000E+00	1.852E-06	ALEACH(4)
2016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
2017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
2017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
2017	Exposure duration	3.000E+01	3.000E+01	---	ED
2017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
2017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
2017	Fraction of time spent indoors	5.000E-01	5.000E-01	---	FIND
2017	Fraction of time spent outdoors (on site)	2.500E-01	2.500E-01	---	FOTD
2017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
2017	Radii of shape factor array (used if FS = -1):				
2017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
2017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
2017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
2017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
2017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
2017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
2017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
2017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
2017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
2017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
2017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
2017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
2017	Fractions of annular areas within AREA:				
2017	Ring 1	not used	1.000E+00	---	FRACA(1)
2017	Ring 2	not used	2.732E-01	---	FRACA(2)
2017	Ring 3	not used	0.000E+00	---	FRACA(3)
2017	Ring 4	not used	0.000E+00	---	FRACA(4)
2017	Ring 5	not used	0.000E+00	---	FRACA(5)
2017	Ring 6	not used	0.000E+00	---	FRACA(6)
2017	Ring 7	not used	0.000E+00	---	FRACA(7)
2017	Ring 8	not used	0.000E+00	---	FRACA(8)
2017	Ring 9	not used	0.000E+00	---	FRACA(9)
2017	Ring 10	not used	0.000E+00	---	FRACA(10)
2017	Ring 11	not used	0.000E+00	---	FRACA(11)
2017	Ring 12	not used	0.000E+00	---	FRACA(12)
2018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
2018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
2018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
2018	Meat and poultry consumption (kg/yr)	not used	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)	3.650E+01	3.650E+01	---	SOIL
2018	Drinking water intake (L/yr)	5.100E+02	5.100E+02	---	DWI
2018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
2018	Contamination fraction of household water	1.000E+00	1.000E+00	---	FHHW
2018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
2018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
2018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
2018	Contamination fraction of plant food	not used	-1	---	FPLANT
2018	Contamination fraction of meat	not used	-1	---	FMEAT
2018	Contamination fraction of milk	not used	-1	---	FMILK
2019	Livestock fodder intake for meat (kg/day)	not used	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)	not used	5.000E+01	---	LWI5
2019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
2019	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
019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---	MLFD
019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
019	Depth of roots (m)	not used	9.000E-01	---	DROOT
019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
019	Household water fraction from ground water	1.000E+00	1.000E+00	---	FGWHH
019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
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
14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
14	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	1.000E+00	1.000E+00	---	STOR_T(3)
TOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
TOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
TOR	Crustacea and mollusks	7.000E+00	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	4.500E+01	4.500E+01	---	STOR_T(9)
021	Thickness of building foundation (m)	1.500E-01	1.500E-01	---	FLOOR1
021	Bulk density of building foundation (g/cm**3)	2.400E+00	2.400E+00	---	DENSFL
021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
021	Total porosity of the building foundation	1.000E-01	1.000E-01	---	TPFL

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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 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	1.000E+00	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	-1.000E+00	-1.000E+00	code computed (time dependent)	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)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	4300.00 square meters	Ra-226	5.000E-01
Thickness:	3.00 meters	Ra-228	5.000E-01
Cover Depth:	0.00 meters		

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

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	3.296E+01	3.338E+01	3.349E+01	3.194E+01	2.932E+01	2.535E+01	1.693E+01	8.740E+00
M(t):	1.318E+00	1.335E+00	1.340E+00	1.278E+00	1.173E+00	1.014E+00	6.774E-01	3.496E-01

Maximum TDOSE(t): 3.353E+01 mrem/yr at t = 2.281 ñ 0.005 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 = 2.281E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.082E+00	0.0919	3.068E-04	0.0000	2.768E+01	0.8258	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.619E-02	0.0008
Ra-228	2.656E+00	0.0792	5.384E-03	0.0002	5.186E-02	0.0015	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.983E-02	0.0006
Total	5.738E+00	0.1711	5.691E-03	0.0002	2.774E+01	0.8273	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.602E-02	0.0014

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.281E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.079E+01	0.9185
Ra-228	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	2.733E+00	0.0815
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	3.353E+01	1.0000

Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
:adio-	ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ	
luclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ
:a-226	3.096E+00	0.0939	2.623E-04	0.0000	2.781E+01	0.8438	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.959E-02	0.0006
:a-228	1.997E+00	0.0606	1.706E-03	0.0001	1.539E-02	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.029E-02	0.0006
ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ
'otal	5.093E+00	0.1545	1.969E-03	0.0001	2.783E+01	0.8442	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.988E-02	0.0012

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

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
adio-	ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ	
uclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ
a-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	3.093E+01	0.9383
a-228	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	2.035E+00	0.0617
ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ	ÍÍÍÍÍÍÍÍÍ	ÍÍÍÍÍÍ
otal	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	3.296E+01	1.0000

Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.090E+00	0.0926	2.823E-04	0.0000	2.776E+01	0.8316	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.255E-02	0.0007
Ra-228	2.445E+00	0.0733	3.933E-03	0.0001	3.742E-02	0.0011	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.061E-02	0.0006
Total	5.535E+00	0.1658	4.215E-03	0.0001	2.779E+01	0.8328	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.315E-02	0.0013

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.087E+01	0.9249
Ra-228	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	2.507E+00	0.0751
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	3.338E+01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
adio-														
uclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
a-226	3.077E+00	0.0919	3.201E-04	0.0000	2.764E+01	0.8254	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.816E-02	0.0008
a-228	2.661E+00	0.0794	5.747E-03	0.0002	5.551E-02	0.0017	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.905E-02	0.0006
otal	5.738E+00	0.1713	6.067E-03	0.0002	2.770E+01	0.8271	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.721E-02	0.0014

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
adio-														
uclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
a-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	3.075E+01	0.9182
a-228	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	2.741E+00	0.0818
otal	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	3.349E+01	1.0000

Sum of all water independent and dependent pathways.

ummary : RESRAD Default Parameters Recreationist Scenario
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
adio-														
uclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
a-226	3.034E+00	0.0950	4.332E-04	0.0000	2.726E+01	0.8534	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.497E-02	0.0014
a-228	1.550E+00	0.0485	3.941E-03	0.0001	3.831E-02	0.0012	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.739E-03	0.0003
otal	4.585E+00	0.1435	4.374E-03	0.0001	2.729E+01	0.8546	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.471E-02	0.0017

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
adio-														
uclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
a-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	3.034E+01	0.9498
a-228	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	1.602E+00	0.0502
otal	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	3.194E+01	1.0000

Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	2.915E+00	0.0994	6.336E-04	0.0000	2.618E+01	0.8929	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.504E-02	0.0026
Ra-228	1.430E-01	0.0049	3.721E-04	0.0000	3.621E-03	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.789E-04	0.0000
Total	3.058E+00	0.1043	1.006E-03	0.0000	2.618E+01	0.8931	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.592E-02	0.0026

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	2.917E+01	0.9950
Ra-228	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	1.479E-01	0.0050
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.932E+01	1.0000

* Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Recreationist Scenario
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	2.532E+00	0.0999	7.507E-04	0.0000	2.272E+01	0.8964	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.450E-02	0.0037
Ra-228	2.772E-05	0.0000	7.213E-08	0.0000	7.019E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.703E-07	0.0000
Total	2.532E+00	0.0999	7.508E-04	0.0000	2.272E+01	0.8964	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.450E-02	0.0037

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	2.535E+01	1.0000
Ra-228	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	2.866E-05	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.535E+01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.692E+00	0.0999	5.200E-04	0.0000	1.518E+01	0.8962	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.584E-02	0.0039
Ra-228	6.835E-16	0.0000	1.779E-18	0.0000	1.731E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.199E-18	0.0000
Total	1.692E+00	0.0999	5.200E-04	0.0000	1.518E+01	0.8962	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.584E-02	0.0039

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	1.693E+01	1.0000
Ra-228	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	7.067E-16	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.693E+01	1.0000

Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	4.127E-01	0.0472	1.268E-04	0.0000	3.682E+00	0.4212	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.606E-02	0.0018
Ra-228	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
Total	4.127E-01	0.0472	1.268E-04	0.0000	3.682E+00	0.4212	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.606E-02	0.0018

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	4.449E+00	0.5090	0.000E+00	0.0000	1.810E-01	0.0207	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.740E+00	1.0000
Ra-228	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
Total	4.449E+00	0.5090	0.000E+00	0.0000	1.810E-01	0.0207	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.740E+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)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226+D	Ra-226+D	1.000E+00	6.185E+01	6.173E+01	6.148E+01	6.062E+01	5.822E+01	5.054E+01	3.375E+01	1.039E+01
Ra-226+D	Pb-210+D	1.000E+00	3.135E-03	9.263E-03	2.091E-02	5.586E-02	1.189E-01	1.633E-01	1.147E-01	7.094E+00
Ra-226+D	ãDSR(j)		6.185E+01	6.174E+01	6.150E+01	6.067E+01	5.834E+01	5.070E+01	3.387E+01	1.748E+01
Ra-228+D	Ra-228+D	1.000E+00	3.156E+00	2.793E+00	2.188E+00	9.305E-01	8.090E-02	1.567E-05	3.864E-16	0.000E+00
Ra-228+D	Th-228+D	1.000E+00	9.132E-01	2.221E+00	3.294E+00	2.274E+00	2.149E-01	4.166E-05	1.027E-15	0.000E+00
Ra-228+D	ãDSR(j)		4.069E+00	5.014E+00	5.482E+00	3.204E+00	2.958E-01	5.733E-05	1.413E-15	0.000E+00

The DSR includes contributions from associated (half-life 6 180 days) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	4.042E-01	4.049E-01	4.065E-01	4.121E-01	4.285E-01	4.931E-01	7.381E-01	1.430E+00
Ra-228	6.144E+00	4.986E+00	4.560E+00	7.802E+00	8.452E+01	4.361E+05	*2.726E+14	*2.726E+14

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 2.281 ñ 0.005 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ra-226	5.000E-01	0.000E+00	6.185E+01	4.042E-01	6.158E+01	4.059E-01
Ra-228	5.000E-01	2.718 ñ 0.005	5.491E+00	4.553E+00	5.466E+00	4.573E+00

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr							
		t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
a-226	Ra-226	1.000E+00	3.093E+01	3.086E+01	3.074E+01	3.031E+01	2.911E+01	2.527E+01	1.688E+01	5.193E+00
b-210	Ra-226	1.000E+00	1.567E-03	4.631E-03	1.045E-02	2.793E-02	5.944E-02	8.166E-02	5.733E-02	3.547E+00
a-228	Ra-228	1.000E+00	1.578E+00	1.397E+00	1.094E+00	4.653E-01	4.045E-02	7.836E-06	1.932E-16	0.000E+00
h-228	Ra-228	1.000E+00	4.566E-01	1.110E+00	1.647E+00	1.137E+00	1.074E-01	2.083E-05	5.135E-16	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g							
		t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
a-226	Ra-226	1.000E+00	5.000E-01	4.990E-01	4.970E-01	4.900E-01	4.707E-01	4.087E-01	2.731E-01	6.661E-02
b-210	Ra-226	1.000E+00	0.000E+00	1.528E-02	4.431E-02	1.315E-01	2.887E-01	4.004E-01	2.813E-01	6.862E-02
a-228	Ra-228	1.000E+00	5.000E-01	4.425E-01	3.466E-01	1.474E-01	1.282E-02	2.483E-06	6.122E-17	0.000E+00
h-228	Ra-228	1.000E+00	0.000E+00	1.425E-01	2.685E-01	2.022E-01	1.932E-02	3.745E-06	9.235E-17	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

ESCALC.EXE execution time = 0.54 seconds

Summary : RESRAD Default Parameters Recreationist Scenario
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Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ac-228 (Source: FGR 12)	5.978E+00	5.978E+00	DCF1(1)
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(2)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(3)
A-1	Bi-212 (Source: FGR 12)	1.171E+00	1.171E+00	DCF1(4)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(5)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(6)
A-1	Pb-212 (Source: FGR 12)	7.043E-01	7.043E-01	DCF1(7)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(8)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(9)
A-1	Po-212 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(10)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(11)
A-1	Po-216 (Source: FGR 12)	1.042E-04	1.042E-04	DCF1(12)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(13)
A-1	Ra-224 (Source: FGR 12)	5.119E-02	5.119E-02	DCF1(14)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(15)
A-1	Ra-228 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(16)
A-1	Rn-220 (Source: FGR 12)	2.298E-03	2.298E-03	DCF1(17)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(18)
A-1	Th-228 (Source: FGR 12)	7.940E-03	7.940E-03	DCF1(19)
A-1	Tl-208 (Source: FGR 12)	2.298E+01	2.298E+01	DCF1(20)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(21)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(1)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(2)
B-1	Ra-228+D	5.078E-03	4.770E-03	DCF2(3)
B-1	Th-228+D	3.454E-01	3.420E-01	DCF2(4)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(1)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(2)
D-1	Ra-228+D	1.442E-03	1.440E-03	DCF3(3)
D-1	Th-228+D	8.086E-04	3.960E-04	DCF3(4)
D-34	Food transfer factors:			
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(1,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(1,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(1,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(2,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(3,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,3)
D-34				

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

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(4,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(4,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(4,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(1,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(2,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(2,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(3,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(3,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(4,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(4,2)

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

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

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)	4.300E+03	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	3.000E+00	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Ra-226	5.000E-01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Ra-228	5.000E-01	0.000E+00	---	S1(3)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---	W1(3)
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)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-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)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	2.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+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)	1.000E+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

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.000E-01	2.000E-01	---	FCUZ(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)	1.000E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.582E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Ra-228				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.582E-03	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.109E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for daughter Th-228				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.852E-06	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
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	7.000E-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	>0 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)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	5.100E+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	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI

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)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	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	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	1.500E-01	1.500E-01	---	FLOOR1
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

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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 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	1.000E+00	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	-1.000E+00	-1.000E+00	code computed (time dependent)	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)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	4300.00 square meters	Ra-226	5.000E-01
Thickness:	3.00 meters	Ra-228	5.000E-01
Cover Depth:	0.00 meters		

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

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	3.296E+01	3.338E+01	3.349E+01	3.194E+01	2.932E+01	2.535E+01	1.693E+01	8.740E+00
M(t):	1.318E+00	1.335E+00	1.340E+00	1.278E+00	1.173E+00	1.014E+00	6.774E-01	3.496E-01

Maximum TDOSE(t): 3.353E+01 mrem/yr at t = 2.281 ñ 0.005 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 = 2.281E+00 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.082E+00	0.0919	3.068E-04	0.0000	2.768E+01	0.8258	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.619E-02	0.0008
Ra-228	2.656E+00	0.0792	5.384E-03	0.0002	5.186E-02	0.0015	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.983E-02	0.0006
Total	5.738E+00	0.1711	5.691E-03	0.0002	2.774E+01	0.8273	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.602E-02	0.0014

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.281E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.079E+01	0.9185
Ra-228	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	2.733E+00	0.0815
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	3.353E+01	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-	ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
ÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ
Ra-226	3.096E+00	0.0939	2.623E-04	0.0000	2.781E+01	0.8438	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.959E-02	0.0006
Ra-228	1.997E+00	0.0606	1.706E-03	0.0001	1.539E-02	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.029E-02	0.0006
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Total	5.093E+00	0.1545	1.969E-03	0.0001	2.783E+01	0.8442	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.988E-02	0.0012

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

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-	ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
ÄÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ
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	3.093E+01	0.9383
Ra-228	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	2.035E+00	0.0617
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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	3.296E+01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.090E+00	0.0926	2.823E-04	0.0000	2.776E+01	0.8316	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.255E-02	0.0007
Ra-228	2.445E+00	0.0733	3.933E-03	0.0001	3.742E-02	0.0011	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.061E-02	0.0006
Total	5.535E+00	0.1658	4.215E-03	0.0001	2.779E+01	0.8328	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.315E-02	0.0013

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.087E+01	0.9249
Ra-228	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	2.507E+00	0.0751
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	3.338E+01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.077E+00	0.0919	3.201E-04	0.0000	2.764E+01	0.8254	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.816E-02	0.0008
Ra-228	2.661E+00	0.0794	5.747E-03	0.0002	5.551E-02	0.0017	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.905E-02	0.0006
Total	5.738E+00	0.1713	6.067E-03	0.0002	2.770E+01	0.8271	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.721E-02	0.0014

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.075E+01	0.9182
Ra-228	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	2.741E+00	0.0818
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	3.349E+01	1.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Recreationist Scenario
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.034E+00	0.0950	4.332E-04	0.0000	2.726E+01	0.8534	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.497E-02	0.0014
Ra-228	1.550E+00	0.0485	3.941E-03	0.0001	3.831E-02	0.0012	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.739E-03	0.0003
Total	4.585E+00	0.1435	4.374E-03	0.0001	2.729E+01	0.8546	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.471E-02	0.0017

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	3.034E+01	0.9498
Ra-228	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	1.602E+00	0.0502
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	3.194E+01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	2.915E+00	0.0994	6.336E-04	0.0000	2.618E+01	0.8929	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.504E-02	0.0026
Ra-228	1.430E-01	0.0049	3.721E-04	0.0000	3.621E-03	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.789E-04	0.0000
Total	3.058E+00	0.1043	1.006E-03	0.0000	2.618E+01	0.8931	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.592E-02	0.0026

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	2.917E+01	0.9950
Ra-228	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	1.479E-01	0.0050
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.932E+01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	2.532E+00	0.0999	7.507E-04	0.0000	2.272E+01	0.8964	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.450E-02	0.0037
Ra-228	2.772E-05	0.0000	7.213E-08	0.0000	7.019E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.703E-07	0.0000
Total	2.532E+00	0.0999	7.508E-04	0.0000	2.272E+01	0.8964	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.450E-02	0.0037

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	2.535E+01	1.0000
Ra-228	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	2.866E-05	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.535E+01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.692E+00	0.0999	5.200E-04	0.0000	1.518E+01	0.8962	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.584E-02	0.0039
Ra-228	6.835E-16	0.0000	1.779E-18	0.0000	1.731E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.199E-18	0.0000
Total	1.692E+00	0.0999	5.200E-04	0.0000	1.518E+01	0.8962	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.584E-02	0.0039

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
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	1.693E+01	1.0000
Ra-228	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	7.067E-16	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.693E+01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	4.127E-01	0.0472	1.268E-04	0.0000	3.682E+00	0.4212	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.606E-02	0.0018
Ra-228	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
Total	4.127E-01	0.0472	1.268E-04	0.0000	3.682E+00	0.4212	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.606E-02	0.0018

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-														
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	4.449E+00	0.5090	0.000E+00	0.0000	1.810E-01	0.0207	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.740E+00	1.0000
Ra-228	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
Total	4.449E+00	0.5090	0.000E+00	0.0000	1.810E-01	0.0207	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.740E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : RESRAD Default Parameters Recreationist Scenario
File : H:\HOME\400001 HEALTH PHYSICS\JOLIET\RESRAD\JOLIET-GARDEN.RAD

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226+D	Ra-226+D	1.000E+00	6.185E+01	6.173E+01	6.148E+01	6.062E+01	5.822E+01	5.054E+01	3.375E+01	1.039E+01
Ra-226+D	Pb-210+D	1.000E+00	3.135E-03	9.263E-03	2.091E-02	5.586E-02	1.189E-01	1.633E-01	1.147E-01	7.094E+00
Ra-226+D	ãDSR(j)		6.185E+01	6.174E+01	6.150E+01	6.067E+01	5.834E+01	5.070E+01	3.387E+01	1.748E+01
Ra-228+D	Ra-228+D	1.000E+00	3.156E+00	2.793E+00	2.188E+00	9.305E-01	8.090E-02	1.567E-05	3.864E-16	0.000E+00
Ra-228+D	Th-228+D	1.000E+00	9.132E-01	2.221E+00	3.294E+00	2.274E+00	2.149E-01	4.166E-05	1.027E-15	0.000E+00
Ra-228+D	ãDSR(j)		4.069E+00	5.014E+00	5.482E+00	3.204E+00	2.958E-01	5.733E-05	1.413E-15	0.000E+00

The DSR includes contributions from associated (half-life ó 180 days) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	4.042E-01	4.049E-01	4.065E-01	4.121E-01	4.285E-01	4.931E-01	7.381E-01	1.430E+00
Ra-228	6.144E+00	4.986E+00	4.560E+00	7.802E+00	8.452E+01	4.361E+05	*2.726E+14	*2.726E+14

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 2.281 ñ 0.005 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ra-226	5.000E-01	0.000E+00	6.185E+01	4.042E-01	6.158E+01	4.059E-01
Ra-228	5.000E-01	2.718 ñ 0.005	5.491E+00	4.553E+00	5.466E+00	4.573E+00

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr							
		t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	3.093E+01	3.086E+01	3.074E+01	3.031E+01	2.911E+01	2.527E+01	1.688E+01	5.193E+00
Pb-210	Ra-226	1.000E+00	1.567E-03	4.631E-03	1.045E-02	2.793E-02	5.944E-02	8.166E-02	5.733E-02	3.547E+00
Ra-228	Ra-228	1.000E+00	1.578E+00	1.397E+00	1.094E+00	4.653E-01	4.045E-02	7.836E-06	1.932E-16	0.000E+00
Th-228	Ra-228	1.000E+00	4.566E-01	1.110E+00	1.647E+00	1.137E+00	1.074E-01	2.083E-05	5.135E-16	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g							
		t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	5.000E-01	4.990E-01	4.970E-01	4.900E-01	4.707E-01	4.087E-01	2.731E-01	6.661E-02
Pb-210	Ra-226	1.000E+00	0.000E+00	1.528E-02	4.431E-02	1.315E-01	2.887E-01	4.004E-01	2.813E-01	6.862E-02
Ra-228	Ra-228	1.000E+00	5.000E-01	4.425E-01	3.466E-01	1.474E-01	1.282E-02	2.483E-06	6.122E-17	0.000E+00
Th-228	Ra-228	1.000E+00	0.000E+00	1.425E-01	2.685E-01	2.022E-01	1.932E-02	3.745E-06	9.235E-17	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

RESCALC.EXE execution time = 0.54 seconds

Exhibit 8

RESRAD Results – Top Soil as Fill (Under Home)

Part 3

Place Holder RESRAD VEGGIES

Attachment F

DEPARTMENT OF
PUBLIC UTILITIES
PHONE: 815/724-4230
FAX: 815/723-7770

CITY OF JOLIET

150 WEST JEFFERSON STREET
JOLIET, ILLINOIS 60432-4158

November 12, 2009

REPLY TO: 921 E. Washington Street
Joliet, IL 60433-1267

Ms. Louise Michels
Staff Attorney
Illinois Emergency Management Agency
1035 Outer Park Drive
Springfield, Illinois 62704

RE: PROPOSED RULEMAKING LICENSING OF RADIOACTIVE MATERIAL 32 ILL. ADM. CODE 330.40

Dear Ms. Michels:

My name is Bon Mui. I am currently the Public Utilities Administrator for the City of Joliet. I am a licensed Professional Engineer and licensed Structural Engineer in the State of Illinois. Prior to being employed by the City of Joliet as their Public Utilities Administrator, I had worked 33 years as a structural and design engineer with the engineering firm Alvord, Burdick & Howson, LLC in Chicago.

The City of Joliet for the past 20 years have land applied the sludge produced at the Eastside and Westside Wastewater Treatment Plant. Our sludge has radium in it from the water we pump out of the Ironton Galesville Aquifer for drinking water.

On the issue of radon exposure for people living on land treated with our sludge, our consultants Rogina and Associates, LTD and RSSI (health physicist) have used the RESRAD model to estimate the radiation dose to an exposed on-site resident living on farm field treated with our sludge. Their modeling indicate that our request to the IEPA to allow us to land apply sludge up to a concentration of 1 pico-curies per gram would have very little health risk to on-site residents. One of our assumptions in the modeling is that top soil treated with our sludge is removed from underneath the house. IEMA disagree with this assumption. IEMA wants the modeler to assume top soil underneath the house which would increase the health risk from the sludge applied on the farm field. I know of no building code that would allow a person to construct a house or building on top of top soil. Top soil is an organic material and is very compressible. If a person was to construct a house or building on top of top soil the structure would settle unevenly, crack and allow rain and snow to enter the structure damage it and make it unsafe and unfit to occupy.

Occupants of buildings, other then residential housing, built on land which may receive sludge from our plant will also have very little risk from radon gas. Architects and engineers design buildings to meet local, state and federal regulations, which do not allow the construction of buildings on top of top soil, and in addition, require proper ventilation of the building per the building code and American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE). Buildings designed to code will not have radon gas accumulate in the building.

In summary, it is proper for our consultants to run the RESRAD model assuming no top soil underneath the house. There is no validity in the assumption that a local, state or federal agency would allow a person to construct a house or building on top of top soil and that buildings are required to have proper ventilation per building codes and ASHRAE. Buildings and houses constructed on top of top soil will settle, crack and allow the elements into the structure and make the building unfit for occupancy.

Sincerely

Bon G. Mui

Bon G. Mui P.E., S.E.
Public Utilities Administrator

Attachment G

CITY OF JOLIET
BUILDING SERVICES
DAVID R. MACKLEY
DIRECTOR
PHONE: 815/724-4070
FAX: 815/740-2311
dmackley@jolietcity.org

150 W. Jefferson St.
Joliet, IL 60432-4158

November 12, 2009

Ms. Louise Michels
Staff Attorney
Illinois Emergency Management Agency
1035 Outer Park Drive
Springfield, Illinois 62704

RE: PROPOSED RULEMAKING LICENSING OF RADIOACTIVE MATERIAL 32 ILL. ADM. CODE 330.40

Dear Ms. Michels:

Please be advised that the Adopted Code of the City of Joliet, the 2003 International Building Code, does not permit the placement of foundations on Top Soil.

Mud, organic silt, organic clays, peat or unprepared fill shall not be assumed to have a presumptive load-bearing capacity. This is a quote from the 2003 IBC.

Most of our structures are designed at a load of 3000 psf or higher. Top soil cannot meet this compressive strength nor does it have suitable Lateral Sliding resistance due to liquefaction. This makes it unsuitable for use as a backfill material.

The frost depth for our area is 42 inches deep. Therefore, we are always well below the level of top soil.

In the instances where slab construction is chosen, the floor interior between the footing and walls is stripped of all top soil to provide adequate bearing soils and fill for the support of the slab and any interior load bearing grade beams. This is also true of detached garages.

Myself and all of my staff can assure you that the aforementioned is true for each and every structure.

Sincerely,

David R. Mackley, Director
Building Services

Attachment H

RSSI

6312 West Oakton Street
Morton Grove, IL 60053-2723
847-965-1999
Fax 847-965-1991

November 13, 2009

Louise Michels
Staff Attorney
Illinois Emergency Management Agency
1035 Outer Park Drive
Springfield, Illinois 62704

RE: PROPOSED RULEMAKING, 32 IAC 330.40

Dear Ms. Michels:

I recently spoke with several prominent Health Physicists about IEMA's proposed application of ALARA to protect the occupants of a house built in violation of all known building codes from an annual dose of 15 mrem at an annual cost of $2,000,000. All were in agreement that the described application of ALARA failed to balance dose savings with cost and was therefore wrong. I posed the question below to these Health Physicists.

> "We recently discussed a proposed Illinois Emergency Management Agency (IEMA) rule that would restrict the beneficial application of sewage sludge to amend soil on agricultural lands. The IEMA rule would limit the increase in the concentration of RA-226 plus Ra-228 (total radium) to 0.4 pCi/g. IEMA has based this limit on a claim of maintaining doses resulting from sludge application programs ALARA. Municipalities, including my client, the city of Joliet (Joliet), are seeking a higher limit, 1.0 pCi/g, to make sludge application programs economically viable.
>
> IEMA has stated that doses resulting from applying sludge at the proposed limit of 0.4 pCi radium are ALARA and that doses from applications that would result in a higher concentration would not be ALARA. The essential difference in the basis for a 0.4 pCi/g or a 1.0 pCi/g limits is in potential for future construction practices for houses on affected land.

RSSI

The several states that even have regulations that control radium in sludge application have limits that are above 1.0 pCi/g.

IEMA has posited that the increase in annual dose resulting from agricultural application of sewage sludge must not exceed 10 mrem over a natural background of ~300 mrem. In Illinois, building codes require removal of uncompacted topsoil prior to construction. Even in the absence of codes, removal of topsoil is necessary for structural stability. Using RESRAD modeling, Joliet and IEMA agree that if future construction is in compliance with codes, and topsoil is removed before construction, a 1.0 pCi increase in radium concentration will result in a 10 mrem increase in annual dose to houses built on former agricultural land.

Similarly, Joliet and IEMA agree that a 1.0 pCi/g increase in radium will increase annual dose by 25 mrem if a hypothetical house is built, in violation of building codes, without removing the topsoil. The additional 15 mrem, mostly due to indoor radon, is 8% of the US EPA reported dose from radon in Illinois. IEMA has stated that, to maintain doses ALARA, they must protect the potential code violator by restricting the increase in radium from sludge applications to no more than 0.4 pCi/g.

In the unlikely event that a house was constructed on topsoil, and in violation of building codes, the increase in cumulative dose to the occupants can be projected. It is reasonable to assume that no more than one house would be built by a code violator on the fields used in a single years application program. We can further assume that the house has five occupants who remain in the house for twenty years. The difference in collective dose resulting from the 0.4 pCi/g and the 1.0 pCi/g limits would be 1,500 mrem. If the 0.4 limit is used, the increase in annual cost to dispose of what had been a beneficial material would be approximately $2 million per year.

RSSI

> As I indicated in our conversation, I would appreciate your comments on the use or misuse of the ALARA principle to require spending $2 million to eliminate a hypothetical collective dose of 1500 person-mrem. I am not seeking comments on the IEMA rule making process or on the virtues of sludge application programs, but only on the applicability of the ALARA principle in reducing collective dose by 1,500 person-mrem at a $2 million cost to taxpayers."

Paul Ziemer and Conrad Sherman have responded to the above question and their responses are attached. Paul Ziemer is a former Assistant Secretary of Energy for Environment, Safety, and Health, and a former President of the Health Physics Society. I respect his opinions in many areas including public policy. His letter is brief, concise, and to the point. Conrad Sherman has a strong background in regulatory affairs, having worked for the NRC, DOE, and OSHA. My original question is attached to his letter. He has a wealth of knowledge, as can be seen from his letter, which is lengthy and contains an (over)abundance of information.

Their letters, and my testimony at the recent hearing, demonstrate how the proposed rule can not be supported by applying the ALARA principle. It is unlikely that any competent and experienced Health Physicist would recommend spending an estimated $2,000,000 of taxpayer's dollars to avoid an annual dose of 15 mrem to an individual or a collective dose of 1,500 person-mrem over 20 years. ALARA requires weighing the cost against any dose savings. To not weigh cost against benefit is poor science and poor policy.

Please call me at 847-965-1999 if you have any questions or require additional information.

Sincerely,

Eli A. Port

Eli A. Port, CHP, CIH, P.E.

Attachments

H:\HOME\400001 Health Physics\Joliet\Joliet IEMA Rulemaking Hearing\Michels01.doc

Attachment I

November 11, 2009

Eli Port
Radiation Safety Service Incorporated
Oakton Street
Morton Grove, Il

Subject: Value Of Protecting Members Of the Public From More than 10 Millirem Per Year

You asked me for my comments on the use or misuse of the ALARA principle to require spending $2 million to eliminate a hypothetical collective dose of 1500 person-mrem (1.5 person-rem).

First off, I know of no standard or law with a per se requirement that annual dose resulting from agricultural application of sewage sludge must not exceed 10 mrem, nor of a consideration that would make a sharp cutoff (i.e. 0.4 pCi/gm as ALARA) required.

ALARA exists within a highly regulated scheme for licensed user of radioactive material and nuclear power plant operators. EPA does not, to my knowledge directly apply this principle to any of its regulatory schemes. As a caveat, I looked at the facts as you stated them and based my analysis on straightforward application of risk-models, in a manner that any reasonably educated member of the public can understand.

The second "A" in ALARA stands for achievable, and almost anything is, given enough resources. The "R" stands for reasonable, and here is where cost-benefit analysis comes in, along with all the associated baggage (NIMBY, socio-economic tradeoff, and so on). ALARA allows for a continuum of decisions and expenditures to achieve its goal, rather than a single hard line in the sand.

THE COSTS AS PROPOSED HERE WOULD PUT THIS RULE ON RECORD AS ONE OF THE MOST IF NOT THE MOST COSTLY RADIATION RULE EVER!

It would be imposed on groups least likely to pay, municipalities as opposed to the federal government.

The NRC has had a longstanding policy of requiring the expenditure of $1,000 (10K?) to avert one person-rem of exposure. This has been correlated by various authorities to a value per life of approximately $1-2 million per fatal cancer averted. Assuming, in the example you gave, that $2 million is spent to avert 1.5 person-rem, then the cost per person-rem would be $2,000,000/1.5 = $1.3 million per person rem. As this is 1,330 times higher than NRC's the guideline, the cost to avert a fatal cancer is not $2,000,000 but $2,600,000,000 per life saved, making it one of the most expensive state regulatory actions ever. I don't know what the economics are for alternate sludge disposal, but you can similarly do an analysis of what the increase in waste sludge disposals costs the average homeowner and compare it to the risk averted.

The Costs Of Radiation Regulations

Radiation protection regulations are expensive. Some examples calculated by the NRC are given here. These may be compared to other federal rule-making actions in a table presented further down in this letter. They turn out to be among the most expensive (on cost per death averted) for a variety of reasons, but one is certainly the ability of the regulated to pay, and the other is the ability of the regulator to pass rules with very low benefit to cost ratios.

Radon remediation in homes and radium in drinking water are good examples to bound any regulation of sludge. Both cover natural materials and costs are largely bourne by individuals or municipalities. The regulatory costs range from <$ 1 million to $6 million per life saved.

Costs of Life-Saving Actions in Radiation-Related Activities[1]

Activity	Cost per life saved (million)
Medical x-ray equipment	0.009
Radon remediation in homes	0.7 (at 4 pCi/L)
Radium in drinking water	6.1
General radwaste practice	24
Civilian high-level waste	44
Defense high-level waste	490

This requirement the rule-making imposes, given the high costs, is dubious on several counts:

- It requires a law, or code to be violated for the risk to even appear
- The costs to protect against this theoretical occurrence are extremely high
- The actual risks to the violator and family are miniscule in comparison to the background radiation
- TheCcity could spend this money elsewhere (schools, road maintenance, road signage improvements) and produce a significantly greater good

In this case, spending $2 million to eliminate a 15 millirem per year dose can be examined. The direct risk is 15 millirem × 20 years × 6×10^{-7} $mrem^{-1}$ fatal cancer risk or about 1.8×10^{-4} fatal cancer risk, so you would have to expose $1/1.8 \times 10^{-4}$ or about 5,000 persons to see a reduction of one statistical fatal cancer. This is $400 per person over those 5,000 theoretical persons. When an expenditure of $10 per person for a traffic light (5000 x 10 = 50,000) or stop sign might have the same effect, who would choose to spend it so wastefully. Further analysis should be performed, considering that the total expenditure to the city and other citiesbe known as well.

[1] FROM NUREG-6212

The total annual cost to the city should be compared to the risk averted, then other ways to spend the same money can be compared for cost-effectiveness.

ALARA is a fine concept in the case of industrial (nuclear) exposure, medical workers, even the diagnostically exposed population. When doses are extremely low, it does not necessarily provide an actual benefit.

It is noble that a regulator wants a 'polluter' to spend its money protect members of the public from an additional 15 millirem per year.. This approach often works well if a large number of people are at risk. It even works where a small population is exposed to higher doses over and over, so that lifetime risks are high. It does not work where small numbers of people are exposed to minimal risks. I assume the radioactive material is natural and is similar to the levels already in soil.

The NRC has required expenditure of $1,000 per person-rem for effluent reduction. Extrapolated to very small doses, and large populations, this can correspond to as much as $ one billion per rem (per death averted) to a population of one million or one million dollars per millirem for the same population. For 100 people, this is equal to spending $1500 per 15 millirem averted. This seems reasonable. Is it?

The NRC rule corresponds to about $2.million to avert one fatal cancer. Clearly the electric utilities have a lot of money, but are the ratepayers willing to pay them for this seemingly fair risk reduction. Assume a power plant serves 1 million people, and the average person buys electricity for 50 years, about 1 million dollars of electricity is produced per day (busbar), then 365 x 50 years x 1,000,000 dollars is 18 billion dollars, or $18,000 PER USER, about $360 per year or $1400 per family. This is like $110 per month so it is in the ballpark. The additional cost for a one person rem reduction is 2,500,000/ 1,000,000 or $25 or $0.5 year (50 years) or $2 per year for the family of four or $100 lifetime. What is the corresponding risk reduction. It is 1 millirem per year per person. It depends on your point of view, or rather your ability to pay. Would an average persom pay $100 to reduce this risk, or $1500 for a 15 millirem reduction if they had a copy of Dr. Cohen's Catalog of Risks Attached). Cohen's work translates risk into life lost on average in time units. Some ultra-low-risk activities are set forth below (more are attached). Note that 15 milliurem is about 1 hour of driving.

Not fastening seat belt	6 seconds per mile
Drinking a diet soft drink	9 seconds
Extra driving	24 seconds per mile
Crossing the street	24 seconds
1 mrem of radiation	1.5 minutes
15 mrem of radiation	22.5 minutes
Smoking a cigarette	10 minutes
Drinking a regular soft drink	15 minutes
Eating a calorie rich dessert	50 minutes

So why did the NRC think consumers would pay it in the form of higher utility bills. Why would anyone spend $1000 (rich or poor) to get a 15 millirem risk reduction[2]. That will also pay for airbags for family car, clearly a better choice. The heart of this matter is stated alternatively, "I want him to pay to reduce my risk."

I can't quote the source, however I recall that the NESHAPs radiation emissions regulation (see Ramsey) was one of the most the most costly in terms of human life saved per expenditure using standard measures. Sustem has neatly compiled a table, from which I extracted some examples. NUREG/CR-6212 provides an alternate clearly showing that we spend more to avert radiation related risk, than most other risks. Thus it is natural for a radiation regulator to be willing to spend more of other peoples money to avert miniscule risk at high cost, but other agencies are able to gain greater benefit for much less money.

The radiation regulators are in unique position, the public fears radiation, and the politicians and judges don't understand it, so that radiation environmental regulations are some of the most costly rule making propositions enacted. The example you have cited however, takes the cake.

The inclination to give in to these regulators must be resisted; otherwise they will require spending in outlandish quantities, over and over, disproportional to the risks averted.

Regulation	Agency	Cost per Premature Death Averted (1990 $Millions)
Unvented space heater ban	CPSC	.1
Aircraft cabin fire protection standard	FAA	1
Auto passive restraint/seat belt standards	NHTSA	.1
Steering column protection standard	NHTSA	.1
Underground construction standards	OSHA-S	.1
Auto fuel system integrity standard	NHTSA	.4
Aircraft floor emergency lighting standard	FAA	.6
Passive restraints for trucks and buses (proposed)	NHTSA	.7
Side-impact standards for autos (dynamic)	NHTSA	.8
Children's sleepwear flammability ban	CPSC	.8

[2] There are some complexities here. Of course markets are ordinarily based on willingness to pay, and poor people are willing to pay less for safety, simply because they have less. Poor people are willing to pay less, as a class and other things equal, for safer cars, safer neighborhoods, and so forth. The aggregated willingness-to-pay approach simply generalizes this phenomenon; there is nothing unusual about it. Thus a system that assigns uniform values to life embeds a kind of subsidy to people with relatively less resources or, more precisely, to people with less willingness to pay. (Sustem)

Trenching and excavation standards	OSHA-S	1.5
Traffic alert and collision avoidance (TCAS) systems	FAA	1.5
Hazard communication standard	OSHA-S	1.6
ALARA for Nuclear Power Rad Emissions3	***NRC***	***2.5***
Rear lap/shoulder belts for autos	NHTSA	3.2
Standards for radionuclides in uranium mines	***EPA***	***3.4***
Benzene NESHAP (original: fugitive emissions)	EPA	3.4
Benzene NESHAP (revised: coke byproducts)	EPA	6.1
Benzene occupational exposure limit	OSHA-H	8.9
Hazardous waste listing for petroleum refining sludge	EPA	27.6
Cover/move uranium mill tailings (inactive sites)	EPA	31.7
Benzene NESHAP (revised: transfer operations)	EPA	32.9
Civilian high-level waste		***44***
Benzene NESHAP (revised: waste operations)	EPA	168.2
Defense high-level waste		***490***
Proposed IEMA Rule on Sludge	**IEMA**	**2,600**
Formaldehyde occupational exposure limit	OSHA-H	86,201.8
Hazardous waste listing for wood-preserving chemicals	EPA	5,700,000

The NRC expectation that $1,000 ?? (not 10k?)be expended to reduce a person-rem of radiation dose seems reasonable, in the abstract, but if many people are exposed, the cost is huge. Where do you cut off the extrapolation to low doses. Federal agencies require spending money to make products and systems safer. This is reasonable. Various estimates range from $100,000 to $10,000,000 for different agencies and rulemakings for such hazards as people are widely exposed to such as consumer products, automobiles, industrial safety and aircraft safety. It is only in the radiation realm that the costs become extreme.

How much should be required for a persom to expend to save a life. I would agree that $1 million to $ 5 million is certainly reasonable.

The benefit of a traffic light is about $50,000 per life saved is obvious and reasonable. What stuck in my mind upon reading the study comparing risk expenditure was that a 50K expenditure saved a real countable life, whereas 100,000,000 dollars only saved a statistical life (one that could never be measured). I would rather have my regulators improving traffic safety in my neighborhood.

I'm sure you are familiar with the Health Physics Society Position Paper PS-008-1 on risk assessment, cautioning against use of risk assessment to extrapolate from low doses. While some consider the HPS to be a flack for the nuclear industry, their caution is valid and is applicable here. Furthermore, doses in the range of 1- 50 millirem per year tend to be lost in the statistical noise of dose variability. Common estimates give around 360 millirem per year as the background dose to an average member of the US population including radiation from medical exposure and radon. The variability is huge, if you live over the wrong geologic formation or in a stone house, your actual dose may be higher.

[3] Added by author

If you are fortunate enough to get good medical care, you get more x-ray and radioisotope diagnostic procedures over a lifetime, increasing your dose. If you are fortunate enough to travel by air, even more radiation.

If the variability from individual to individual is on the order of 100 millirem per year, then what is an additional 15 or even 50 millirem mean. Clearly no one knows the answer. No epidemiology has measured such an effect. Even in higher dose regions such as Kerala, India, the Reading Prong and the Rockies, there is no evidence of life shortening from natural radioactivity . We do know from Atomic Bomb survivors as well as uranium miners that there is a real risk, but doses were significantly higher in these cases.

There are many ways to look at the appropriate expenditure to reduse a risk from 15 millirem. A dose of 15 millirem corresponds to about 9×10^{-6} fatal cancer risk. Another way to express this is that if we expose a population of 1,000 people to this dose, than we would statistically expect 0.009 additional fatal cancers in a population experiencing 200 to 350 fatal cancers from all causes.

How much should be spent to avert this risk?

I have included some reading and attached some useful articles.

Conrad I Sherman
Certified Health Physicist, Certified Industrial Hygienist
Development Engineer
University of California, Berkeley

Copy of Request

Conrad:

Thank you for the time you spent with me on the phone discussing a proposed Illinois Emergency Management Agency (IEMA) rule that would restrict the beneficial application of sewage sludge to amend soil on agricultural lands. The IEMA rule would limit the increase in the concentration of RA-226 plus Ra-228 (total radium) to 0.4 pCi/g. IEMA has based this limit on a claim of maintaining doses resulting from sludge application programs ALARA. Municipalities, including my client, the city of Joliet (Joliet), are seeking a higher limit, 1.0 pCi/g, to make sludge application programs economically viable.

IEMA has stated that doses resulting from applying sludge at the proposed limit of 0.4 pCi radium are ALARA and that doses from applications that would result in a higher concentration would not be ALARA. The essential difference in the basis for a 0.4 pCi/g or a 1.0 pCi/g limits is in potential for future construction practices for houses on affected land. The several states that even have regulations that control radium in sludge application have limits that are above 1.0 pCi/g.

IEMA has posited that the increase in annual dose resulting from agricultural application of sewage sludge must not exceed 10 mrem over a natural background of ~300 mrem. In Illinois, building codes require removal of uncompacted topsoil prior to construction. Even in the absence of codes, removal of topsoil is necessary for structural stability. Using RESRAD modeling, Joliet and IEMA agree that if future construction is in compliance with codes, and topsoil is removed before construction, a 1.0 pCi increase in radium concentration will result in a 10 mrem increase in annual dose to houses built on former agricultural land.

Similarly, Joliet and IEMA agree that a 1.0 pCi/g increase in radium will increase annual dose by 25 mrem if a hypothetical house is built, in violation of building codes, without removing the topsoil. The additional 15 mrem, mostly due to indoor radon, is 8% of the US EPA reported dose from radon in Illinois. IEMA has stated that, to maintain doses ALARA, they must protect the potential code violator by restricting the increase in radium from sludge applications to no more than 0.4 pCi/g.

In the unlikely event that a house was constructed on topsoil, and in violation of building codes, the increase in cumulative dose to the occupants can be projected. It is reasonable to assume that no more than one house would be built by a code violator on the fields used in a single year's application program. We can further assume that the house has five occupants who remain in the house for twenty years. The difference in collective dose resulting from the 0.4 pCi/g and the 1.0 pCi/g limits would be 1,500 mrem. If the 0.4 limit is used, the increase in annual cost to dispose of what had been a beneficial material would be approximately $2 million per year.

As I indicated in our conversation, I would appreciate your comments on the use or

misuse of the ALARA principle to require spending $2 million to eliminate a hypothetical collective dose of 1500 person-mrem. I am not seeking comments on the IEMA rule making process or on the virtues of sludge application programs, but only on the applicability of the ALARA principle in reducing collective dose by 1,500 person-mrem at a $2 million cost to taxpayers. Because of the scheduling for comments, it would be very helpful if you can send your response to me by Wednesday afternoon. A pdf or doc letter as an attachment would be most useful, but an email response will be ok. The credentials you choose to use will be important.

Thanks again.

Reference Material

TIME OF LIFE LOST FROM INDIVUDUAL ACTIONS

NOT FASTENING SEAT BELT 6 SECONDS PER MILE
DRINKING A DIET SOFT DRINK 9 SECONDS
EXTRA DRIVING 24 SECONDS PER MILE
CROSSING THE STREET 24 SECONDS
1 MREM OF RADIATION 1.5 MINUTES
15 MREM of RADIATION 22.5 MINUTES
SMOKING A CIGARETTE 10 MINUTES
DRINKING A REGULAR SOFT DRINK 15 MINUTES
EATING A CALORIE RICH DESSERT 50 MINUTES
TAKING A COAST TO COAST FLIGHT 1 HOUR 40 MINUTES
DRIVING COAST TO COAST 16 HOURS 40 MINUTES
BUYING A SMALL CAR 5 DAYS
CHOOSE VIETNAM ARMY DUTY 417 DAYS
MOVING TO AN UNFAVORABLE STATE 556 DAYS

DAYS ADDED TO LIFE EXPECTANCY BY VARIOUS ACTIONS

SMOKE ALARM IN HOME 10 DAYS
USING SEAT BELTS 50 DAYS
DRIVING AN AIR BAG INSTALLED CAR 50 DAYS
BUYING A LARGER CAR 50 DAYS
TRAINING FAMILY IN RESUSCITATION MORE THAN 100 DAYS

TIME OF LOSS OF LIFE DUE TO VARIOUS CAUSES

BEING UNMARRIED, MALE 3,500 DAYS
CIGARETTE SMOKING, MALE 2,250 DAYS
BEING UNMARRIED, FEMALE 1,600 DAYS
BEING 30% OVERWEIGHT 1,300 DAYS
BEING A COAL MINER 1,100 DAYS
BEING 20% OVERWEIGHT 900 DAYS
< 8th GRADE EDUCATION 850 DAYS
CIGARETTE SMOKING, FEMALE 800 DAYS
LOW SOCIOECONOMIC STATUS 700 DAYS
LIVING IN UNFAVORABLE STATE 500 DAYS
ARMY IN VIETNAM 400 DAYS
CIGAR SMOKING 330 DAYS
PIPE SMOKING 220 DAYS
INCREASED FOOD INTAKE, 100 CAL/D 210 DAYS
MOTOR VEHICLE ACCIDENTS 207 DAYS
DRINKING ALCOHOL (US AVERAGE) 130 DAYS
LEGAL DRUG MISSUSE 90 DAYS
JOB WITH RADIATION EXPOSURE 40 DAYS
ILLICIT DRUG USE (US AVERAGE) 18 DAYS

GUN ACCIDENTS 13 DAYS
MEDICAL XRAY EXPOSURE (AVERAGE) 6 DAYS
TAKING BIRTH CONTROL PILLS 5 DAYS
DRINKING DIET DRINKS 2 DAYS
NUCLEAR REACTOR ACCIDENTS 29 minutes to 2 days
RADIATION FROM NUCLEAR INDUSTRY 29 minutes
(THE LAST TWO ASSUMES ALL US POWER IS NUCLEAR)

What Does it Cost Society to Save One Life?
by John Boehnert

Published in Providence Business News (April 3, 1995)

How much cost should our Government impose on society to save a life? $100,000? $1 Million? $10 Million?

How about $72 billion per expected statistical life saved? That's the estimated cost of OSHA's formaldehyde standard.

That may be an extreme example of environmental overregulation, but even less costly regulations demonstrate the inefficiency and irrationality of many federal regulations governing health, safety and the environment.

For example, the 1986 OSHA asbestos standard costs Americans $89 million per statistical life saved, and the 1989 EPA asbestos standard cost $104 million per life saved.

One economist has calculated that the cost effectiveness

of federal regulations per life saved ranges from $100,000 to $119 billion, with a median value of approximately $9 million. However, environmental regulations are more costly than safety regulations.

This is particularly bad news, since environmental regulations are the fastest growing segment of federal regulations by costs imposed.

In 1990, the General Accounting Office calculated that environmental regulation costs $115 billion, approximately 2.1 % of the Gross Domestic Product. By 1994 the cost was $140 billion.

Economists have also found that these expenditures generally are not recovered by increased efficiencies, and actually decease productivity in the industries affected.

One economist predicted that when the Clean Air Act is fully implemented, it will reduce economic productivity by $15 billion annually, even after accounting for health benefits.

It is considerations such as this which led the U.S. House of Representatives to pass legislation requiring a cost benefit analysis to justify new regulations; the benefits of a regulation must outweigh its costs.

The issue is not a minor one. Regulatory compliance costs Americans $580 billion annually, or almost $6,000 per household. Society pays the price for such regulations in lower wages, higher consumer prices, increased taxes, reduced job opportunities, and lower economic growth.

If testimony before the Senate Committee on Government Affairs is any indication, environmentalists oppose cost benefit analysis on several grounds:

- You can't place a dollar value on intangible benefits, such as a clean environment.

- It is neither possible nor moral to put a cost on human life.
- There is insufficient scientific support for the risk assessments necessary to make the cost benefit analysis.
- The public overwhelmingly supports environmental regulation.

These arguments fall short for several reasons.

First, while some intangible benefits cannot be reduced to a dollar value, this does not mean that a cost benefit analysis is impossible. An EPA former general counsel correctly argues that intangible benefits can be considered by simply requiring that the cost must not be disproportionate to the benefits.

Additionally, the government now recovers damages for injury to natural resources, such as for despoiling ocean water with an oil spill and harming fish and wildlife. If such damages can be calculated, intangible benefits can be accommodated in a cost benefit analysis.

As for valuing human life, while it may be distasteful, society does this every day when courts award damages for loss of life. Moreover, the free market places a value on human life. Economists have calculated that riskier jobs require a premium in compensation of $3 7 million per expected statistical mortality.

The argument that risk assessments are not a scientificly sound basis to support cost benefit analysis is ironic, because today the EPA requires millions of dollars of hazardous waste remediation based upon risk assessments.

Finally, environmentalist argue that public polls demonstrate overwhelming support for environmental regulation. That's because polls ask the wrong questions.

Americans should be asked if they would pay $48,000 more for each new automobile in order to make it 5% safer. The answer would be a resounding no. Yet, as Stephen Breyer pointed out before his appointment to the U.S. Supreme Court, Americans would approve of spending this money if they fully supported asbestos regulation in schools, because that's the translation per life saved.

If Americans were aware of the actual cost of environmental regulation, the polls would be far more meaningful.

Such awareness may be in the wings, however, because the costs are becoming too large to hide and some regulatory efforts are falling by their own inane dead weight. As has been noted, it makes no sense to clean a site to drinking water standards when it is a railyard, or to require soil to be so free of contaminates that a person could eat dirt for 245 days a year when the site is a swamp.

Even if cost benefit analysis is an imperfect tool, it would still impose much needed rationality on a regulatory bureaucracy which is out of control.

http://www.terrafirmaltd.com/article_apr_95.html on 11-5-09

I. Introduction

In the Millennium Edition of the Wall Street Journal, Professor James Buchanan complained that economists are now mainly concerned with piddling mathematical puzzles.(1) The issue of how to value life, however, is not a small puzzle. It is of great importance. And an issue of even greater importance is how do we create value in our lives. By understanding more about how we value life, we can perhaps understand better what it is that creates a valuable life and how we can increase that value.

The issue of life valuation has taken up a good deal of space in the economic literature since the late 1960s. Over the past three decades, a broad body of economic research has been published on estimates of the value of an anonymous human life. Most studies show that, on an ex ante basis, life is routinely valued at two to three million dollars (Miller, 1990; Fisher, Chestnut and Violette, 1989; Viscusi, 1993). These results can serve as a societal standard for government agencies in their consideration of the costs and benefits of life and injury-saving regulations and for corporations in their safety design activities. Do we want safer cars and safer planes? What price are we willing to pay for increased safety?

For example, a cost-benefit assessment of a government program or regulation may reveal that, while the cost of the regulation may be small, the lifesaving benefit is minimal. Therefore the cost to save a statistical life is significantly greater than what we in general are willing to place on life. While there is no explicit standard used by government agencies, in a review of federal agency regulations Gillette and Hopkins (1988) conclude that the range is $1,000,000 to $2,000,000 per statistical life saved. Another review of 132 federal regulatory decisions regarding cancer risk found that there were no regulations for substances with risk reduction costs above two million dollars per life saved (Travis, Richter, Crouch, Wilson, and Klema 1987).

Value-of-life estimates are also used by industry. A societal standard regarding the value of life helps corporations determine the extent to which they should invest in safety in their plants as well as in their product designs. By matching the societal standard, corporations may meet legal tests of "reasonable" behavior that can be used to judge whether compensation and even punitive damages should be awarded in litigation

TITLE 1--GENERAL PROVISIONS

CHAPTER III--ADMINISTRATIVE CONFERENCE OF THE UNITED STATES

PART 305--RECOMMENDATIONS OF THE ADMINISTRATIVE CONFERENCE OF THE UNITED STATES

1 C.F.R. s 305.88-7

s 305.88-7 Valuation of Human Life in Regulatory Decisionmaking (Recommendation No. 88-7).

Regulations intended to lessen risks of accidents and illness ordinarily impose compliance costs on regulated entities and on rulemaking agencies. In return, society gains numerous benefits, most notably the avoidance of fatalities, injuries and disease, and in some instances a reduction in property damage. Promulgation of such regulations is a multi-faceted process, and this recommendation addresses one set of issues frequently encountered in agency decisionmaking--the valuation of human life.

Agencies often make reasoned estimates of the reduction in fatalities likely to follow implementation of a particular regulation, or of alternative regulations. It is rarely if ever possible to eliminate risk altogether, and it is nearly always the case that greater risk reduction raises compliance costs. Faced with such situations, agencies cannot avoid placing a value-- either explicitly or implicitly--on the societal benefits of risk reduction. Although similar issues are obviously involved when agencies seek to evaluate the benefit of avoiding illnesses or injuries, this recommendation is limited to agency practices and constraints in benefits valuation when the benefit at issue is future lives saved.

Placement of a dollar value on human life is controversial and complex, and a wide array of approaches may be employed. A broad range of dollar values per life saved can be observed in regulatory outcomes across programs and departments. In part, this reflects differing views about what explicit value is suitable for a given type of hazard, and in part it reflects judgments that, for reasons of policy or legal constraints, decisions should take no account of the value of life implicit in those decisions. Some agencies reject all explicit efforts to place a monetary value on human life, while others routinely build such estimates into their regulatory proposals. This diversity can be sharp even within the same department. Those agencies that are willing to utilize explicit normative benchmarks for the value of life appear to be moving toward reliance on the same basic estimation technique, generally referred to as "willingness-to-pay." This technique is premised on the assumption that by examination of marketplace behavior, one can roughly ascertain how much individuals would be willing to pay in order to reduce the

probability of death from a particular hazard or cause, or how much they would require in the form of salary increases or other payments to be willing to accept the increased probability. While willingness-to-pay provides the most inclusive analysis currently available for evaluating the benefits derived from regulatory reduction of fatalities, it falls far short of an ideal process and can produce results that are misleading because the analysis often fails to take into account all relevant variables.

The Conference recognizes the rudimentary state of knowledge on this issue, and realizes that both methodologies and results are likely to continue to vary among agencies. In this environment, however, it would be useful for agencies to take measures that would reveal publicly the processes through which they have determined the valuation of life incorporated in policy decisions. [FN1] Such a procedure would provide useful clarification and exposition of the unavoidable trade-offs in regulating hazards, and would also assist in drawing attention to those hazards where further protection may be feasible at acceptable cost.

[FN1] In 1979, the Conference made a similar recommendation about cost-benefit analyses, Recommendation 79-4, Public Disclosure Concerning the Use of Cost- Benefit and Similar Analyses in Regulation, 1 C.R.F. s 305.79-4 (1988).

In this way, agency practice may also be measured against developments in the valuation techniques and evaluated for consistency with other agencies as well as with other regulations in the same agency. The Office of Management and Budget (OMB), in its oversight of executive branch regulatory activities, could facilitate consistency by providing a central clearinghouse for research and information on life valuation issues. OMB should also assist agencies by updating its guidance concerning discount rates used by agencies in deriving present value equivalents of future effects. The current government-wide general guidance on discounting is contained in OMB Circular A-94 which has not been updated since 1972.

Recommendation

1. When an agency adopts a regulation that is intended to reduce the risk to human life, based on a judgment that the associated compliance costs are justified, the agency should disclose the dollar value per statistical life used for the purposes of that determination. Such statements and disclosures should also set forth the human life valuation implications of alternative levels of regulatory stringency considered by the agency. Exceptions to this principle may be appropriate where empirical information about either the costs or benefits of the regulation is highly conjectural, or where the benefits include values which cannot be quantified in market terms, e.g., aesthetic gains. In such cases, agencies should explain the nature and degree of imprecision in the valuation process so that the public will not be misled. When an agency declines to adopt a regulation due to these considerations, it should provide similar information.

2. In implementing paragraph 1, agencies that develop and use methodologies for placing a monetary value on human life should recognize that there remain substantial limitations of current methodology to incorporate all the variables that affect societal valuations of human life. An agency should explain the factors included or considered in its valuation. The agency also should explain how it weighs such factors.

3. Whenever agencies choose to discount costs and benefits in implementing paragraph 1, they should clearly and fully disclose what rates they are using, the methodology that generated those rates, and the sensitivity of outcomes to the particular rates applied. The Office of Management and Budget (OMB) should revise its guidance concerning the use of a discount rate in the valuation of costs and benefits to reflect recent learning on the subject, either through updating OMB Circular A-94 or by other means. Such guidance should articulate the various methods by which a discount rate can be derived and the scope of subjects to which it can be applied.

4. OMB should serve federal agencies as a central clearinghouse for research and information on life valuation issues. To this end, OMB should continue and expand its discussion of agency practices in the life valuation area, initiated in the 1987-88 edition of the annual Regulatory Program of the United States Government.

[53 FR 39586, Oct. 11, 1988]

Authority: 5 U.S.C. 591-596.

SOURCE: 38 FR 19782, July 23, 1973; 57 FR 61760, 61768, Dec. 29, 1992, unless otherwise noted.

From 11/5/09 http://www.law.fsu.edu/library/admin/acus/305887.html

Attachment J

920 Southernview Drive, N.
Lafayette, IN 47909

Paul L. Ziemer

November 11, 2009

Eli Port, CHP, CIH, PE
RSSI
6312 West Oakton St.
Morton Grove, IL 60053-2723

Dear Eli:

I have reviewed your analysis of the IMEA rulemaking concerning the agricultural application of sewage sludge in the Joliet, Illinois region. From the figures that you provided, it is clear that the incremental cost of saving a collective dose of 1500 person-millirem (or 1.5 person-rem) would be $2,000,000.

The issue, as I see it, is whether or not the community can justify the societal cost for the corresponding reduction in risk. The key to answering that question lies in the proper use of the ALARA (As Low As Reasonably Achievable) concept. The ALARA concept, as spelled out by the International Commission on Radiological Protection (ICRP) and other such bodies expressly states that ALARA must take into account "the economics of improvements in relation to benefits to public health and safety, to other societal considerations, and in relation to the use of atomic energy in the public interest." There have been a number of published studies concerning what is "reasonable" as opposed to what is possible. Since public (and private) funds are finite, it is important that decisions on health expenditures not be made in isolation, but rather in the context of other health risks and costs. For example, Guenther and Thein (Health Phys. **72**, 204-221, 1997) published a paper entitled "Estimated cost of a person-sievert exposure." They compared the cost of health risks (including the "value" of a human life) as established through wrongful death suits, medical expenditures, life insurance policies, life-saving interventions, investments, and other such measures. From this, they estimated that our society values a human life at $3,116,000. For radiation exposure, they took the National Cancer Institute's risk factor for cancer death for an average individual as 0.05 per sievert (or 0.0005 per rem). If the value of human life is rounded up to $ 4,000,000, then an acceptable cost for reducing radiation exposure would be $2,000 per person-rem.

Clearly an expenditure of $ 2,000,000 for a collective dose saving of 1.5 person-rem is way out of line with what our society is normally willing to spend to reduce health risks. The $2 million would be much better spent to provide some other health benefits for the people in the Joliet area.

Sincerely,

Paul L. Ziemer, Ph.D., CHP
Professor and Former Head, Purdue School of Health Sciences

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