



LA-UR-01-990
March 2001
ER2001-0075

**A Department of Energy
Environmental Cleanup Program**

Derivation and Use of Radionuclide Screening Action Levels

Los Alamos
NATIONAL LABORATORY

Los Alamos, NM 87545

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Produced by the Analysis and Assessment Focus Area

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ACRONYMS

ALARA	as low as reasonably achievable
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	US Department of Energy
DOE-AL	US Department of Energy/Albuquerque Office
EPA	US Environmental Protection Agency
ER	environmental restoration
NRC	US Nuclear Regulatory Commission
PRS	potential release site
SAL	screening action level

1.0 INTRODUCTION

This paper documents the calculation of Environmental Restoration (ER) Project screening action levels (SALs) for radionuclides in soils at Los Alamos National Laboratory (the Laboratory). It also describes the use of the RESRAD computer code for calculating SAL values and the assumptions governing those calculations. These SAL calculations are based on a residential exposure scenario, which includes exposure pathways for incidental soil ingestion, dust inhalation, plant ingestion, radon inhalation, and external irradiation. Radionuclide SAL values are tabulated in [Attachment 1](#). RESRAD input parameter values are provided in [Attachment 2](#).

The RESRAD computer code was developed by Argonne National Laboratory for the US Department of Energy (DOE). RESRAD incorporates the dose assessment methodology described in DOE Order 5400.5, "Radiation Protection of the Public and the Environment" (DOE 1990, 58980) and is used to implement residual radioactive material guidelines contained in this DOE Order. As stated in a DOE Albuquerque Operations Office (DOE-AL) memorandum regarding release of property with residual radioactive materials, "DOE requires the use of RESRAD computer models for evaluating potential doses resulting from the presence of residual contamination" (DOE-AL 2000, 67153).

The RESRAD code has been continually revised and improved since it was issued in 1989. The most recent manual describing its use was published as a working draft in September 1993 (Yu et al. 1993, 58695), when the RESRAD code existed as Version 5.0. Since Version 5.0, approximately 30 revisions have been made to the code. The current version, used for the SAL calculations described in this document, is Version 5.95. Major changes since Version 5.0 that affect the calculation of dose-based soil guidelines include the US Environmental Protection Agency (EPA) dose-conversion factors from two federal guidance reports (Number 11 [EPA 1988, 50123] and Number 12 [EPA 1993, 62798]) and the introduction of a new area factor model for the inhalation pathway.

Soil guideline values are calculated in RESRAD as the sum of the products of several "pathway factors." A pathway factor is a model of the connection between environmental compartments (e.g., air, plants, and soil) among which radionuclides can be transported. A complete exposure pathway model is the product of a group of pathway factors. For example, the inhalation pathway contains the air/soil concentration ratio; the area, cover, depth, and occupancy factors; and annual intake of air. The individual exposure pathways, such as plant ingestion and external irradiation, can be activated independently to create a site-specific land-use scenario.

The radiation dose that is the basis of the soil guidelines calculated using RESRAD is the effective dose equivalent for external irradiation and the committed effective dose equivalent for internal irradiation. A dose equivalent is defined as a radiation dose absorbed by a tissue multiplied by a dimensionless quality factor that represents the biological effectiveness of the radiation type (i.e., alpha particles, photons) for causing stochastic biological effects such as cancer or hereditary effects (EPA 1989, 08021). The effective dose equivalent is the weighted sum of the dose equivalents to different organs and tissues, where the weighting factor is the ratio of stochastic risk for an individual tissue to the total stochastic risk for all tissue following whole body irradiation (ICRP 1977, 68750). The committed effective dose equivalent for internal irradiation is the total effective dose equivalent deposited in the body in a 50-yr period following the intake of a radionuclide (ICRP 1977, 68750).

2.0 OBJECTIVES

The primary purpose of this paper is to document the input and assumptions for SAL calculations for radionuclides in soils. Soils may include hillside colluvium and fine-grained material in outfall areas, as well as true soils and fill on mesa tops. For the ER Project, radionuclide SALs are used as an initial screening tool to determine whether radionuclide soil concentrations could be associated with dose rates that are greater than target limits under residential land-use conditions. The primary audience for this document consists of the health physicists, risk assessors, and other qualified ER Project individuals who use radionuclide SALs in screening assessments for potential release sites (PRSs). Although the complete methodology for the application of SALs in ER Project dose assessments is not provided here, sufficient information about assumptions and conditions of use is provided to enable independent stakeholder review of the project's methodology for calculating SALs.

These SAL values are subject to review annually (at the start of each new fiscal year [October]). However, they are revised only if a new version of the RESRAD code had been published during the previous fiscal year, and if changes to the new RESRAD code affect the SAL values documented here. The ER Project will start using the revised SALs at the beginning of the fiscal year; the new values will not be retroactive.

3.0 APPLICABLE REGULATIONS AND GUIDANCE

The Organization Act of 1977 authorizes the DOE to protect the public from radiation and radioactive materials that result from research, development, and production activities at DOE facilities. DOE has published health and safety orders of which DOE Order 5400.5, "Radiation Protection of the Public and the Environment" is most pertinent to development and application of cleanup guidelines (DOE 1990, 59980.1). DOE Order 5400.5 requires the reduction of all DOE-source radiation doses to a level as low as reasonably achievable (ALARA) below the primary dose limit of 100 mrem/yr above background. DOE approves limits developed by its project offices, authorizing approval on a case-by-case basis and in accord with the primary dose limit and ALARA. Where achievement of an authorized limit is impractical or inappropriate, DOE may approve a supplemental limit that also complies with the basic dose limit of 100 mrem/yr above background.

DOE-AL has published guidance that addresses the selection of annual dose limits for dose assessments under its jurisdiction (DOE-AL 2000, 67153). This guidance states, "DOE-AL staff will approve proposed releases of real property where the modeled dose is up to and including 15 mrem/yr. Proposed releases resulting in doses greater than 15 mrem/yr require concurrence with DOE-HQ."

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) authorizes the EPA to regulate hazardous substances, including radionuclides, that are released or may be released into the environment. Although ER Project PRSs are not subject to CERCLA, EPA guidance under CERCLA may be useful in defining soil cleanup levels. EPA has published guidelines for establishing cleanup levels for radionuclides under CERCLA that state that 15 mrem/yr should "generally be the maximum dose limit for humans" (EPA 1997, 58693). A second EPA standard that potentially is applicable to the ER Project is found in the Clean Air Act (40 CFR 61, Subpart H). This regulation limits exposure of any member of the public via the inhalation pathway to 10 mrem/yr.

The Atomic Energy Act of 1954 authorizes the US Nuclear Regulatory Commission (NRC) to regulate commercial, research, and medical uses of nuclear materials as well as their transport, storage, and disposal. One such NRC regulation is 10 CFR Part 20, "Standards for Protection Against Radiation." In Subpart E of 10 CFR Part 20, "Radiological Criteria for License Termination," NRC proposed an annual

dose limit of 25 mrem/yr above background for the average member of a critical group for restricted or unrestricted use of a site.

4.0 TARGET DOSE LIMIT

To approve cleanup guidelines for releasing sites for unrestricted public use, DOE-AL requires that the site-specific modeled dose does not exceed 15 mrem/yr (DOE-AL 2000, 67153). A 15-mrem/yr target dose limit is consistent with published EPA guidance and is well below the basic dose limit of 100 mrem/yr above background established in DOE Order 5400.5 (DOE 1990, 58980.1). The EPA has determined that a target dose limit of 15 mrem/yr equates to an approximate increased lifetime cancer risk of 10^{-4} , and "is consistent with levels generally considered protective in other governmental actions, particularly regulations and guidance developed by EPA in other radiation control programs" (EPA 1997, 58693). For these reasons, the ER Project uses a target dose limit of 15 mrem/yr to calculate radionuclide SALs.

Using conservative RESRAD default values, a residential-exposure scenario, and this target dose limit, the ER Project satisfies the DOE ALARA goal. That is, if radionuclides present in soil could result in a total dose of less than 15 mrem/yr above background, any additional activity to reduce soil concentrations would not significantly reduce that dose. However, cost-benefit considerations under ALARA may lead to the selection (with DOE Headquarters approval) of a target dose limit that exceeds 15 mrem/yr above background but that complies with the 100-mrem/yr public dose limit stipulated in DOE Order 5400.5 (DOE 1990, 58980).

5.0 EXPOSURE SCENARIO, MEDIA, AND PATHWAYS

Three exposure scenarios have been identified for current and future land use at the Laboratory: residential, recreational, and commercial/industrial. The residential scenario typically is most appropriate for townsite properties. The recreational scenario typically is most appropriate for buffer areas or areas where development is topographically limited. The commercial/industrial scenario typically is most appropriate for areas that are subject to continued Laboratory use or for locations where commercial development is foreseen. The SAL values described in this document are associated with residential land use, which is associated with greater exposure to soil than the other land-use scenarios. Therefore, sites screened and released on the basis of residential land use are also safe for recreational and commercial/industrial activities.

The SAL values described in this document were developed primarily for application to surface and near-surface soil at mesa-top PRSs. Below depths at which construction activities reasonably may be expected to occur (approximately 12 ft), and in solid environmental media (e.g., tuff), SAL values are applied at the discretion of the ER Project risk assessor. SAL values also should be appropriate for screening exposures to soil on mesa slopes. However, SAL values have been designed to predict the maximal on-site soil dose over time, but these values do not account for radionuclide migration with surface water and/or infiltration to groundwater. Radionuclide migration with water may be of equal or greater concern as soil dose at some canyon-bottom sites and at mesa-top sites where potentially contaminated water discharged. Therefore, at these types of sites in particular, SAL values for site screening may need to be supplemented with an evaluation of migration potential. An approach for assessing radionuclide migration and dose for canyon-bottom sites is documented in ER Project Canyons Focus Area reports, including Reneau et al. (1998, 65406; 1998, 65407; 1998, 59667), Katzman et al. (1999, 63915), and Reneau et al. (2000, 66867).

The exposure pathways used to calculate radionuclide SALs are incidental soil ingestion, inhalation of suspended soil, external irradiation, and ingestion of garden produce. Unique exposure pathways for a gaseous form of tritium (as water vapor) include ambient inhalation of tritiated water vapor and absorption of tritiated water vapor through the skin. Ingestion of garden produce is a pathway that is commonly evaluated in radionuclide dose assessments but generally is excluded in screening-level chemical risk assessment calculations (e.g., plant ingestion is not included in the soil-screening criteria published by EPA Regions 3, 6, and 9). In keeping with common practice and because certain radionuclides (particularly strontium-90) known to occur at some sites are susceptible to plant uptake, ingestion of garden produce is included among the pathways the ER Project uses to calculate radionuclide SALs.

The primary sources of exposure parameters used in the SAL calculations are EPA's standard default exposure factors (EPA 1991, 56140) and EPA's exposure factors handbook (EPA 1997, 66597; EPA 1997, 66598). The parameter values are intended to provide estimates of "reasonable maximum exposure" for an exposure scenario that incorporates EPA pathways (EPA 1991, 56140). Exposure-parameter assumptions, values, and references are provided in Attachment 2.

6.0 KEY INPUT PARAMETERS AND ASSUMPTIONS

Certain parameters listed in Attachment 2 are critical to defining site conditions and how these conditions may change over time. These parameters generally are subject to great site-specific variability. These parameters include the size, thickness, and soil erosion rate of the contaminated zone; the evapotranspiration coefficient at the site; and the site-related soil particulate concentration in air. In addition, the length of the modeling period can influence radionuclide SALs for certain radionuclides associated with ingrowth of radioactive progeny. These parameter values have been defined so that the calculation of radionuclide SALs effectively results in static soil conditions. As a result, radionuclides in soil are modeled so that they do not leach from the contaminated zone or become depleted due to erosion.

The size of the contaminated area may affect exposure by incidental soil ingestion, dust inhalation, and external gamma irradiation. RESRAD modifies daily soil and air intake values to reflect the potential contribution to total daily intake associated with a site. These modifications are based on land-use assumptions that are consistent with a resident-farmer exposure scenario. Both the area of 405,000 m² used for the SAL calculations and the RESRAD default area of 10,000 m² result in infinite ingestion and external irradiation exposure pathways. However, the area factor model for inhalation exposure calculates an area factor of approximately 0.15 with an area of 405,000 m² and a Laboratory-specific wind speed of 3 m/sec (Chang et al. 1998, 68749). Hence, only 15% of the suspended dust at the theoretical site used in the SAL calculations originates on the site. An area of 405,000 m² corresponds to approximately a 100-ac site. In practice, very few ER Project sites are likely to exceed this size. Increases in the area factor with increasing size of the contaminated zone are also relatively small (a 1000-ac site would still have an area factor of less than 0.2 with a wind speed of 3 m/sec).

The thickness, erosion rate, and infiltration rate of the contaminated zone can affect radionuclide SALs for which ingrowth of progeny results in an increased dose over time. The ER Project soil-erosion rate has been set at zero for the SAL calculations. The combination of no infiltration and no erosion creates a static contaminated zone, which in turn results in a maximum on-site dose over time. Under the static site conditions achieved in the calculation of radionuclide SALs (i.e., the contaminated zone is not depleted by erosion or infiltration of water), progeny continue to ingrow in soil at a rate that is proportional to the half-life of the daughters.

The evapotranspiration coefficient for calculating radionuclide SALs has been set at the RESRAD limit of 0.999, effectively eliminating leaching of radionuclides from the contaminated zone by water, thereby maximizing the retention of radionuclides in surface soil over time. Because the value used for the evapotranspiration coefficient results in no infiltration, RESRAD vadose and saturated zone hydrogeologic parameters have no influence on the radionuclide SAL values. A value of 0.999 is unrealistic for any individual site (plant growth would be impossible) but has the utility of simplicity and conservatism for these calculations. A local precipitation rate value is used in the calculations because that parameter influences the SAL for tritium, but all hydrological parameters are set to RESRAD default values.

Radionuclide SALs are calculated within a 1000-yr time frame. One thousand years is the time limit for dose calculations based on two regulations that address radionuclides in soil: the proposed 40 CFR 196, "Radiation Site Cleanup Regulation," and 10 CFR Part 20, Subpart E, "Radiological Criteria for License Termination." For most radionuclides, maximum exposure (dose) occurs at the beginning of this 1000-yr time interval, but two of the radionuclides for which SALs are calculated (uranium-234 and uranium-235) contribute their maximum dose at the end of the modeling period due to their slow ingrowth of radioactive progeny.

Although the contaminated zone is modeled as static with respect to loss of radionuclides through erosion and leaching, RESRAD accounts for radon and tritium diffusing as gases from contaminated soil (lost to the atmosphere). As a result, the modeled tritium dose declines rapidly over time. Radon isotopes, however, will be in equilibrium with their parent nuclides; changes over time for dose rates through radon inhalation will depend on site-specific conditions with respect to the concentrations of these parent nuclides. Radon dose rates also can be influenced by many radon pathway-specific parameters that govern the diffusion of radon through soil and into a building. Tritium diffusion from soil as water vapor (resulting in the inhalation dose) is greatly affected by the absolute humidity of the air above the contaminated zone (a local value for absolute humidity is used in SAL calculations).

7.0 APPLICATION OF RADIONUCLIDE SCREENING ACTION LEVELS

To determine if radionuclide SALs are applicable to a particular site it is necessary to determine if the assumptions underlying their calculation are consistent with the site conceptual model. The site conceptual model includes what is known or assumed regarding the spatial distribution of radionuclides in soil, the potential for radionuclide migration over time, and characteristics of the applicable receptor population. If potentially important site-specific transport or exposure pathways are not included in the derivation of the radionuclide SALs, a comparison of site data to radionuclide SALs may be either inappropriate or require site-specific calculation of screening values that are representative of the site. If screening is determined to be inappropriate for a site, a site-specific dose assessment should be conducted.

Radionuclide migration from a contaminated site may occur by dissolution in surface or groundwater, erosion of soil, resuspension as airborne particulate, through biotic uptake, and/or by volatilization as a vapor. Radionuclide migration to an off-site location is not incorporated in the radionuclide SALs and RESRAD does not directly support such evaluations. Although potential off-site radionuclide concentrations generally should be lower than those observed on the site, modeling remote concentrations over time may be important because of (1) public concerns, (2) different routes and/or intensities of exposure than are considered for on-site receptors, and (3) regulatory requirements to assess off-site impacts. An example of a potentially significant off-site impact is strontium-90 uptake by plants rooted in contaminated soil and the subsequent redistribution in leaf litter or in fine particulates if

the plant or plant material burns. Appendix K of Yu et al. (1993, 58695) provides guidance for evaluating off-site migration using RESRAD output.

Radionuclide SALs are calculated for individual radionuclides such that a receptor will not receive a dose greater than 15 mrem/yr when the contaminated zone contains a uniform radionuclide concentration equal to the SAL. When two or more radionuclides have been released, however, it is necessary to determine whether their collective impact may result in a total annual dose greater than the target dose limit. If no SAL is exceeded, the soil concentration of each radionuclide is divided by the SAL for that radionuclide to produce a ratio. These ratios then are summed. If the sum exceeds unity, the dose for a receptor exceeds 15 mrem/yr under the exposure conditions described in Attachment 2 for the radionuclide SALs, even though all radionuclides are present at concentrations below their individual SALs.

It should be noted that the modeling times for some radionuclides from which the SAL values were obtained may differ, specifically, uranium-234 and uranium-235 (see Attachment 1). However, summing the quotients derived with SALs for uranium-234 or uranium-235 with quotients derived with the SALs for the other radionuclides is protective of human health because the SALs for the uranium isotopes assume a 1000-yr period of ingrowth for their progeny compared with zero years for the others.

8.0 SUMMARY

In summary, ER Project radionuclide SALs are applicable for screening contaminated soil at most PRSs and are conservatively biased within the bounds of the assumptions used in their calculations. The user must determine if concerns outside these bounds warrant evaluation at a specific site. A comparison of the applicability of the SAL values can be established by comparing the underlying radionuclide SAL assumptions with site-specific conditions.

9.0 REFERENCES

The following list includes all references cited in this document. The parenthetical information following the reference provides the author, publication date, and ER Project identification (ER ID) number. This information is also included in the citation in the text and can be used to locate the document.

ER ID numbers are assigned by the Laboratory's ER Project to track all material associated with Laboratory PRSs. These numbers can be used to locate copies of the documents at the ER Project's Records Processing Facility.

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Attachment 1

Radionuclide Screening Action Levels

Table A.1-1
RADIONUCLIDE SCREENING ACTION LEVELS
(RESRAD Version 5.95)
November 2000

Analyte Code	Radionuclide	SAL Value (pCi/g)	SAL w/o Indoor Radon Inhalation ^a Pathway (pCi/g)	SAL Value w/o Plant Ingestion Pathway ^a (pCi/g)	Time at which SAL Value Applies ^b (year)
Am-241	americium-241	39	39	85	0.0
Co-60	cobalt-60	1.2	1.2	1.2	0.0
Cs-137	cesium-137+D ^c	5.3	5.3	5.5	0.0
Eu-152	europium-152	2.7	2.7	2.7	0.0
Eu-154	europium-154	2.5	2.5	2.5	0.0
Eu-155	europium-155	110	110	110	0.0
H-3	tritium	880	880	6,600	0.0
I-129	iodine-129	45	45	740	0.0
K-40	potassium-40	13	13	18	0.0
Na-22	sodium-22	1.5	1.5	1.5	0.0
Np-237	neptunium-237+D	2.4	2.4	14	0.0
Pu-238	plutonium-238	49	49	120	0.0
Pu-239	plutonium-239 ^d	44	44	110	0.0
Ra-226	radium-226+D ^e	5	n/a ^f	n/a	n/a
Ra-228	radium-228+D ^e	5	n/a	n/a	n/a
Ru-106	ruthenium-106+D	19	19	20	0.0
Sr-90	strontium-90+D	5.7	5.7	600	0.0
Tc-99	technetium-99	36	36	98,000	0.0
Th-228	thorium-228+D	2.0	2.2	2.0	0.0
Th-230	thorium-230 ^e	5	n/a	n/a	n/a
Th-232	thorium-232 ^e	5	n/a	n/a	n/a
U-234	uranium-234	63	180	81	1,000
U-235	uranium-235+D	17	17	22	1,000
U-238	uranium-238+D	93	93	120	0.0

^aThis information is provided to assist users in evaluating the contribution to SAL values of pathways that may not be applicable at some sites.

^bModeling period is 1000 yr.

^cIncludes contribution to dose of radionuclide daughters.

^dPlutonium-239 and plutonium-240 typically are unresolved in laboratory analysis. SAL values for the two isotopes are identical.

^eSAL is the generic soil guideline published in DOE Order 5400.5; 5 pCi/g applies to the concentration averaged over the first 15 cm of soil below the surface; for subsequent 15-cm-thick layers the generic soil guideline is 15 pCi/g. If both thorium-230 and radium-226 or both thorium-232 and radium-228 are present and not in secular equilibrium, or if other mixtures of radionuclides occur, refer to DOE Order 5400.5 for guidance.

^fn/a = Not applicable; SAL value is not calculated with RESRAD.

Attachment 2

RESRAD Exposure Input Parameter Values

This attachment provides exposure input parameter values for the RESRAD code. Table 2.1-1 provides selected parameters, references, and/or comments. Table 2.2-2 is the summary report generated in RESRAD that documents input to the SAL calculations.

Table A.2-1
Selected Resrad Exposure Input Parameter References and Comments

Parameter	Unit	RESRAD Default	SAL Value	Reference	Comments
dose conversion factors				EPA 1997, 66598; EPA 1997, 66597	RESRAD default values are from EPA federal guidance reports (numbers 11 and 12).
plant/soil concentration ratios			-	Wang et al. 1993, 59979	Contains RESRAD default values.
radiation dose limit	mrem/yr	30	15	Sections 3.0 and 4.0 of this document	15 mrem/yr is consistent with DOE-AL and EPA guidance, and is below the NRC 25-mrem/yr limit.
maximum time for dose evaluation	yr	1000	1000	Section 6.0 of this document	EPA and NRC use 1000 yr in relevant regulations.
area of contaminated zone	m ²	10,000	405,000		405,000 m ² area is equal to a 100-ac site. Larger area than default increases dose via inhalation pathway; some ER Project sites are larger than the 10,000 m ² (2.5 ac) default in RESRAD.
thickness of contaminated zone	m	2	2		Any thickness >15 cm should produce approximately equivalent results because leaching and erosion are defeated; 2-m depth provides infinite source for gamma irradiation.
time since placement of material	yr	0	0		Radioactive decay since time of data collection may need to be addressed for particular sites.
cover depth	m	0	0		Uniform layer of contamination is assumed from ground surface to an effectively infinite depth.
density of contaminated zone	g/cm ³	1.5	1.6		Best professional judgment of ER Project geologists for soils across Laboratory.
contaminated zone erosion rate	m/yr	0.001	0.0		Eliminating soil-erosion results in maximum on-site dose over time; specific sites may experience erosion or accumulation of surface soils.
wind speed	m/sec	2	3	www.weather.lanl.gov/html/climatology.html	Annual average wind speed at Laboratory is 2.5 m/sec, with sustained winds over 4 m/sec occurring 20% of the time between mid-March and early June.
humidity in air	g/m ³	8	5.55	www.weather.lanl.gov/html/climatology.html	Range is 2.4 (January) to 8.7 g/m ³ (July-August) over year; 5.55 g/m ³ is range midpoint.

Table A.2-1 (continued)

Parameter	Unit	RESRAD Default	SAL Value	Reference	Comments
evapo-transpiration coefficient		0.5	0.999		0.999 is maximum allowed value in RESRAD; this defeats infiltration of water through contaminated zone, thereby maximizing on-site dose from soil
precipitation	m/yr	1	0.476	www.weather.lanl.gov/html/climatology.html	This parameter used to calculate tritium SAL.
inhalation rate	m ³ /yr	8400	7,300	EPA 1991, 56140	Based on recommended long-term inhalation rate of 20 m ³ /day.
mass loading for inhalation	g/m ³	1E-04	2E-05	environmental surveillance report data	2E-05 g/m ³ is average of 15 PM-10 measurements between 1990 and 1998.
exposure duration	yr	30	30	EPA 1991, 56140	Does not affect annual dose rate. This parameter is used to calculate excess cancer risk.
shielding factor, inhalation		0.4	1.0		A value of 1.0 results in no attenuation of dust concentrations in the indoor environment.
shielding factor, external gamma		0.7	0.8	EPA 1991, 58234	EPA default value for gamma shielding factor.
fraction of time spent outdoors	0.25		0.24	EPA 1997, 66598, Table 15-132, page 15-148	Equivalent to 6-hr/day spent outdoors: the 90th percentile for time spent outdoors; assumes 350 day/yr on the site.
fraction of time spent indoors		0.5	0.719	EPA 1991, 56140	Assumption that time indoors is 18 hr/day is derived from the amount of time spent outdoors.
shape factor, external gamma		1	1		Circular contaminated zone is modeled for external gamma irradiation.
fruits, vegetables and grain consumption	kg/yr	160	57	EPA 1997, 66597, Tables 13-33, 13-6, and 13-7	Based on 75th percentile of seasonally adjusted consumer-only intake of homegrown fruits and vegetables for western United States. Higher percentile was not chosen due to relatively short growing season. Vegetable values corrected by 18% average preparation loss for corn, pumpkin, peppers, and tomatoes; fruit corrected by 23% average preparation loss for apples, pears, and peaches.

Table A.2-1 (continued)

Parameter	Unit	RESRAD Default	SAL Value	Reference	Comments
leafy vegetable consumption	kg/yr	14	0		Separate intake values for leafy vegetables not evaluated. Assumes minor consumption of homegrown leafy vegetables compared to other vegetables and fruits.
soil ingestion rate	g/yr	36.5	36.5	EPA 1991, 56140	Based on daily incidental soil ingestion rate of 100 mg/day for adults.
contamination fraction of plant food		based on area	1		Vegetable and fruit intake values based on homegrown produce.
mass loading for foliar deposition	g/m ³	0.0001	0.0001		
depth of soil mixing layer	m	0.15	0.15		This mixing depth originates with plow depth and assumes cultivation of land; this does not affect SALs as contaminated zone is assumed to be 2 m deep.
depth of roots	m	0.9	0.9		Rooting depths of vegetables likely much less; this does not affect SALs as contaminated zone is assumed to be 2 m deep.
storage time for fruits, vegetables and grain	day	14	1		Assumes produce from home garden is eaten soon after harvesting. This parameter has minimal effect on SALs due to relatively long half-lives of radionuclides for which SALs are calculated.
building depth below ground surface		-1	0		Assumes slab-on-grade construction.

Table A2-2
RESRAD Summary Report for Radionuclide SALs

RESRAD, Version 5.95 T_{1/2} Limit = 0.5 year 10/23/2000 12:15 Page 1
Summary : Radionuclide SALs peer review draft 10-23-00 File: SALS00.RAD

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Dose Conversion Factor (and Related) Parameter Summary
 File: Default.LIB

Menu	Parameter	Current Value	Default	Parameter Name

B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.720E+00	6.720E+00	DCF2 (1)
B-1	Am-241	4.440E-01	4.440E-01	DCF2 (2)
B-1	Co-60	2.190E-04	2.190E-04	DCF2 (3)
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2 (4)
B-1	Eu-152	2.210E-04	2.210E-04	DCF2 (5)
B-1	Eu-154	2.860E-04	2.860E-04	DCF2 (7)
B-1	Eu-155	4.140E-05	4.140E-05	DCF2 (8)
B-1	Gd-152	2.430E-01	2.430E-01	DCF2 (9)
B-1	H-3	6.400E-08	6.400E-08	DCF2(10)
B-1	I-129	1.740E-04	1.740E-04	DCF2(11)
B-1	K-40	1.240E-05	1.240E-05	DCF2(12)
B-1	Na-22	7.660E-06	7.660E-06	DCF2(13)
B-1	Np-237+D	5.400E-01	5.400E-01	DCF2(14)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(15)
B-1	Pb-210+D	2.320E-02	2.320E-02	DCF2(16)
B-1	Pu-238	3.920E-01	3.920E-01	DCF2(17)
B-1	Pu-239	4.290E-01	4.290E-01	DCF2(18)
B-1	Pu-240	4.290E-01	4.290E-01	DCF2(19)
B-1	Ra-226+D	8.600E-03	8.600E-03	DCF2(20)
B-1	Ra-228+D	5.080E-03	5.080E-03	DCF2(21)
B-1	Ru-106+D	4.770E-04	4.770E-04	DCF2(22)
B-1	Sr-90+D	1.310E-03	1.310E-03	DCF2(23)
B-1	Tc-99	8.330E-06	8.330E-06	DCF2(24)
B-1	Th-228+D	3.450E-01	3.450E-01	DCF2(25)
B-1	Th-229+D	2.160E+00	2.160E+00	DCF2(26)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(27)
B-1	Th-232	1.640E+00	1.640E+00	DCF2(28)
B-1	U-233	1.350E-01	1.350E-01	DCF2(29)
B-1	U-234	1.320E-01	1.320E-01	DCF2(30)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(31)
B-1	U-236	1.250E-01	1.250E-01	DCF2(32)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(33)

D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.480E-02	DCF3 (1)
D-1	Am-241	3.640E-03	3.640E-03	DCF3 (2)
D-1	Co-60	2.690E-05	2.690E-05	DCF3 (3)
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3 (4)
D-1	Eu-152	6.480E-06	6.480E-06	DCF3 (5)
D-1	Eu-154	9.550E-06	9.550E-06	DCF3 (7)
D-1	Eu-155	1.530E-06	1.530E-06	DCF3 (8)
D-1	Gd-152	1.610E-04	1.610E-04	DCF3 (9)
D-1	H-3	6.400E-08	6.400E-08	DCF3(10)
D-1	I-129	2.760E-04	2.760E-04	DCF3(11)
D-1	K-40	1.860E-05	1.860E-05	DCF3(12)
D-1	Na-22	1.150E-05	1.150E-05	DCF3(13)
D-1	Np-237+D	4.440E-03	4.440E-03	DCF3(14)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(15)
D-1	Pb-210+D	7.270E-03	7.270E-03	DCF3(16)
D-1	Pu-238	3.200E-03	3.200E-03	DCF3(17)

March 29, 2001

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ER2001-0075

Derivation and Use of Rad SALs

Summary : Radionuclide SALs peer review draft 10-23-00

File: SALS00.RAD

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: Default.LIB

Menu	Parameter	Current Value	Default	Parameter Name
D-1	Pu-239	3.540E-03	3.540E-03	DCF3 (18)
D-1	Pu-240	3.540E-03	3.540E-03	DCF3 (19)
D-1	Ra-226+D	1.330E-03	1.330E-03	DCF3 (20)
D-1	Ra-228+D	1.440E-03	1.440E-03	DCF3 (21)
D-1	Ru-106+D	2.740E-05	2.740E-05	DCF3 (22)
D-1	Sr-90+D	1.530E-04	1.530E-04	DCF3 (23)
D-1	Tc-99	1.460E-06	1.460E-06	DCF3 (24)
D-1	Th-228+D	8.080E-04	8.080E-04	DCF3 (25)
D-1	Th-229+D	4.030E-03	4.030E-03	DCF3 (26)
D-1	Th-230	5.480E-04	5.480E-04	DCF3 (27)
D-1	Th-232	2.730E-03	2.730E-03	DCF3 (28)
D-1	U-233	2.890E-04	2.890E-04	DCF3 (29)
D-1	U-234	2.830E-04	2.830E-04	DCF3 (30)
D-1	U-235+D	2.670E-04	2.670E-04	DCF3 (31)
D-1	U-236	2.690E-04	2.690E-04	DCF3 (32)
D-1	U-238+D	2.690E-04	2.690E-04	DCF3 (33)
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF (1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF (1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF (1,3)
D-34	Am-241 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF (2,1)
D-34	Am-241 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-05	5.000E-05	RTF (2,2)
D-34	Am-241 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-06	2.000E-06	RTF (2,3)
D-34	Co-60 , plant/soil concentration ratio, dimensionless	8.000E-02	8.000E-02	RTF (3,1)
D-34	Co-60 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-02	2.000E-02	RTF (3,2)
D-34	Co-60 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF (3,3)
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF (4,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF (4,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF (4,3)
D-34	Eu-152 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF (5,1)
D-34	Eu-152 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF (5,2)
D-34	Eu-152 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF (5,3)
D-34	Eu-154 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF (7,1)
D-34	Eu-154 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF (7,2)
D-34	Eu-154 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF (7,3)
D-34	Eu-155 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF (8,1)
D-34	Eu-155 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF (8,2)
D-34	Eu-155 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF (8,3)
D-34	Gd-152 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF (9,1)
D-34	Gd-152 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF (9,2)
D-34	Gd-152 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF (9,3)

Dose Conversion Factor (and Related) Parameter Summary (continued)
 File: Default.LIB

Menu	Parameter	Current Value	Default	Parameter Name
D-34	H-3 , plant/soil concentration ratio, dimensionless	4.800E+00	4.800E+00	RTF (10,1)
D-34	H-3 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.200E-02	1.200E-02	RTF (10,2)
D-34	H-3 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-02	1.000E-02	RTF (10,3)
D-34	I-129 , plant/soil concentration ratio, dimensionless	2.000E-02	2.000E-02	RTF (11,1)
D-34	I-129 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	7.000E-03	7.000E-03	RTF (11,2)
D-34	I-129 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-02	1.000E-02	RTF (11,3)
D-34	K-40 , plant/soil concentration ratio, dimensionless	3.000E-01	3.000E-01	RTF (12,1)
D-34	K-40 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-02	2.000E-02	RTF (12,2)
D-34	K-40 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	7.000E-03	7.000E-03	RTF (12,3)
D-34	Na-22 , plant/soil concentration ratio, dimensionless	5.000E-02	5.000E-02	RTF (13,1)
D-34	Na-22 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-02	8.000E-02	RTF (13,2)
D-34	Na-22 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	4.000E-02	4.000E-02	RTF (13,3)
D-34	Np-237+D , plant/soil concentration ratio, dimensionless	2.000E-02	2.000E-02	RTF (14,1)
D-34	Np-237+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF (14,2)
D-34	Np-237+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF (14,3)
D-34	Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF (15,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF (15,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF (15,3)
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF (16,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF (16,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF (16,3)
D-34	Pu-238 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF (17,1)
D-34	Pu-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF (17,2)
D-34	Pu-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF (17,3)
D-34	Pu-239 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF (18,1)
D-34	Pu-239 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF (18,2)
D-34	Pu-239 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF (18,3)
D-34	Pu-240 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF (19,1)
D-34	Pu-240 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF (19,2)
D-34	Pu-240 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-06	1.000E-06	RTF (19,3)
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF (20,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF (20,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF (20,3)
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF (21,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF (21,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF (21,3)
D-34	Ru-106+D , plant/soil concentration ratio, dimensionless	3.000E-02	3.000E-02	RTF (22,1)
D-34	Ru-106+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF (22,2)
D-34	Ru-106+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.300E-06	3.300E-06	RTF (22,3)

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Derivation and Use of Rad SALs

Dose Conversion Factor (and Related) Parameter Summary (continued)
 File: Default.LIB

0 Menu	Parameter	Current Value	Default	Parameter Name
D-34	Sr-90+D , plant/soil concentration ratio, dimensionless	3.000E-01	3.000E-01	RTF (23,1)
D-34	Sr-90+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-03	8.000E-03	RTF (23,2)
D-34	Sr-90+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF (23,3)
D-34	Tc-99 , plant/soil concentration ratio, dimensionless	5.000E+00	5.000E+00	RTF (24,1)
D-34	Tc-99 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF (24,2)
D-34	Tc-99 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF (24,3)
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF (25,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF (25,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF (25,3)
D-34	Th-229+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF (26,1)
D-34	Th-229+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF (26,2)
D-34	Th-229+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF (26,3)
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF (27,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF (27,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF (27,3)
D-34	Th-232 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF (28,1)
D-34	Th-232 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF (28,2)
D-34	Th-232 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF (28,3)
D-34	U-233 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF (29,1)
D-34	U-233 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF (29,2)
D-34	U-233 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF (29,3)
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF (30,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF (30,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF (30,3)
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF (31,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF (31,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF (31,3)
D-34	U-236 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF (32,1)
D-34	U-236 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF (32,2)
D-34	U-236 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF (32,3)
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF (33,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF (33,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF (33,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC (1,1)
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC (1,2)
D-5	Am-241 , fish	3.000E+01	3.000E+01	BIOFAC (2,1)
D-5	Am-241 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC (2,2)
D-5				

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Dose Conversion Factor (and Related) Parameter Summary (continued)
 File: Default.LIB

Menu	Parameter	Current Value	Default	Parameter Name
D-5	Co-60 , fish	3.000E+02	3.000E+02	BIOFAC (3,1)
D-5	Co-60 , crustacea and mollusks	2.000E+02	2.000E+02	BIOFAC (3,2)
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC (4,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC (4,2)
D-5	Eu-152 , fish	5.000E+01	5.000E+01	BIOFAC (5,1)
D-5	Eu-152 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC (5,2)
D-5	Eu-154 , fish	5.000E+01	5.000E+01	BIOFAC (7,1)
D-5	Eu-154 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC (7,2)
D-5	Eu-155 , fish	5.000E+01	5.000E+01	BIOFAC (8,1)
D-5	Eu-155 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC (8,2)
D-5	Gd-152 , fish	2.500E+01	2.500E+01	BIOFAC (9,1)
D-5	Gd-152 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC (9,2)
D-5	H-3 , fish	1.000E+00	1.000E+00	BIOFAC (10,1)
D-5	H-3 , crustacea and mollusks	1.000E+00	1.000E+00	BIOFAC (10,2)
D-5	I-129 , fish	4.000E+01	4.000E+01	BIOFAC (11,1)
D-5	I-129 , crustacea and mollusks	5.000E+00	5.000E+00	BIOFAC (11,2)
D-5	K-40 , fish	1.000E+03	1.000E+03	BIOFAC (12,1)
D-5	K-40 , crustacea and mollusks	2.000E+02	2.000E+02	BIOFAC (12,2)
D-5	Na-22 , fish	2.000E+01	2.000E+01	BIOFAC (13,1)
D-5	Na-22 , crustacea and mollusks	2.000E+02	2.000E+02	BIOFAC (13,2)
D-5	Np-237+D , fish	3.000E+01	3.000E+01	BIOFAC (14,1)
D-5	Np-237+D , crustacea and mollusks	4.000E+02	4.000E+02	BIOFAC (14,2)
D-5	Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC (15,1)
D-5	Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC (15,2)
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC (16,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC (16,2)
D-5	Pu-238 , fish	3.000E+01	3.000E+01	BIOFAC (17,1)
D-5	Pu-238 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC (17,2)
D-5	Pu-239 , fish	3.000E+01	3.000E+01	BIOFAC (18,1)
D-5	Pu-239 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC (18,2)
D-5	Pu-240 , fish	3.000E+01	3.000E+01	BIOFAC (19,1)
D-5	Pu-240 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC (19,2)
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC (20,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC (20,2)

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Dose Conversion Factor (and Related) Parameter Summary (continued)
 File: Default.LIB

Menu	Parameter	Current Value	Default	Parameter Name
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC (21,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC (21,2)
D-5	Ru-106+D , fish	1.000E+01	1.000E+01	BIOFAC (22,1)
D-5	Ru-106+D , crustacea and mollusks	3.000E+02	3.000E+02	BIOFAC (22,2)
D-5	Sr-90+D , fish	6.000E+01	6.000E+01	BIOFAC (23,1)
D-5	Sr-90+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC (23,2)
D-5	Tc-99 , fish	2.000E+01	2.000E+01	BIOFAC (24,1)
D-5	Tc-99 , crustacea and mollusks	5.000E+00	5.000E+00	BIOFAC (24,2)
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC (25,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC (25,2)
D-5	Th-229+D , fish	1.000E+02	1.000E+02	BIOFAC (26,1)
D-5	Th-229+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC (26,2)
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC (27,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC (27,2)
D-5	Th-232 , fish	1.000E+02	1.000E+02	BIOFAC (28,1)
D-5	Th-232 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC (28,2)
D-5	U-233 , fish	1.000E+01	1.000E+01	BIOFAC (29,1)
D-5	U-233 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC (29,2)
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC (30,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC (30,2)
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC (31,1)
D-5	U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC (31,2)
D-5	U-236 , fish	1.000E+01	1.000E+01	BIOFAC (32,1)
D-5	U-236 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC (32,2)
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC (33,1)
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC (33,2)

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Site-Specific Parameter Summary					
0	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	4.050E+05	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	2.000E+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)	1.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T (2)
R011	Times for calculations (yr)	3.000E+01	3.000E+00	---	T (3)
R011	Times for calculations (yr)	1.000E+02	1.000E+01	---	T (4)
R011	Times for calculations (yr)	1.000E+03	3.000E+01	---	T (5)
R011	Times for calculations (yr)	not used	1.000E+02	---	T (6)
R011	Times for calculations (yr)	not used	3.000E+02	---	T (7)
R011	Times for calculations (yr)	not used	1.000E+03	---	T (8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T (9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Am-241	1.000E+01	0.000E+00	---	S1 (2)
R012	Initial principal radionuclide (pCi/g): Co-60	1.000E+01	0.000E+00	---	S1 (3)
R012	Initial principal radionuclide (pCi/g): Cs-137	1.000E+01	0.000E+00	---	S1 (4)
R012	Initial principal radionuclide (pCi/g): Eu-152	1.000E+01	0.000E+00	---	S1 (5)
R012	Initial principal radionuclide (pCi/g): Eu-154	1.000E+01	0.000E+00	---	S1 (7)
R012	Initial principal radionuclide (pCi/g): Eu-155	1.000E+01	0.000E+00	---	S1 (8)
R012	Initial principal radionuclide (pCi/g): H-3	1.000E+01	0.000E+00	---	S1(10)
R012	Initial principal radionuclide (pCi/g): I-129	1.000E+01	0.000E+00	---	S1(11)
R012	Initial principal radionuclide (pCi/g): K-40	1.000E+01	0.000E+00	---	S1(12)
R012	Initial principal radionuclide (pCi/g): Na-22	1.000E+01	0.000E+00	---	S1(13)
R012	Initial principal radionuclide (pCi/g): Np-237	1.000E+01	0.000E+00	---	S1(14)
R012	Initial principal radionuclide (pCi/g): Pu-238	1.000E+01	0.000E+00	---	S1(17)
R012	Initial principal radionuclide (pCi/g): Pu-239	1.000E+01	0.000E+00	---	S1(18)
R012	Initial principal radionuclide (pCi/g): Pu-240	1.000E+01	0.000E+00	---	S1(19)
R012	Initial principal radionuclide (pCi/g): Ra-226	1.000E+01	0.000E+00	---	S1(20)
R012	Initial principal radionuclide (pCi/g): Ra-228	1.000E+01	0.000E+00	---	S1(21)
R012	Initial principal radionuclide (pCi/g): Ru-106	1.000E+01	0.000E+00	---	S1(22)
R012	Initial principal radionuclide (pCi/g): Sr-90	1.000E+01	0.000E+00	---	S1(23)
R012	Initial principal radionuclide (pCi/g): Tc-99	1.000E+01	0.000E+00	---	S1(24)
R012	Initial principal radionuclide (pCi/g): Th-228	1.000E+01	0.000E+00	---	S1(25)
R012	Initial principal radionuclide (pCi/g): Th-230	1.000E+01	0.000E+00	---	S1(27)
R012	Initial principal radionuclide (pCi/g): Th-232	1.000E+01	0.000E+00	---	S1(28)
R012	Initial principal radionuclide (pCi/g): U-234	1.000E+01	0.000E+00	---	S1(30)
R012	Initial principal radionuclide (pCi/g): U-235	1.000E+01	0.000E+00	---	S1(31)
R012	Initial principal radionuclide (pCi/g): U-238	1.000E+01	0.000E+00	---	S1(33)
R012	Concentration in groundwater (pCi/L): Am-241	not used	0.000E+00	---	W1 (2)
R012	Concentration in groundwater (pCi/L): Co-60	not used	0.000E+00	---	W1 (3)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1 (4)
R012	Concentration in groundwater (pCi/L): Eu-152	not used	0.000E+00	---	W1 (5)
R012	Concentration in groundwater (pCi/L): Eu-154	not used	0.000E+00	---	W1 (7)
R012	Concentration in groundwater (pCi/L): Eu-155	not used	0.000E+00	---	W1 (8)
R012	Concentration in groundwater (pCi/L): H-3	not used	0.000E+00	---	W1(10)
R012	Concentration in groundwater (pCi/L): I-129	not used	0.000E+00	---	W1(11)
R012	Concentration in groundwater (pCi/L): K-40	not used	0.000E+00	---	W1(12)
R012	Concentration in groundwater (pCi/L): Na-22	not used	0.000E+00	---	W1(13)
R012	Concentration in groundwater (pCi/L): Np-237	not used	0.000E+00	---	W1(14)

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Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R012	Concentration in groundwater (pCi/L): Pu-238	not used	0.000E+00	---	W1 (17)
R012	Concentration in groundwater (pCi/L): Pu-239	not used	0.000E+00	---	W1 (18)
R012	Concentration in groundwater (pCi/L): Pu-240	not used	0.000E+00	---	W1 (19)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1 (20)
R012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---	W1 (21)
R012	Concentration in groundwater (pCi/L): Ru-106	not used	0.000E+00	---	W1 (22)
R012	Concentration in groundwater (pCi/L): Sr-90	not used	0.000E+00	---	W1 (23)
R012	Concentration in groundwater (pCi/L): Tc-99	not used	0.000E+00	---	W1 (24)
R012	Concentration in groundwater (pCi/L): Th-228	not used	0.000E+00	---	W1 (25)
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---	W1 (27)
R012	Concentration in groundwater (pCi/L): Th-232	not used	0.000E+00	---	W1 (28)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1 (30)
R012	Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	---	W1 (31)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1 (33)
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)	1.600E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	0.000E+00	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)	3.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	5.550E+00	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	9.990E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	4.760E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	0.000E+00	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
R015	Number of unsaturated zone strata	1	1	---	NS

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Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
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 Am-241				
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.913E-06	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Co-60				
R016	Contaminated zone (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.190E-07	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.190E-07	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for Eu-152				
R016	Contaminated zone (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.442E-07	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for Eu-154				
R016	Contaminated zone (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.442E-07	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for Eu-155				
R016	Contaminated zone (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.442E-07	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)

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Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for H-3				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC (10)
R016	Unsaturated zone 1 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU (10, 1)
R016	Saturated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCS (10)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.520E-04	ALEACH (10)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (10)
R016	Distribution coefficients for I-129				
R016	Contaminated zone (cm**3/g)	1.000E-01	1.000E-01	---	DCNUCC (11)
R016	Unsaturated zone 1 (cm**3/g)	1.000E-01	1.000E-01	---	DCNUCU (11, 1)
R016	Saturated zone (cm**3/g)	1.000E-01	1.000E-01	---	DCNUCS (11)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.289E-04	ALEACH (11)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (11)
R016	Distribution coefficients for K-40				
R016	Contaminated zone (cm**3/g)	5.500E+00	5.500E+00	---	DCNUCC (12)
R016	Unsaturated zone 1 (cm**3/g)	5.500E+00	5.500E+00	---	DCNUCU (12, 1)
R016	Saturated zone (cm**3/g)	5.500E+00	5.500E+00	---	DCNUCS (12)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.116E-05	ALEACH (12)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (12)
R016	Distribution coefficients for Na-22				
R016	Contaminated zone (cm**3/g)	1.000E+01	1.000E+01	---	DCNUCC (13)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+01	1.000E+01	---	DCNUCU (13, 1)
R016	Saturated zone (cm**3/g)	1.000E+01	1.000E+01	---	DCNUCS (13)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.175E-05	ALEACH (13)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (13)
R016	Distribution coefficients for Np-237				
R016	Contaminated zone (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCC (14)
R016	Unsaturated zone 1 (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCU (14, 1)
R016	Saturated zone (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCS (14)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.620E-07	ALEACH (14)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (14)
R016	Distribution coefficients for Pu-238				
R016	Contaminated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCC (17)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCU (17, 1)
R016	Saturated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCS (17)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.950E-08	ALEACH (17)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (17)
R016	Distribution coefficients for Pu-239				
R016	Contaminated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCC (18)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCU (18, 1)
R016	Saturated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCS (18)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.950E-08	ALEACH (18)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (18)

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0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Pu-240				
R016	Contaminated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCC (19)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCU (19, 1)
R016	Saturated zone (cm**3/g)	2.000E+03	2.000E+03	---	DCNUCS (19)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.950E-08	ALEACH (19)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (19)
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC (20)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU (20, 1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS (20)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.697E-06	ALEACH (20)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (20)
R016	Distribution coefficients for Ra-228				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC (21)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU (21, 1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS (21)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.697E-06	ALEACH (21)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (21)
R016	Distribution coefficients for Ru-106				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC (22)
R016	Unsaturated zone 1 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU (22, 1)
R016	Saturated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCS (22)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.520E-04	ALEACH (22)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (22)
R016	Distribution coefficients for Sr-90				
R016	Contaminated zone (cm**3/g)	3.000E+01	3.000E+01	---	DCNUCC (23)
R016	Unsaturated zone 1 (cm**3/g)	3.000E+01	3.000E+01	---	DCNUCU (23, 1)
R016	Saturated zone (cm**3/g)	3.000E+01	3.000E+01	---	DCNUCS (23)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.950E-06	ALEACH (23)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (23)
R016	Distribution coefficients for Tc-99				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC (24)
R016	Unsaturated zone 1 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU (24, 1)
R016	Saturated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCS (24)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.520E-04	ALEACH (24)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (24)
R016	Distribution coefficients for Th-228				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC (25)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU (25, 1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS (25)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.983E-09	ALEACH (25)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (25)

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0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC (27)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU (27, 1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS (27)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.983E-09	ALEACH (27)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (27)
R016	Distribution coefficients for Th-232				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC (28)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU (28, 1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS (28)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.983E-09	ALEACH (28)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (28)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC (30)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU (30, 1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS (30)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.374E-06	ALEACH (30)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (30)
R016	Distribution coefficients for U-235				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC (31)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU (31, 1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS (31)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.374E-06	ALEACH (31)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (31)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC (33)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU (33, 1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS (33)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.374E-06	ALEACH (33)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (33)
R016	Distribution coefficients for daughter Ac-227				
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCC (1)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU (1, 1)
R016	Saturated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCS (1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.913E-06	ALEACH (1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (1)
R016	Distribution coefficients for daughter Gd-152				
R016	Contaminated zone (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCC (9)
R016	Unsaturated zone 1 (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCU (9, 1)
R016	Saturated zone (cm**3/g)	-1.000E+00	-1.000E+00	8.249E+02	DCNUCS (9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.442E-07	ALEACH (9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (9)

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0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter Pa-231				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC (15)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU (15,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS (15)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.374E-06	ALEACH (15)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (15)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC (16)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU (16,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS (16)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.188E-06	ALEACH (16)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (16)
R016	Distribution coefficients for daughter Th-229				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC (26)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU (26,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS (26)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.983E-09	ALEACH (26)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (26)
R016	Distribution coefficients for daughter U-233				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC (29)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU (29,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS (29)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.374E-06	ALEACH (29)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (29)
R016	Distribution coefficients for daughter U-236				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC (32)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU (32,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS (32)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.374E-06	ALEACH (32)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK (32)
R017	Inhalation rate (m**3/yr)	7.300E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	2.000E-05	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	1.000E+00	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	8.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	7.190E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.400E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS

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0 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)	5.700E+01	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	0.000E+00	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	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)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	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	0.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	1.000E+00	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLPD

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0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	not used	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	1.000E+00	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	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)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	1.000E+00	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	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	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	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	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	2.000E+01	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	1.000E+00	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
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

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Derivation and Use of Rad SALs

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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	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	---	HMX
R021	Average building air exchange rate (1/hr)	5.000E-01	5.000E-01	---	REXG
R021	Height of the building (room) (m)	2.500E+00	2.500E+00	---	HRM
R021	Building interior area factor	0.000E+00	0.000E+00	code computed (time dependent)	FAI
R021	Building depth below ground surface (m)	0.000E+00	-1.000E+00	---	DMPL
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	5	---	---	KYMAX

Summary of Pathway Selections

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

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Contaminated Zone Dimensions	Initial Soil Concentrations, pCi/g
Area: 405000.00 square meters	Am-241 1.000E+01
Thickness: 2.00 meters	Co-60 1.000E+01
Cover Depth: 0.00 meters	Cs-137 1.000E+01
	Eu-152 1.000E+01
	Eu-154 1.000E+01
	Eu-155 1.000E+01
	H-3 1.000E+01
	I-129 1.000E+01
	K-40 1.000E+01
	Na-22 1.000E+01
	Np-237 1.000E+01
	Pu-238 1.000E+01
	Pu-239 1.000E+01
	Pu-240 1.000E+01
	Ra-226 1.000E+01
	Ra-228 1.000E+01
	Ru-106 1.000E+01
	Sr-90 1.000E+01
	Tc-99 1.000E+01
	Th-228 1.000E+01
	Th-230 1.000E+01
	Th-232 1.000E+01
	U-234 1.000E+01
	U-235 1.000E+01
	U-238 1.000E+01

Total Dose TDOSE(t), mrem/yr

Basic Radiation Dose Limit = 15 mrem/yr

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

t (years)	0.000E+00	1.000E+00	3.000E+01	1.000E+02	1.000E+03
TDOSE(t):	1.716E+03	1.667E+03	1.389E+03	1.361E+03	1.351E+03
M(t):	1.144E+02	1.111E+02	9.261E+01	9.076E+01	9.004E+01

Maximum TDOSE(t): 1.716E+03 mrem/yr at t = 0.000E+00 years

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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)

Radio- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	3.558E-01	0.0002	1.326E-01	0.0001	0.000E+00	0.0000	2.076E+00	0.0012	0.000E+00	0.0000	0.000E+00	0.0000	1.273E+00	0.0007
Co-60	1.223E+02	0.0713	6.134E-05	0.0000	0.000E+00	0.0000	1.149E+00	0.0007	0.000E+00	0.0000	0.000E+00	0.0000	8.823E-03	0.0000
Cs-137	2.717E+01	0.0158	9.425E-06	0.0000	0.000E+00	0.0000	1.127E+00	0.0007	0.000E+00	0.0000	0.000E+00	0.0000	1.730E-02	0.0000
Eu-152	5.510E+01	0.0321	6.437E-05	0.0000	0.000E+00	0.0000	9.002E-03	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.210E-03	0.0000
Eu-154	5.952E+01	0.0347	8.220E-05	0.0000	0.000E+00	0.0000	1.309E-02	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.215E-03	0.0000
Eu-155	1.383E+00	0.0008	1.155E-05	0.0000	0.000E+00	0.0000	2.036E-03	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.998E-04	0.0000
H-3	0.000E+00	0.0000	2.257E-02	0.0000	0.000E+00	0.0000	1.471E-01	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	1.410E-05	0.0000
I-129	1.051E-01	0.0001	5.199E-05	0.0000	0.000E+00	0.0000	3.147E+00	0.0018	0.000E+00	0.0000	0.000E+00	0.0000	9.658E-02	0.0001
K-40	8.379E+00	0.0049	3.706E-06	0.0000	0.000E+00	0.0000	3.181E+00	0.0019	0.000E+00	0.0000	0.000E+00	0.0000	6.511E-03	0.0000
Na-22	9.695E+01	0.0565	2.010E-06	0.0000	0.000E+00	0.0000	2.877E-01	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	3.534E-03	0.0000
Np-237	8.908E+00	0.0052	1.614E-01	0.0001	0.000E+00	0.0000	5.062E+01	0.0295	0.000E+00	0.0000	0.000E+00	0.0000	1.554E+00	0.0009
Pu-238	1.226E-03	0.0000	1.167E-01	0.0001	4.216E-13	0.0000	1.819E+00	0.0011	0.000E+00	0.0000	0.000E+00	0.0000	1.116E+00	0.0006
Pu-239	2.394E-03	0.0000	1.282E-01	0.0001	0.000E+00	0.0000	2.020E+00	0.0012	0.000E+00	0.0000	0.000E+00	0.0000	1.239E+00	0.0007
Pu-240	1.198E-03	0.0000	1.282E-01	0.0001	3.860E-21	0.0000	2.020E+00	0.0012	0.000E+00	0.0000	0.000E+00	0.0000	1.239E+00	0.0007
Ra-226	9.025E+01	0.0526	2.677E-03	0.0000	9.165E+02	0.5340	3.096E+01	0.0180	0.000E+00	0.0000	0.000E+00	0.0000	5.046E-01	0.0003
Ra-228	5.812E+01	0.0339	1.738E-02	0.0000	1.216E+00	0.0007	3.102E+01	0.0181	0.000E+00	0.0000	0.000E+00	0.0000	5.186E-01	0.0003
Ru-106	7.529E+00	0.0044	1.031E-04	0.0000	0.000E+00	0.0000	3.387E-01	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	6.933E-03	0.0000
Sr-90	1.982E-01	0.0001	3.869E-04	0.0000	0.000E+00	0.0000	2.585E+01	0.0151	0.000E+00	0.0000	0.000E+00	0.0000	5.292E-02	0.0000
Tc-99	1.023E-03	0.0000	2.489E-06	0.0000	0.000E+00	0.0000	4.159E+00	0.0024	0.000E+00	0.0000	0.000E+00	0.0000	5.108E-04	0.0000
Th-228	6.889E+01	0.0401	8.650E-02	0.0001	6.596E+00	0.0038	3.868E-01	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	2.373E-01	0.0001
Th-230	2.939E-02	0.0000	9.744E-02	0.0001	1.985E-01	0.0001	3.194E-01	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	1.919E-01	0.0001
Th-232	3.328E+00	0.0019	4.909E-01	0.0003	5.084E-02	0.0000	3.455E+00	0.0020	0.000E+00	0.0000	0.000E+00	0.0000	9.866E-01	0.0006
U-234	3.274E-03	0.0000	3.945E-02	0.0000	5.958E-07	0.0000	4.035E-01	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	9.906E-02	0.0001
U-235	6.138E+00	0.0036	3.677E-02	0.0000	0.000E+00	0.0000	3.813E-01	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	9.350E-02	0.0001
U-238	1.107E+00	0.0006	3.527E-02	0.0000	4.428E-13	0.0000	3.835E-01	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	9.416E-02	0.0001
===== Total	6.158E+02	0.3587	1.497E+00	0.0009	9.246E+02	0.5386	1.653E+02	0.0963	0.000E+00	0.0000	0.000E+00	0.0000	9.346E+00	0.0054

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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

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.837E+00	0.0022
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.235E+02	0.0719
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.832E+01	0.0165
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.511E+01	0.0321
Eu-154	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.954E+01	0.0347
Eu-155	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.386E+00	0.0008
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.697E-01	0.0001
I-129	0.000E+00	0.0000	0.000E+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+00	0.0020
K-40	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.157E+01	0.0067
Na-22	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.724E+01	0.0567
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.124E+01	0.0357
Pu-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.053E+00	0.0018
Pu-239	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.390E+00	0.0020
Pu-240	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.389E+00	0.0020
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	1.038E+03	0.6049
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	9.089E+01	0.0530
Ru-106	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.874E+00	0.0046
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.611E+01	0.0152
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.161E+00	0.0024
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	7.620E+01	0.0444
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.367E-01	0.0005
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	8.311E+00	0.0048
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.453E-01	0.0003
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.650E+00	0.0039
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.620E+00	0.0009
===== 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	1.716E+03	1.0000

Sum of all water independent and dependent pathways.

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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- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	3.552E-01	0.0002	1.324E-01	0.0001	0.000E+00	0.0000	2.072E+00	0.0012	0.000E+00	0.0000	0.000E+00	0.0000	1.271E+00	0.0008
Co-60	1.072E+02	0.0643	5.378E-05	0.0000	0.000E+00	0.0000	1.008E+00	0.0006	0.000E+00	0.0000	0.000E+00	0.0000	7.736E-03	0.0000
Cs-137	2.655E+01	0.0159	9.210E-06	0.0000	0.000E+00	0.0000	1.101E+00	0.0007	0.000E+00	0.0000	0.000E+00	0.0000	1.691E-02	0.0000
Eu-152	5.231E+01	0.0314	6.110E-05	0.0000	0.000E+00	0.0000	8.546E-03	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.098E-03	0.0000
Eu-154	5.501E+01	0.0330	7.598E-05	0.0000	0.000E+00	0.0000	1.210E-02	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.971E-03	0.0000
Eu-155	1.203E+00	0.0007	1.004E-05	0.0000	0.000E+00	0.0000	1.770E-03	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.346E-04	0.0000
H-3	0.000E+00	0.0000	8.223E-03	0.0000	0.000E+00	0.0000	5.364E-02	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.138E-06	0.0000
I-129	1.051E-01	0.0001	5.197E-05	0.0000	0.000E+00	0.0000	3.146E+00	0.0019	0.000E+00	0.0000	0.000E+00	0.0000	9.653E-02	0.0001
K-40	8.379E+00	0.0050	3.706E-06	0.0000	0.000E+00	0.0000	3.181E+00	0.0019	0.000E+00	0.0000	0.000E+00	0.0000	6.510E-03	0.0000
Na-22	7.428E+01	0.0446	1.540E-06	0.0000	0.000E+00	0.0000	2.204E-01	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	2.707E-03	0.0000
Np-237	8.908E+00	0.0053	1.614E-01	0.0001	0.000E+00	0.0000	5.062E+01	0.0304	0.000E+00	0.0000	0.000E+00	0.0000	1.554E+00	0.0009
Pu-238	1.216E-03	0.0000	1.158E-01	0.0001	6.313E-12	0.0000	1.805E+00	0.0011	0.000E+00	0.0000	0.000E+00	0.0000	1.107E+00	0.0007
Pu-239	2.394E-03	0.0000	1.282E-01	0.0001	0.000E+00	0.0000	2.020E+00	0.0012	0.000E+00	0.0000	0.000E+00	0.0000	1.239E+00	0.0007
Pu-240	1.198E-03	0.0000	1.282E-01	0.0001	1.106E-19	0.0000	2.020E+00	0.0012	0.000E+00	0.0000	0.000E+00	0.0000	1.239E+00	0.0007
Ra-226	9.021E+01	0.0541	2.884E-03	0.0000	9.161E+02	0.5495	3.220E+01	0.0193	0.000E+00	0.0000	0.000E+00	0.0000	5.810E-01	0.0003
Ra-228	7.117E+01	0.0427	4.008E-02	0.0000	2.960E+00	0.0018	2.761E+01	0.0166	0.000E+00	0.0000	0.000E+00	0.0000	5.274E-01	0.0003
Ru-106	3.782E+00	0.0023	5.176E-05	0.0000	0.000E+00	0.0000	1.701E-01	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	3.482E-03	0.0000
Sr-90	1.935E-01	0.0001	3.778E-04	0.0000	0.000E+00	0.0000	2.525E+01	0.0151	0.000E+00	0.0000	0.000E+00	0.0000	5.168E-02	0.0000
Tc-99	1.022E-03	0.0000	2.486E-06	0.0000	0.000E+00	0.0000	4.155E+00	0.0025	0.000E+00	0.0000	0.000E+00	0.0000	5.103E-04	0.0000
Th-228	4.795E+01	0.0288	6.021E-02	0.0000	4.591E+00	0.0028	2.692E-01	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	1.651E-01	0.0001
Th-230	6.848E-02	0.0000	9.744E-02	0.0001	5.955E-01	0.0004	3.330E-01	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	1.922E-01	0.0001
Th-232	1.121E+01	0.0067	4.945E-01	0.0003	3.119E-01	0.0002	6.983E+00	0.0042	0.000E+00	0.0000	0.000E+00	0.0000	1.050E+00	0.0006
U-234	3.275E-03	0.0000	3.945E-02	0.0000	4.170E-06	0.0000	4.035E-01	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	9.906E-02	0.0001
U-235	6.138E+00	0.0037	3.678E-02	0.0000	0.000E+00	0.0000	3.826E-01	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	9.358E-02	0.0001
U-238	1.107E+00	0.0007	3.527E-02	0.0000	6.325E-12	0.0000	3.835E-01	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	9.416E-02	0.0001
===== Total	5.662E+02	0.3396	1.482E+00	0.0009	9.246E+02	0.5546	1.654E+02	0.0992	0.000E+00	0.0000	0.000E+00	0.0000	9.404E+00	0.0056

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Derivation and Use of Rad SALs

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

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.831E+00	0.0023
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.083E+02	0.0649
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.767E+01	0.0166
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.232E+01	0.0314
Eu-154	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.503E+01	0.0330
Eu-155	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.205E+00	0.0007
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.186E-02	0.0000
I-129	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.347E+00	0.0020
K-40	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.157E+01	0.0069
Na-22	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.450E+01	0.0447
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.124E+01	0.0367
Pu-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.029E+00	0.0018
Pu-239	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.390E+00	0.0020
Pu-240	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.388E+00	0.0020
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	1.039E+03	0.6233
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	1.023E+02	0.0614
Ru-106	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.955E+00	0.0024
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.549E+01	0.0153
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.157E+00	0.0025
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	5.304E+01	0.0318
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.287E+00	0.0008
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	2.005E+01	0.0120
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.453E-01	0.0003
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.651E+00	0.0040
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.620E+00	0.0010
===== 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	1.667E+03	1.0000

Sum of all water independent and dependent pathways.

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Derivation and Use of Rad SALs

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- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	3.391E-01	0.0002	1.263E-01	0.0001	0.000E+00	0.0000	1.978E+00	0.0014	0.000E+00	0.0000	0.000E+00	0.0000	1.213E+00	0.0009
Co-60	2.367E+00	0.0017	1.187E-06	0.0000	0.000E+00	0.0000	2.224E-02	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.707E-04	0.0000
Cs-137	1.359E+01	0.0098	4.713E-06	0.0000	0.000E+00	0.0000	5.635E-01	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	8.651E-03	0.0000
Eu-152	1.158E+01	0.0083	1.353E-05	0.0000	0.000E+00	0.0000	1.892E-03	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.645E-04	0.0000
Eu-154	5.603E+00	0.0040	7.738E-06	0.0000	0.000E+00	0.0000	1.233E-03	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.026E-04	0.0000
Eu-155	2.090E-02	0.0000	1.745E-07	0.0000	0.000E+00	0.0000	3.076E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.552E-06	0.0000
H-3	0.000E+00	0.0000	1.576E-15	0.0000	0.000E+00	0.0000	1.028E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.847E-19	0.0000
I-129	1.035E-01	0.0001	5.117E-05	0.0000	0.000E+00	0.0000	3.098E+00	0.0022	0.000E+00	0.0000	0.000E+00	0.0000	9.506E-02	0.0001
K-40	8.374E+00	0.0060	3.704E-06	0.0000	0.000E+00	0.0000	3.179E+00	0.0023	0.000E+00	0.0000	0.000E+00	0.0000	6.506E-03	0.0000
Na-22	3.278E-02	0.0000	6.796E-10	0.0000	0.000E+00	0.0000	9.729E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.195E-06	0.0000
Np-237	8.908E+00	0.0064	1.614E-01	0.0001	0.000E+00	0.0000	5.062E+01	0.0364	0.000E+00	0.0000	0.000E+00	0.0000	1.554E+00	0.0011
Pu-238	9.675E-04	0.0000	9.208E-02	0.0001	4.503E-08	0.0000	1.435E+00	0.0010	0.000E+00	0.0000	0.000E+00	0.0000	8.803E-01	0.0006
Pu-239	2.393E-03	0.0000	1.281E-01	0.0001	0.000E+00	0.0000	2.018E+00	0.0015	0.000E+00	0.0000	0.000E+00	0.0000	1.238E+00	0.0009
Pu-240	1.194E-03	0.0000	1.278E-01	0.0001	2.578E-15	0.0000	2.014E+00	0.0014	0.000E+00	0.0000	0.000E+00	0.0000	1.235E+00	0.0009
Ra-226	8.911E+01	0.0641	6.751E-03	0.0000	9.046E+02	0.6512	5.513E+01	0.0397	0.000E+00	0.0000	0.000E+00	0.0000	2.006E+00	0.0014
Ra-228	4.335E+00	0.0031	3.949E-03	0.0000	2.982E-01	0.0002	8.493E-01	0.0006	0.000E+00	0.0000	0.000E+00	0.0000	2.349E-02	0.0000
Ru-106	8.053E-09	0.0000	1.102E-13	0.0000	0.000E+00	0.0000	3.623E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.416E-12	0.0000
Sr-90	9.702E-02	0.0001	1.894E-04	0.0000	0.000E+00	0.0000	1.266E+01	0.0091	0.000E+00	0.0000	0.000E+00	0.0000	2.591E-02	0.0000
Tc-99	9.945E-04	0.0000	2.418E-06	0.0000	0.000E+00	0.0000	4.042E+00	0.0029	0.000E+00	0.0000	0.000E+00	0.0000	4.964E-04	0.0000
Th-228	1.311E-03	0.0000	1.646E-06	0.0000	1.255E-04	0.0000	7.361E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.515E-06	0.0000
Th-230	1.195E+00	0.0009	9.748E-02	0.0001	1.203E+01	0.0087	9.036E-01	0.0007	0.000E+00	0.0000	0.000E+00	0.0000	2.097E-01	0.0002
Th-232	1.260E+02	0.0907	5.909E-01	0.0004	7.565E+00	0.0054	3.401E+01	0.0245	0.000E+00	0.0000	0.000E+00	0.0000	1.719E+00	0.0012
U-234	3.439E-03	0.0000	3.947E-02	0.0000	1.655E-03	0.0000	4.036E-01	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	9.910E-02	0.0001
U-235	6.143E+00	0.0044	3.747E-02	0.0000	0.000E+00	0.0000	4.245E-01	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	9.705E-02	0.0001
U-238	1.107E+00	0.0008	3.527E-02	0.0000	4.777E-08	0.0000	3.835E-01	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	9.416E-02	0.0001
===== Total	2.789E+02	0.2008	1.447E+00	0.0010	9.245E+02	0.6656	1.737E+02	0.1251	0.000E+00	0.0000	0.000E+00	0.0000	1.051E+01	0.0076

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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

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.657E+00	0.0026
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.389E+00	0.0017
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.416E+01	0.0102
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.158E+01	0.0083
Eu-154	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.605E+00	0.0040
Eu-155	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.094E-02	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.186E-14	0.0000
I-129	0.000E+00	0.0000	0.000E+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+00	0.0024
K-40	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.156E+01	0.0083
Na-22	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.288E-02	0.0000
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.124E+01	0.0441
Pu-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.408E+00	0.0017
Pu-239	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.387E+00	0.0024
Pu-240	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.378E+00	0.0024
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	1.051E+03	0.7565
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	5.510E+00	0.0040
Ru-106	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.423E-09	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.278E+01	0.0092
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.043E+00	0.0029
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	1.450E-03	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.444E+01	0.0104
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	1.699E+02	0.1223
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.472E-01	0.0004
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.702E+00	0.0048
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.620E+00	0.0012
===== 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	1.389E+03	1.0000

Sum of all water independent and dependent pathways.

March 29, 2001

A2-28

ER2001-0075

Derivation and Use of Rad SALs

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- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	3.031E-01	0.0002	1.129E-01	0.0001	0.000E+00	0.0000	1.768E+00	0.0013	0.000E+00	0.0000	0.000E+00	0.0000	1.084E+00	0.0008
Co-60	2.379E-04	0.0000	1.193E-10	0.0000	0.000E+00	0.0000	2.236E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.716E-08	0.0000
Cs-137	2.696E+00	0.0020	9.351E-07	0.0000	0.000E+00	0.0000	1.118E-01	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	1.716E-03	0.0000
Eu-152	3.040E-01	0.0002	3.551E-07	0.0000	0.000E+00	0.0000	4.967E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.219E-05	0.0000
Eu-154	2.259E-02	0.0000	3.119E-08	0.0000	0.000E+00	0.0000	4.969E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.220E-06	0.0000
Eu-155	1.180E-06	0.0000	9.848E-12	0.0000	0.000E+00	0.0000	1.736E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.262E-10	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
I-129	9.972E-02	0.0001	4.931E-05	0.0000	0.000E+00	0.0000	2.985E+00	0.0022	0.000E+00	0.0000	0.000E+00	0.0000	9.161E-02	0.0001
K-40	8.362E+00	0.0061	3.698E-06	0.0000	0.000E+00	0.0000	3.174E+00	0.0023	0.000E+00	0.0000	0.000E+00	0.0000	6.497E-03	0.0000
Na-22	2.611E-10	0.0000	5.414E-18	0.0000	0.000E+00	0.0000	7.750E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.518E-15	0.0000
Np-237	8.907E+00	0.0065	1.614E-01	0.0001	0.000E+00	0.0000	5.062E+01	0.0372	0.000E+00	0.0000	0.000E+00	0.0000	1.554E+00	0.0011
Pu-238	5.571E-04	0.0000	5.297E-02	0.0000	1.405E-06	0.0000	8.256E-01	0.0006	0.000E+00	0.0000	0.000E+00	0.0000	5.064E-01	0.0004
Pu-239	2.388E-03	0.0000	1.279E-01	0.0001	0.000E+00	0.0000	2.014E+00	0.0015	0.000E+00	0.0000	0.000E+00	0.0000	1.236E+00	0.0009
Pu-240	1.185E-03	0.0000	1.269E-01	0.0001	4.622E-14	0.0000	1.999E+00	0.0015	0.000E+00	0.0000	0.000E+00	0.0000	1.226E+00	0.0009
Ra-226	8.646E+01	0.0635	8.883E-03	0.0000	8.775E+02	0.6446	6.742E+01	0.0495	0.000E+00	0.0000	0.000E+00	0.0000	2.803E+00	0.0021
Ra-228	9.385E-04	0.0000	8.550E-07	0.0000	6.457E-05	0.0000	1.838E-04	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.084E-06	0.0000
Ru-106	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	1.833E-02	0.0000	3.578E-05	0.0000	0.000E+00	0.0000	2.391E+00	0.0018	0.000E+00	0.0000	0.000E+00	0.0000	4.895E-03	0.0000
Tc-99	9.302E-04	0.0000	2.262E-06	0.0000	0.000E+00	0.0000	3.780E+00	0.0028	0.000E+00	0.0000	0.000E+00	0.0000	4.643E-04	0.0000
Th-228	1.268E-14	0.0000	1.592E-17	0.0000	1.214E-15	0.0000	7.117E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.365E-17	0.0000
Th-230	3.855E+00	0.0028	9.766E-02	0.0001	3.904E+01	0.0287	2.834E+00	0.0021	0.000E+00	0.0000	0.000E+00	0.0000	2.870E-01	0.0002
Th-232	1.303E+02	0.0957	5.948E-01	0.0004	7.863E+00	0.0058	3.486E+01	0.0256	0.000E+00	0.0000	0.000E+00	0.0000	1.742E+00	0.0013
U-234	5.033E-03	0.0000	3.952E-02	0.0000	1.779E-02	0.0000	4.046E-01	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	9.922E-02	0.0001
U-235	6.164E+00	0.0045	4.055E-02	0.0000	0.000E+00	0.0000	5.403E-01	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	1.090E-01	0.0001
U-238	1.107E+00	0.0008	3.527E-02	0.0000	1.695E-06	0.0000	3.835E-01	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	9.417E-02	0.0001
===== Total	2.486E+02	0.1826	1.399E+00	0.0010	9.244E+02	0.6790	1.761E+02	0.1294	0.000E+00	0.0000	0.000E+00	0.0000	1.085E+01	0.0080

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Derivation and Use of Rad SALs

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

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.268E+00	0.0024
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.401E-04	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.809E+00	0.0021
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.041E-01	0.0002
Eu-154	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.259E-02	0.0000
Eu-155	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.182E-06	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
I-129	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.177E+00	0.0023
K-40	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.154E+01	0.0085
Na-22	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.619E-10	0.0000
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.124E+01	0.0450
Pu-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.385E+00	0.0010
Pu-239	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.380E+00	0.0025
Pu-240	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.353E+00	0.0025
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	1.034E+03	0.7596
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	1.193E-03	0.0000
Ru-106	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.414E+00	0.0018
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.782E+00	0.0028
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	1.402E-14	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.611E+01	0.0339
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	1.754E+02	0.1288
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.661E-01	0.0004
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.854E+00	0.0050
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.619E+00	0.0012
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	1.361E+03	1.0000

Sum of all water independent and dependent pathways.

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Derivation and Use of Rad SALs

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- Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	7.257E-02	0.0001	2.654E-02	0.0000	0.000E+00	0.0000	4.232E-01	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	2.548E-01	0.0002
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	2.510E-09	0.0000	8.708E-16	0.0000	0.000E+00	0.0000	1.041E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.598E-12	0.0000
Eu-152	1.439E-21	0.0000	2.502E-15	0.0000	0.000E+00	0.0000	7.909E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.942E-15	0.0000
Eu-154	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-155	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
I-129	6.195E-02	0.0000	3.064E-05	0.0000	0.000E+00	0.0000	1.855E+00	0.0014	0.000E+00	0.0000	0.000E+00	0.0000	5.691E-02	0.0000
K-40	8.204E+00	0.0061	3.629E-06	0.0000	0.000E+00	0.0000	3.114E+00	0.0023	0.000E+00	0.0000	0.000E+00	0.0000	6.374E-03	0.0000
Na-22	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Np-237	8.904E+00	0.0066	1.616E-01	0.0001	0.000E+00	0.0000	5.058E+01	0.0374	0.000E+00	0.0000	0.000E+00	0.0000	1.554E+00	0.0012
Pu-238	4.487E-05	0.0000	5.763E-05	0.0000	4.387E-04	0.0000	8.523E-04	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.509E-04	0.0000
Pu-239	2.332E-03	0.0000	1.246E-01	0.0001	0.000E+00	0.0000	1.963E+00	0.0015	0.000E+00	0.0000	0.000E+00	0.0000	1.204E+00	0.0009
Pu-240	1.078E-03	0.0000	1.153E-01	0.0001	5.426E-12	0.0000	1.817E+00	0.0013	0.000E+00	0.0000	0.000E+00	0.0000	1.114E+00	0.0008
Ra-226	5.845E+01	0.0433	6.215E-03	0.0000	5.933E+02	0.4393	4.683E+01	0.0347	0.000E+00	0.0000	0.000E+00	0.0000	1.972E+00	0.0015
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
Ru-106	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	9.073E-12	0.0000	1.771E-14	0.0000	0.000E+00	0.0000	1.184E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.423E-12	0.0000
Tc-99	3.937E-04	0.0000	9.574E-07	0.0000	0.000E+00	0.0000	1.600E+00	0.0012	0.000E+00	0.0000	0.000E+00	0.0000	1.965E-04	0.0000
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	0.000E+00	0.0000
Th-230	3.160E+01	0.0234	9.983E-02	0.0001	3.206E+02	0.2374	2.504E+01	0.0185	0.000E+00	0.0000	0.000E+00	0.0000	1.220E+00	0.0009
Th-232	1.303E+02	0.0965	5.948E-01	0.0004	7.863E+00	0.0058	3.486E+01	0.0258	0.000E+00	0.0000	0.000E+00	0.0000	1.742E+00	0.0013
U-234	1.559E-01	0.0001	4.013E-02	0.0000	1.548E+00	0.0011	5.213E-01	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	1.051E-01	0.0001
U-235	6.486E+00	0.0048	8.533E-02	0.0001	0.000E+00	0.0000	2.070E+00	0.0015	0.000E+00	0.0000	0.000E+00	0.0000	2.757E-01	0.0002
U-238	1.104E+00	0.0008	3.530E-02	0.0000	1.516E-03	0.0000	3.839E-01	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	9.422E-02	0.0001
===== Total	2.454E+02	0.1817	1.290E+00	0.0010	9.233E+02	0.6836	1.711E+02	0.1266	0.000E+00	0.0000	0.000E+00	0.0000	9.599E+00	0.0071

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Derivation and Use of Rad SALs

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

Radio- Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.771E-01	0.0006
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.616E-09	0.0000
Eu-152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.235E-14	0.0000
Eu-154	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Eu-155	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
I-129	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.973E+00	0.0015
K-40	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.132E+01	0.0084
Na-22	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.120E+01	0.0453
Pu-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.844E-03	0.0000
Pu-239	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.293E+00	0.0024
Pu-240	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.047E+00	0.0023
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	7.006E+02	0.5187
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
Ru-106	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.195E-09	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.601E+00	0.0012
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	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+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+02	0.2803
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	1.754E+02	0.1299
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.370E+00	0.0018
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.916E+00	0.0066
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.619E+00	0.0012
===== 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	1.351E+03	1.0000

Sum of all water independent and dependent pathways.

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Dose/Source Ratios Summed Over All Pathways									
Parent and Progeny Principal Radionuclide Contributions Indicated									
0Parent (i)	Product (j)	Branch Fraction*	t=	DSR(j,t) 0.000E+00	(mrem/yr) 1.000E+00	(pCi/g) 3.000E+01	1.000E+02	1.000E+03	
Am-241	Am-241	1.000E+00	3.837E-01	3.831E-01	3.656E-01	3.267E-01	7.672E-02		
Am-241	Np-237	1.000E+00	0.000E+00	2.967E-06	5.904E-05	1.841E-04	9.856E-04		
Am-241	U-233	1.000E+00	0.000E+00	9.494E-14	3.665E-11	3.832E-10	2.495E-08		
Am-241	Th-229	1.000E+00	0.000E+00	1.447E-16	1.081E-12	3.752E-11	2.627E-08		
Am-241	äDSR(j)		3.837E-01	3.831E-01	3.657E-01	3.268E-01	7.771E-02		
Co-60	Co-60	1.000E+00	1.235E+01	1.083E+01	2.389E-01	2.401E-05	0.000E+00		
Cs-137	Cs-137	1.000E+00	2.832E+00	2.767E+00	1.416E+00	2.809E-01	2.616E-10		
Eu-152	Eu-152	7.208E-01	3.972E+00	3.771E+00	8.348E-01	2.192E-02	1.038E-22		
Eu-152	Eu-152	2.792E-01	1.539E+00	1.461E+00	3.233E-01	8.489E-03	4.020E-23		
Eu-152	Gd-152	2.792E-01	0.000E+00	9.257E-17	9.825E-16	1.229E-15	1.235E-15		
Eu-152	äDSR(j)		1.539E+00	1.461E+00	3.233E-01	8.489E-03	1.235E-15		
Eu-154	Eu-154	1.000E+00	5.954E+00	5.503E+00	5.605E-01	2.259E-03	3.688E-34		
Eu-155	Eu-155	1.000E+00	1.386E-01	1.205E-01	2.094E-03	1.182E-07	0.000E+00		
H-3	H-3	1.000E+00	1.697E-02	6.186E-03	1.186E-15	0.000E+00	0.000E+00		
I-129	I-129	1.000E+00	3.349E-01	3.347E-01	3.296E-01	3.177E-01	1.973E-01		
K-40	K-40	1.000E+00	1.157E+00	1.157E+00	1.156E+00	1.154E+00	1.132E+00		
Na-22	Na-22	1.000E+00	9.724E+00	7.450E+00	3.288E-03	2.619E-11	0.000E+00		
Np-237	Np-237	1.000E+00	6.124E+00	6.124E+00	6.124E+00	6.124E+00	6.119E+00		
Np-237	U-233	1.000E+00	0.000E+00	3.740E-07	7.537E-06	2.482E-05	2.462E-04		
Np-237	Th-229	1.000E+00	0.000E+00	8.341E-10	3.320E-07	3.596E-06	3.457E-04		
Np-237	äDSR(j)		6.124E+00	6.124E+00	6.124E+00	6.124E+00	6.120E+00		
Pu-238	Pu-238	1.000E+00	3.053E-01	3.029E-01	2.408E-01	1.385E-01	1.132E-04		
Pu-238	U-234	1.000E+00	0.000E+00	2.303E-07	4.189E-06	1.072E-05	1.947E-05		
Pu-238	Th-230	1.000E+00	0.000E+00	1.819E-12	6.713E-10	6.152E-09	1.716E-07		
Pu-238	Ra-226	1.000E+00	0.000E+00	7.145E-13	5.097E-09	1.591E-07	4.966E-05		
Pu-238	Pb-210	1.000E+00	0.000E+00	3.931E-16	4.344E-11	3.234E-09	1.970E-06		
Pu-238	äDSR(j)		3.053E-01	3.029E-01	2.408E-01	1.385E-01	1.844E-04		
Pu-239	Pu-239	1.000E+00	3.390E-01	3.390E-01	3.387E-01	3.380E-01	3.293E-01		
Pu-239	U-235	1.000E+00	0.000E+00	9.822E-10	1.996E-08	6.571E-08	6.450E-07		
Pu-239	Pa-231	1.000E+00	0.000E+00	1.602E-13	6.400E-11	6.940E-10	6.766E-08		
Pu-239	Ac-227	1.000E+00	0.000E+00	1.837E-15	1.115E-11	2.633E-10	4.288E-08		
Pu-239	äDSR(j)		3.390E-01	3.390E-01	3.387E-01	3.380E-01	3.293E-01		

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Parent and Progeny		Dose/Source Ratios Summed Over All Pathways				
0Parent (i)	Product (j)	Branch Fraction*	t=	DSR(j,t)	(mrem/yr)	Contributions Indicated (pCi/g)
Pu-240	Pu-240	1.000E+00	0.000E+00	1.000E+00	3.000E+01	1.000E+02 1.000E+03
Pu-240	U-236	1.000E+00	0.000E+00	2.293E-09	4.658E-08	1.529E-07 1.450E-06
Pu-240	Th-232	1.000E+00	0.000E+00	5.139E-19	2.041E-16	2.211E-15 2.121E-13
Pu-240	Ra-228	1.000E+00	0.000E+00	8.526E-19	3.322E-15	5.086E-14 5.657E-12
Pu-240	Th-228	1.000E+00	0.000E+00	1.279E-19	2.979E-15	5.341E-14 6.269E-12
Pu-240	äDSR(j)		3.389E-01	3.388E-01	3.378E-01	3.353E-01 3.047E-01
Ra-226	Ra-226	1.000E+00	1.038E+02	1.037E+02	1.024E+02	9.934E+01 6.716E+01
Ra-226	Pb-210	1.000E+00	0.000E+00	2.015E-01	2.678E+00	4.080E+00 2.892E+00
Ra-226	äDSR(j)		1.038E+02	1.039E+02	1.051E+02	1.034E+02 7.006E+01
Ra-228	Ra-228	1.000E+00	7.683E+00	6.810E+00	2.065E-01	4.468E-05 0.000E+00
Ra-228	Th-228	1.000E+00	0.000E+00	3.421E+00	3.445E-01	7.459E-05 0.000E+00
Ra-228	äDSR(j)		7.683E+00	1.023E+01	5.510E-01	1.193E-04 0.000E+00
Ru-106	Ru-106	1.000E+00	7.874E-01	3.955E-01	8.423E-10	9.857E-31 0.000E+00
Sr-90	Sr-90	1.000E+00	2.611E+00	2.549E+00	1.278E+00	2.414E-01 1.195E-10
Tc-99	Tc-99	1.000E+00	4.161E-01	4.157E-01	4.043E-01	3.782E-01 1.601E-01
Th-228	Th-228	1.000E+00	7.620E+00	5.304E+00	1.450E-04	1.402E-15 0.000E+00
Th-230	Th-230	1.000E+00	6.118E-02	6.118E-02	6.117E-02	6.113E-02 6.063E-02
Th-230	Ra-226	1.000E+00	0.000E+00	6.741E-02	1.362E+00	4.419E+00 3.630E+01
Th-230	Pb-210	1.000E+00	0.000E+00	6.873E-05	2.051E-02	1.308E-01 1.501E+00
Th-230	äDSR(j)		6.118E-02	1.287E-01	1.444E+00	4.611E+00 3.786E+01
Th-232	Th-232	1.000E+00	3.008E-01	3.008E-01	3.008E-01	3.008E-01 3.008E-01
Th-232	Ra-228	1.000E+00	0.000E+00	1.344E+00	7.947E+00	8.154E+00 8.154E+00
Th-232	Th-228	1.000E+00	0.000E+00	3.606E-01	8.740E+00	9.085E+00 9.085E+00
Th-232	äDSR(j)		3.008E-01	2.005E+00	1.699E+01	1.754E+01 1.754E+01
U-234	U-234	1.000E+00	5.452E-02	5.452E-02	5.452E-02	5.450E-02 5.424E-02
U-234	Th-230	1.000E+00	0.000E+00	8.273E-07	1.680E-05	5.531E-05 5.471E-04
U-234	Ra-226	1.000E+00	0.000E+00	4.720E-07	1.874E-04	2.013E-03 1.753E-01
U-234	Pb-210	1.000E+00	0.000E+00	3.342E-10	2.019E-06	4.762E-05 7.006E-03
U-234	äDSR(j)		5.452E-02	5.453E-02	5.472E-02	5.661E-02 2.370E-01
U-235	U-235	1.000E+00	6.649E-01	6.649E-01	6.649E-01	6.648E-01 6.633E-01
U-235	Pa-231	1.000E+00	0.000E+00	2.094E-04	4.262E-03	1.403E-02 1.381E-01
U-235	Ac-227	1.000E+00	0.000E+00	3.461E-06	1.036E-03	6.629E-03 9.023E-02
U-235	äDSR(j)		6.649E-01	6.651E-01	6.702E-01	6.854E-01 8.916E-01

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Derivation and Use of Rad SALS

Dose/Source Ratios Summed Over All Pathways

Parent (i)	Product (j)	Branch Fraction*	t=	DSR(j,t)	(mrem/yr)	(pCi/g)
U-238	U-238	1.000E+00	0.000E+00	1.620E-01	1.620E-01	1.000E+03
U-238	U-234	1.000E+00	0.000E+00	2.319E-07	4.714E-06	1.553E-05
U-238	Th-230	1.000E+00	0.000E+00	1.827E-12	7.263E-10	7.881E-09
U-238	Ra-226	1.000E+00	0.000E+00	7.160E-13	5.408E-09	1.919E-07
U-238	Pb-210	1.000E+00	0.000E+00	5.166E-16	4.561E-11	3.806E-09
U-238	«DSR(j)			1.620E-01	1.620E-01	1.619E-01

*Branch Fraction is the cumulative factor for the j't principal radionuclide daughter: CUMBRF(j) = BRF(1)*BRF(2)* ... BRF(j).
The DSR includes contributions from associated (half-life > 0.5 yr) daughters.

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

ONuclide (i)	t= 0.000E+00	1.000E+00	3.000E+01	1.000E+02	1.000E+03
Am-241	3.909E+01	3.916E+01	4.102E+01	4.589E+01	1.930E+02
Co-60	1.215E+00	1.386E+00	6.279E+01	6.246E+05	*1.131E+15
Cs-137	5.297E+00	5.421E+00	1.059E+01	5.339E+01	5.734E+10
Eu-152	2.722E+00	2.867E+00	1.295E+01	4.933E+02	*1.765E+14
Eu-154	2.519E+00	2.726E+00	2.676E+01	6.639E+03	*2.639E+14
Eu-155	1.082E+02	1.245E+02	7.164E+03	1.269E+08	*4.651E+14
H-3	8.838E+02	2.425E+03	*9.594E+15	*9.594E+15	*9.594E+15
I-129	4.479E+01	4.481E+01	4.550E+01	4.722E+01	7.601E+01
K-40	1.297E+01	1.297E+01	1.298E+01	1.300E+01	1.325E+01
Na-22	1.543E+00	2.013E+00	4.562E+03	5.727E+11	*6.244E+15
Np-237	2.449E+00	2.449E+00	2.449E+00	2.449E+00	2.451E+00
Pu-238	4.914E+01	4.953E+01	6.228E+01	1.083E+02	8.133E+04
Pu-239	4.425E+01	4.425E+01	4.429E+01	4.438E+01	4.555E+01
Pu-240	4.427E+01	4.427E+01	4.441E+01	4.474E+01	4.922E+01
Ra-226	1.445E-01	1.444E-01	1.427E-01	1.450E-01	2.141E-01
Ra-228	1.650E+00	1.466E+00	2.722E+01	1.258E+05	*2.726E+14
Ru-106	1.905E+01	3.792E+01	1.781E+10	*3.347E+15	*3.347E+15
Sr-90	5.746E+00	5.884E+00	1.174E+01	6.213E+01	1.255E+11
Tc-99	3.605E+01	3.609E+01	3.710E+01	3.967E+01	9.371E+01
Th-228	1.969E+00	2.828E+00	1.034E+05	*8.192E+14	*8.192E+14
Th-230	1.793E+02	1.166E+02	1.039E+01	3.253E+00	3.962E-01
Th-232	1.805E+01	7.481E+00	8.829E-01	8.552E-01	8.552E-01
U-234	2.751E+02	2.751E+02	2.741E+02	2.650E+02	6.328E+01
U-235	2.256E+01	2.255E+01	2.238E+01	2.188E+01	1.682E+01
U-238	9.261E+01	9.261E+01	9.261E+01	9.262E+01	9.264E+01

*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 = 0.000E+00 years

ONuclide (i)	Initial pCi/g	tmin (years)	DSR(i,tmin) (pCi/g)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Am-241	1.000E+01	0.000E+00	3.837E-01	3.909E+01	3.837E-01	3.909E+01
Co-60	1.000E+01	0.000E+00	1.235E+01	1.215E+00	1.235E+01	1.215E+00
Cs-137	1.000E+01	0.000E+00	2.832E+00	5.297E+00	2.832E+00	5.297E+00
Eu-152	1.000E+01	0.000E+00	5.511E+00	2.722E+00	5.511E+00	2.722E+00
Eu-154	1.000E+01	0.000E+00	5.954E+00	2.519E+00	5.954E+00	2.519E+00
Eu-155	1.000E+01	0.000E+00	1.386E-01	1.082E+02	1.386E-01	1.082E+02
H-3	1.000E+01	0.000E+00	1.697E-02	8.838E+02	1.697E-02	8.838E+02
I-129	1.000E+01	0.000E+00	3.349E-01	4.479E+01	3.349E-01	4.479E+01
K-40	1.000E+01	0.000E+00	1.157E+00	1.297E+01	1.157E+00	1.297E+01
Na-22	1.000E+01	0.000E+00	9.724E+00	1.543E+00	9.724E+00	1.543E+00
Np-237	1.000E+01	0.000E+00	6.124E+00	2.449E+00	6.124E+00	2.449E+00
Pu-238	1.000E+01	0.000E+00	3.053E-01	4.914E+01	3.053E-01	4.914E+01
Pu-239	1.000E+01	0.000E+00	3.390E-01	4.425E+01	3.390E-01	4.425E+01
Pu-240	1.000E+01	0.000E+00	3.389E-01	4.427E+01	3.389E-01	4.427E+01
Ra-226	1.000E+01	34.73 ñ 0.07	1.051E+02	1.427E-01	1.038E+02	1.445E-01
Ra-228	1.000E+01	2.130 ñ 0.004	1.059E+01	1.417E+00	9.089E+00	1.650E+00
Ru-106	1.000E+01	0.000E+00	7.874E-01	1.905E+01	7.874E-01	1.905E+01
Sr-90	1.000E+01	0.000E+00	2.611E+00	5.746E+00	2.611E+00	5.746E+00
Tc-99	1.000E+01	0.000E+00	4.161E-01	3.605E+01	4.161E-01	3.605E+01
Th-228	1.000E+01	0.000E+00	7.620E+00	1.969E+00	7.620E+00	1.969E+00
Th-230	1.000E+01	1.000E+03	3.786E+01	3.962E-01	8.367E-02	1.793E+02
Th-232	1.000E+01	149.0 ñ 0.3	1.754E+01	8.552E-01	8.311E-01	1.805E+01
U-234	1.000E+01	1.000E+03	2.370E-01	6.328E+01	5.453E-02	2.751E+02
U-235	1.000E+01	1.000E+03	8.916E-01	1.682E+01	6.650E-01	2.256E+01
U-238	1.000E+01	0.000E+00	1.620E-01	9.261E+01	1.620E-01	9.261E+01

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Derivation and Use of Rad SALs

Individual Nuclide Dose Summed Over All Pathways						
Parent Nuclide and Branch Fraction Indicated						
0Nuclide	Parent	BRF (i)	DOSE(j,t), mrem/yr			
(j)	(i)		t= 0.000E+00	1.000E+00	3.000E+01	1.000E+02
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Am-241	Am-241	1.000E+00	3.837E+00	3.831E+00	3.656E+00	3.267E+00
Np-237	Am-241	1.000E+00	9.877E-06	2.967E-05	5.904E-04	1.841E-03
Np-237	Np-237	1.000E+00	6.124E+01	6.124E+01	6.124E+01	6.124E+01
Np-237	äDOSE(j):		6.124E+01	6.124E+01	6.124E+01	6.120E+01
U-233	Am-241	1.000E+00	1.388E-13	9.494E-13	3.665E-10	3.832E-09
U-233	Np-237	1.000E+00	1.265E-06	3.740E-06	7.537E-05	2.482E-04
U-233	äDOSE(j):		1.265E-06	3.740E-06	7.537E-05	2.482E-04
Th-229	Am-241	1.000E+00	9.692E-17	1.447E-15	1.081E-11	3.752E-10
Th-229	Np-237	1.000E+00	1.193E-09	8.341E-09	3.320E-06	3.596E-05
Th-229	äDOSE(j):		1.193E-09	8.341E-09	3.320E-06	3.596E-05
Co-60	Co-60	1.000E+00	1.235E+02	1.083E+02	2.389E+00	2.401E-04
Cs-137	Cs-137	1.000E+00	2.832E+01	2.767E+01	1.416E+01	2.809E+00
Eu-152	Eu-152	7.208E-01	3.972E+01	3.771E+01	8.348E+00	2.192E-01
Eu-152	Eu-152	2.792E-01	1.539E+01	1.461E+01	3.233E+00	8.489E-02
Eu-152	äDOSE(j):		5.511E+01	5.232E+01	1.158E+01	3.041E-01
Gd-152	Eu-152	2.792E-01	3.157E-16	9.257E-16	9.825E-15	1.229E-14
Eu-154	Eu-154	1.000E+00	5.954E+01	5.503E+01	5.605E+00	2.259E-02
Eu-155	Eu-155	1.000E+00	1.386E+00	1.205E+00	2.094E-02	1.182E-06
H-3	H-3	1.000E+00	1.697E-01	6.186E-02	1.186E-14	0.000E+00
I-129	I-129	1.000E+00	3.349E+00	3.347E+00	3.296E+00	3.177E+00
K-40	K-40	1.000E+00	1.157E+01	1.157E+01	1.156E+01	1.154E+01
Na-22	Na-22	1.000E+00	9.724E+01	7.450E+01	3.288E-02	2.619E-10
Pu-238	Pu-238	1.000E+00	3.053E+00	3.029E+00	2.408E+00	1.385E+00
U-234	Pu-238	1.000E+00	7.693E-07	2.303E-06	4.189E-05	1.072E-04
U-234	U-234	1.000E+00	5.452E-01	5.452E-01	5.452E-01	5.450E-01
U-234	U-238	1.000E+00	7.729E-07	2.319E-06	4.714E-05	1.553E-04
U-234	äDOSE(j):		5.453E-01	5.453E-01	5.453E-01	5.452E-01
Th-230	Pu-238	1.000E+00	2.613E-12	1.819E-11	6.713E-09	6.152E-08
Th-230	Th-230	1.000E+00	6.118E-01	6.118E-01	6.117E-01	6.113E-01
Th-230	U-234	1.000E+00	2.764E-06	8.273E-06	1.680E-04	5.531E-04
Th-230	U-238	1.000E+00	2.619E-12	1.827E-11	7.263E-09	7.881E-08
Th-230	äDOSE(j):		6.118E-01	6.118E-01	6.118E-01	6.118E-01

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Individual Nuclide Dose Summed Over All Pathways									
Parent Nuclide and Branch Fraction Indicated									
0Nuclide	Parent	BRF(i)	DOSE(j,t), mrem/yr						
(j)	(i)		t=	0.000E+00	1.000E+00	3.000E+01	1.000E+02	1.000E+03	
Ra-226	Pu-238	1.000E+00	4.772E-13	7.145E-12	5.097E-08	1.591E-06	4.966E-04		
Ra-226	Ra-226	1.000E+00	1.038E+03	1.037E+03	1.024E+03	9.934E+02	6.716E+02		
Ra-226	Th-230	1.000E+00	2.247E-01	6.741E-01	1.362E+01	4.419E+01	3.630E+02		
Ra-226	U-234	1.000E+00	6.743E-07	4.720E-06	1.874E-03	2.013E-02	1.753E+00		
Ra-226	U-238	1.000E+00	5.011E-13	7.160E-12	5.408E-08	1.919E-06	1.716E-03		
Ra-226	äDOSE(j):		1.038E+03	1.038E+03	1.038E+03	1.038E+03	1.036E+03		
Pb-210	Pu-238	1.000E+00	1.294E-16	3.931E-15	4.344E-10	3.234E-08	1.970E-05		
Pb-210	Ra-226	1.000E+00	6.864E-01	2.015E+00	2.678E+01	4.080E+01	2.892E+01		
Pb-210	Th-230	1.000E+00	1.003E-04	6.873E-04	2.051E-01	1.308E+00	1.501E+01		
Pb-210	U-234	1.000E+00	2.280E-10	3.342E-09	2.019E-05	4.762E-04	7.006E-02		
Pb-210	U-238	1.000E+00	0.000E+00	5.166E-15	4.561E-10	3.806E-08	6.648E-05		
Pb-210	äDOSE(j):		6.865E-01	2.015E+00	2.699E+01	4.211E+01	4.400E+01		
Pu-239	Pu-239	1.000E+00	3.390E+00	3.390E+00	3.387E+00	3.380E+00	3.293E+00		
U-235	Pu-239	1.000E+00	3.274E-09	9.822E-09	1.996E-07	6.571E-07	6.450E-06		
U-235	U-235	1.000E+00	6.649E+00	6.649E+00	6.649E+00	6.648E+00	6.633E+00		
U-235	äDOSE(j):		6.649E+00	6.649E+00	6.649E+00	6.648E+00	6.633E+00		
Pa-231	Pu-239	1.000E+00	2.282E-13	1.602E-12	6.400E-10	6.940E-09	6.766E-07		
Pa-231	U-235	1.000E+00	6.967E-04	2.094E-03	4.262E-02	1.403E-01	1.381E+00		
Pa-231	äDOSE(j):		6.967E-04	2.094E-03	4.262E-02	1.403E-01	1.381E+00		
Ac-227	Pu-239	1.000E+00	1.244E-15	1.837E-14	1.115E-10	2.633E-09	4.288E-07		
Ac-227	U-235	1.000E+00	5.021E-06	3.461E-05	1.036E-02	6.629E-02	9.023E-01		
Ac-227	äDOSE(j):		5.021E-06	3.461E-05	1.036E-02	6.629E-02	9.023E-01		
Pu-240	Pu-240	1.000E+00	3.389E+00	3.388E+00	3.378E+00	3.353E+00	3.047E+00		
U-236	Pu-240	1.000E+00	7.633E-09	2.293E-08	4.658E-07	1.529E-06	1.450E-05		
Th-232	Pu-240	1.000E+00	7.368E-19	5.139E-18	2.041E-15	2.211E-14	2.121E-12		
Th-232	Th-232	1.000E+00	3.008E+00	3.008E+00	3.008E+00	3.008E+00	3.008E+00		
Th-232	äDOSE(j):		3.008E+00	3.008E+00	3.008E+00	3.008E+00	3.008E+00		
Ra-228	Pu-240	1.000E+00	5.816E-19	8.526E-18	3.322E-14	5.086E-13	5.657E-11		
Ra-228	Ra-228	1.000E+00	7.683E+01	6.810E+01	2.065E+00	4.468E-04	0.000E+00		
Ra-228	Th-232	1.000E+00	4.715E+00	1.344E+01	7.947E+01	8.154E+01	8.154E+01		
Ra-228	äDOSE(j):		8.154E+01	8.154E+01	8.154E+01	8.154E+01	8.154E+01		
Th-228	Pu-240	1.000E+00	4.471E-20	1.279E-18	2.979E-14	5.341E-13	6.269E-11		
Th-228	Ra-228	1.000E+00	1.406E+01	3.421E+01	3.445E+00	7.459E-04	0.000E+00		
Th-228	Th-228	1.000E+00	7.620E+01	5.304E+01	1.450E-03	1.402E-14	0.000E+00		
Th-228	Th-232	1.000E+00	5.883E-01	3.606E+00	8.740E+01	9.085E+01	9.085E+01		
Th-228	äDOSE(j):		9.085E+01	9.085E+01	9.085E+01	9.085E+01	9.085E+01		
Ru-106	Ru-106	1.000E+00	7.874E+00	3.955E+00	8.423E-09	0.000E+00	0.000E+00		
Sr-90	Sr-90	1.000E+00	2.611E+01	2.549E+01	1.278E+01	2.414E+00	1.195E-09		

Derivation and Use of Rad SALs

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

0Nuclide (j)	Parent (i)	BRF(i)	DOSE(j,t), mrem/yr				
			t= 0.000E+00	1.000E+00	3.000E+01	1.000E+02	1.000E+03
Tc-99	Tc-99	1.000E+00	4.161E+00	4.157E+00	4.043E+00	3.782E+00	1.601E+00
U-238	U-238	1.000E+00	1.620E+00	1.620E+00	1.620E+00	1.619E+00	1.616E+00

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

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		Individual Nuclide Soil Concentration					
		Parent Nuclide and Branch Fraction Indicated					
0Nuclide (j)	Parent (i)	BRF (i)	S(j,t), pCi/g				
			t= 0.000E+00	1.000E+00	3.000E+01	1.000E+02	1.000E+03
Am-241	Am-241	1.000E+00	1.000E+01	9.984E+00	9.529E+00	8.513E+00	2.000E+00
Np-237	Am-241	1.000E+00	0.000E+00	3.236E-06	9.486E-05	2.992E-04	1.609E-03
Np-237	Np-237	1.000E+00	1.000E+01	1.000E+01	1.000E+01	9.999E+00	9.992E+00
Np-237	äS(j):		1.000E+01	1.000E+01	1.000E+01	1.000E+01	9.994E+00
U-233	Am-241	1.000E+00	0.000E+00	7.079E-12	6.272E-09	6.715E-08	4.414E-06
U-233	Np-237	1.000E+00	0.000E+00	4.373E-05	1.312E-03	4.372E-03	4.357E-02
U-233	äS(j):		0.000E+00	4.373E-05	1.312E-03	4.372E-03	4.357E-02
Th-229	Am-241	1.000E+00	0.000E+00	2.231E-16	5.943E-12	2.137E-10	1.517E-07
Th-229	Np-237	1.000E+00	0.000E+00	2.065E-09	1.857E-06	2.058E-05	1.996E-03
Th-229	äS(j):		0.000E+00	2.065E-09	1.857E-06	2.058E-05	1.996E-03
Co-60	Co-60	1.000E+00	1.000E+01	8.768E+00	1.935E-01	1.945E-05	0.000E+00
Cs-137	Cs-137	1.000E+00	1.000E+01	9.772E+00	5.000E+00	9.921E-01	9.239E-10
Eu-152	Eu-152	7.208E-01	7.208E+00	6.843E+00	1.515E+00	3.977E-02	1.883E-22
Eu-152	Eu-152	2.792E-01	2.792E+00	2.651E+00	5.867E-01	1.540E-02	7.294E-23
Eu-152	äS(j):		1.000E+01	9.493E+00	2.101E+00	5.517E-02	2.612E-22
Gd-152	Eu-152	2.792E-01	0.000E+00	1.746E-14	2.722E-13	3.427E-13	3.446E-13
Eu-154	Eu-154	1.000E+00	1.000E+01	9.243E+00	9.414E-01	3.795E-03	6.194E-34
Eu-155	Eu-155	1.000E+00	1.000E+01	8.696E+00	1.511E-01	8.528E-06	0.000E+00
H-3	H-3	1.000E+00	1.000E+01	3.643E+00	6.982E-13	0.000E+00	0.000E+00
I-129	I-129	1.000E+00	1.000E+01	9.995E+00	9.843E+00	9.485E+00	5.892E+00
K-40	K-40	1.000E+00	1.000E+01	1.000E+01	9.994E+00	9.979E+00	9.791E+00
Na-22	Na-22	1.000E+00	1.000E+01	7.661E+00	3.381E-03	2.693E-11	0.000E+00
Pu-238	Pu-238	1.000E+00	1.000E+01	9.921E+00	7.890E+00	4.538E+00	3.707E-03
U-234	Pu-238	1.000E+00	0.000E+00	2.824E-05	7.572E-04	1.959E-03	3.571E-03
U-234	U-234	1.000E+00	1.000E+01	1.000E+01	9.998E+00	9.995E+00	9.948E+00
U-234	U-238	1.000E+00	0.000E+00	2.835E-05	8.504E-04	2.834E-03	2.824E-02
U-234	äS(j):		1.000E+01	1.000E+01	1.000E+01	1.000E+01	9.980E+00
Th-230	Pu-238	1.000E+00	0.000E+00	1.273E-10	1.063E-07	9.966E-07	2.804E-05
Th-230	Th-230	1.000E+00	1.000E+01	1.000E+01	9.997E+00	9.991E+00	9.910E+00
Th-230	U-234	1.000E+00	0.000E+00	9.002E-05	2.700E-03	8.996E-03	8.938E-02
Th-230	U-238	1.000E+00	0.000E+00	1.276E-10	1.148E-07	1.275E-06	1.269E-04
Th-230	äS(j):		1.000E+01	1.000E+01	1.000E+01	1.000E+01	1.000E+01

Individual Nuclide Soil Concentration							
Parent Nuclide and Branch Fraction Indicated							
0Nuclide	Parent	BRF(i)	S(j,t), pCi/g				
(j)	(i)		t= 0.000E+00	1.000E+00	3.000E+01	1.000E+02	
Ra-226	Pu-238	1.000E+00	0.000E+00	1.839E-14	4.678E-10	1.512E-08	4.780E-06
Ra-226	Ra-226	1.000E+00	1.000E+01	9.996E+00	9.870E+00	9.574E+00	6.473E+00
Ra-226	Th-230	1.000E+00	0.000E+00	4.331E-03	1.291E-01	4.237E-01	3.496E+00
Ra-226	U-234	1.000E+00	0.000E+00	1.950E-08	1.747E-05	1.921E-04	1.687E-02
Ra-226	U-238	1.000E+00	0.000E+00	1.680E-14	4.958E-10	1.822E-08	1.652E-05
Ra-226	äS(j):		1.000E+01	1.000E+01	9.999E+00	9.998E+00	9.986E+00
Pb-210	Pu-238	1.000E+00	0.000E+00	1.419E-16	9.249E-11	7.216E-09	4.466E-06
Pb-210	Ra-226	1.000E+00	0.000E+00	3.060E-01	6.019E+00	9.257E+00	6.565E+00
Pb-210	Th-230	1.000E+00	0.000E+00	6.663E-05	4.523E-02	2.948E-01	3.405E+00
Pb-210	U-234	1.000E+00	0.000E+00	2.004E-10	4.372E-06	1.067E-04	1.589E-02
Pb-210	U-238	1.000E+00	0.000E+00	0.000E+00	9.704E-11	8.485E-09	1.507E-05
Pb-210	äS(j):		0.000E+00	3.060E-01	6.064E+00	9.552E+00	9.986E+00
Pu-239	Pu-239	1.000E+00	1.000E+01	1.000E+01	9.991E+00	9.971E+00	9.715E+00
U-235	Pu-239	1.000E+00	0.000E+00	9.848E-09	2.953E-07	9.833E-07	9.696E-06
U-235	U-235	1.000E+00	1.000E+01	1.000E+01	9.999E+00	9.998E+00	9.976E+00
U-235	äS(j):		1.000E+01	1.000E+01	9.999E+00	9.998E+00	9.976E+00
Pa-231	Pu-239	1.000E+00	0.000E+00	1.042E-13	9.372E-11	1.040E-09	1.023E-07
Pa-231	U-235	1.000E+00	0.000E+00	2.116E-04	6.345E-03	2.113E-02	2.089E-01
Pa-231	äS(j):		0.000E+00	2.116E-04	6.345E-03	2.113E-02	2.089E-01
Ac-227	Pu-239	1.000E+00	0.000E+00	1.097E-15	2.388E-11	5.835E-10	9.612E-08
Ac-227	U-235	1.000E+00	0.000E+00	3.332E-06	2.258E-03	1.477E-02	2.023E-01
Ac-227	äS(j):		0.000E+00	3.332E-06	2.258E-03	1.477E-02	2.023E-01
Pu-240	Pu-240	1.000E+00	1.000E+01	9.999E+00	9.968E+00	9.894E+00	8.993E+00
U-236	Pu-240	1.000E+00	0.000E+00	2.960E-07	8.866E-06	2.944E-05	2.805E-04
Th-232	Pu-240	1.000E+00	0.000E+00	7.302E-18	6.565E-15	7.276E-14	7.045E-12
Th-232	Th-232	1.000E+00	1.000E+01	1.000E+01	1.000E+01	1.000E+01	1.000E+01
Th-232	äS(j):		1.000E+01	1.000E+01	1.000E+01	1.000E+01	1.000E+01
Ra-228	Pu-240	1.000E+00	0.000E+00	2.848E-19	3.912E-15	6.170E-14	6.931E-12
Ra-228	Ra-228	1.000E+00	1.000E+01	8.864E+00	2.688E-01	5.816E-05	0.000E+00
Ra-228	Th-232	1.000E+00	0.000E+00	1.136E+00	9.731E+00	1.000E+01	1.000E+01
Ra-228	äS(j):		1.000E+01	1.000E+01	1.000E+01	1.000E+01	1.000E+01
Th-228	Pu-240	1.000E+00	0.000E+00	2.418E-20	3.136E-15	5.814E-14	6.893E-12
Th-228	Ra-228	1.000E+00	0.000E+00	2.853E+00	4.025E-01	8.716E-05	0.000E+00
Th-228	Th-228	1.000E+00	1.000E+01	6.961E+00	1.903E-04	1.840E-15	0.000E+00
Th-228	Th-232	1.000E+00	0.000E+00	1.864E-01	9.597E+00	1.000E+01	1.000E+01
Th-228	äS(j):		1.000E+01	1.000E+01	1.000E+01	1.000E+01	1.000E+01
Ru-106	Ru-106	1.000E+00	1.000E+01	5.023E+00	1.070E-08	1.252E-29	0.000E+00
Sr-90	Sr-90	1.000E+00	1.000E+01	9.765E+00	4.896E+00	9.249E-01	4.578E-10

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Individual Nuclide Soil Concentration
 Parent Nuclide and Branch Fraction Indicated

0Nuclide (j)	Parent (i)	BRF(i)	S(j,t), pCi/g					
			t=	0.000E+00	1.000E+00	3.000E+01	1.000E+02	1.000E+03
Tc-99	Tc-99	1.000E+00	1.000E+01	9.990E+00	9.717E+00	9.089E+00	3.847E+00	
U-238	U-238	1.000E+00	1.000E+01	1.000E+01	9.999E+00	9.998E+00	9.976E+00	

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

RESMAIN5.EXE execution time = 369.32 seconds

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