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RADIOLOGICAL RISK ASSESSMENT IN SUPPORT OF PETITION FOR BENEFICAL USE OF PHOSPHOGYPSUM

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EXECUTIVE SUMMARY

Phosphogypsum is a by-product of the production of phosphoric acid for the fertilizer industry and contains naturally occurring radioactivity, the same radioactivity that is present in the phosphate ore from which phosphogypsum is derived.

Prior to December 1989, phosphogypsum was considered an item of commerce and sold for agricultural use in central and north Florida and throughout the United States at locations where it was manufactured.

Subsequent Reconsideration

The United States Environmental Protection Agency (EPA) issued the first National Emission Standards for Hazardous Air Pollutants (NESHAP) for radon emissions from phosphogypsum (PG) stacks on December 15, 1989 (54 FR 51654). This NESHAP required that PG be disposed of in stacks. (See legal discussion in the Petition).

The risk assessment described in this report is provided in support of a petition ("Petition") for the beneficial use of By-Product Phosphogypsum ("PG") for the construction of roads. Specifically, three road construction scenarios are considered in the following risk assessment:

1. Road base – PG and soil mixture
2. Road pavement – PG in concrete
3. Road base and pavement – PG in both

The approach to risk assessment for use of PG in road construction is based on EPA guidance and regulation regarding the appropriate risk benchmark for judging reuse of PG. The current risk assessment adopts EPA's long-standing risk management safe level of 3 in 10,000. EPA has previously determined that use of this "risk threshold is consistent with the determination of a 'safe' level (first announced in the NESHAP for certain benzene source categories (54 FR 38044, September 13, 1989))."[1] In 1992, EPA reaffirmed that a 3 in 10,000 risk level was protective of human health and consistent with EPA's long-standing risk management goals.[2] In particular, EPA determined that the 3 in 10,000 risk level provided "an ample margin of safety, considering the cost, scientific uncertainty, and technological feasibility of control technologies needed to further reduce the radon emissions from [the PG] stacks."[3] EPA may approve new uses of phosphogypsum that are demonstrated to be protective of public health with an estimated total risk to any individual of no more than 3 in 10,000.

[1] USEPA PG Workbook, supra note 4, at 5.

[2] EPA, National Emission Standards for Hazardous Air Pollutants; National Emission Standards for Radon Emissions from Phosphogypsum, 57 Fed. Reg. 23,305, 23,311-12, 23,316 (1992).

[3] USEPA PG Workbook, supra note 4 at 5.

Consistent with standards for radiological protection, this refers to cancer mortality as a clear endpoint of exposure. For the risk analysis described in this report, dose to risk conversion is expressed in terms of risk per milli Roentgen equivalent man (mrem) of 5 x 10^{-7} (i.e., a risk of 5 in 10,000,000 per mrem).

As previously indicated, this risk assessment describes the potential uses of PG in road construction and lays out the potential associated exposure pathways and estimates the risk for workers and members of the public who work in the construction of roads, who live proximate to roads constructed from PG, and who use the roads once constructed (referred to as receptors). The following receptors were considered and assessed with the results demonstrating that the receptors have reasonable maximum exposures (RME).

- Road Construction Worker who works on roads built exclusively with PG material for 5 years;
- Road User (motorist/bicyclist) on PG-constructed roads for 26 years;
- Resident Living Near Road who lives for 26 years 50 feet (ft) from a road;
- Truck Driver who delivers PG for road base material to construction site for 5 years;
- Utility Worker trenching across PG-containing road base for up to 160 hours in a year.

The annual doses to a reasonably maximally exposed receptor for each of the above scenarios was estimated for both annual exposure and for the assumed exposure duration.

The total doses estimated for each of the road exposure scenarios described earlier in the report are summarized in the following Table ES-1. The table also summarizes the corresponding risks arising from the duration of exposure assumed for each scenario and receptor.

Table ES-1 Dose and Risk Summary for All Scenarios

Receptor	CSM	Exposure Duration (years)	Exposure Dose (mrem)	Estimated Cancer Risk	Background Dose from Exposure Duration (mrem)	Exposure Dose Percentage of Background Dose (%)
Reasonable Maximum Exposure Scenarios						
Road Construction Worker	PG in Road Base	5	110	0.5 in 10,000	1550	7%
Road User (Motorist/Bicyclist)	PG in Road Base & Surface	26	28	0.1 in 10,000	8060	0.3%
Truck Driver	PG-Containing Material for Road Base	5	93	0.5 in 10,000	1550	6%
Nearby Resident	PG in Road Base & Surface	26	16	0.08 in 10,000	8060	0.2%
Utility Worker	PG in Road Base	1	0.8	0.004 in 10,000	310	0.3%
	EPA Cancer Risk Management Goal		600	3 in 10,000	600	

Estimated cancer risk below this goal.

All of the predicted risks for the RME receptors are below the EPA's risk management safe level for new uses of PG of 3 in 10,000. As explained in the following sections, the average annual dose to anyone in the US is about 310 mrem per year (as per NCRP 160). This value is provided in this table and the subsequent figures as a point of reference.

Figure ES-1 below shows the estimated annual doses for each of the receptors. Figure ES-2 shows the estimated doses for the assumed duration of exposure ("exposure dose") and Figure ES-3 shows the corresponding estimated cancer risks. It is clear from Figure ES-1 that the annual doses estimated for the various receptors arising from the use of PG in road construction are small and indeed, reflect only a small fraction of the unavoidable dose from natural background radiation.

Figure ES-2 below demonstrates that the exposure dose for each scenario is well below the dose of 600 mrem which is equivalent to EPA's cancer risk goal of 3 in 10,000.

Figure ES-3 below shows the estimated cancer risk from use of PG in road construction is well below EPA's reference risk of 3 in 10,000.

Overall, the use of PG in road construction will result in very small doses (to reasonably maximally exposed receptors) and total risks are well below EPA's reference risk goal.

Figure ES-1 Estimated Annual Doses

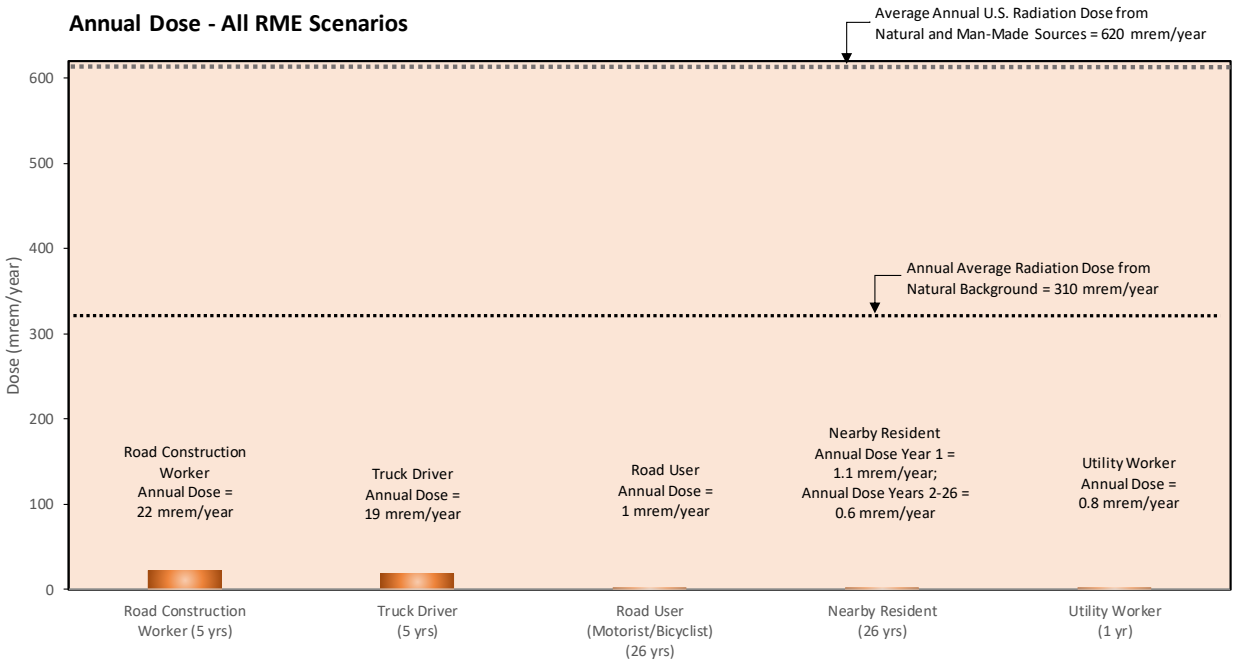


Figure ES-2 Estimated Exposure Doses

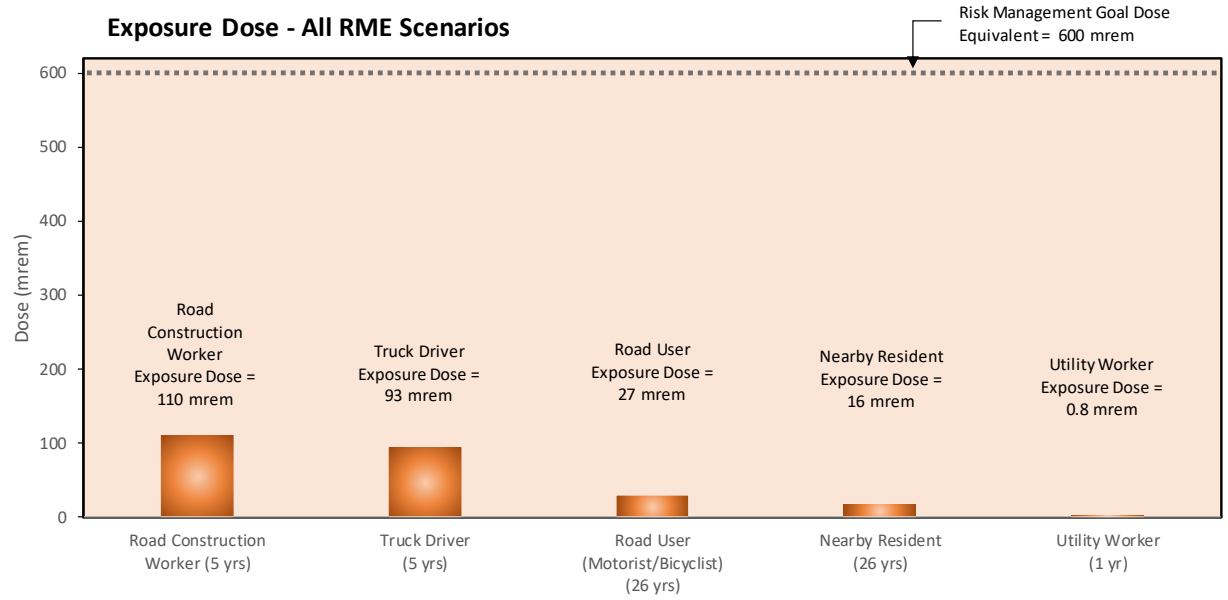
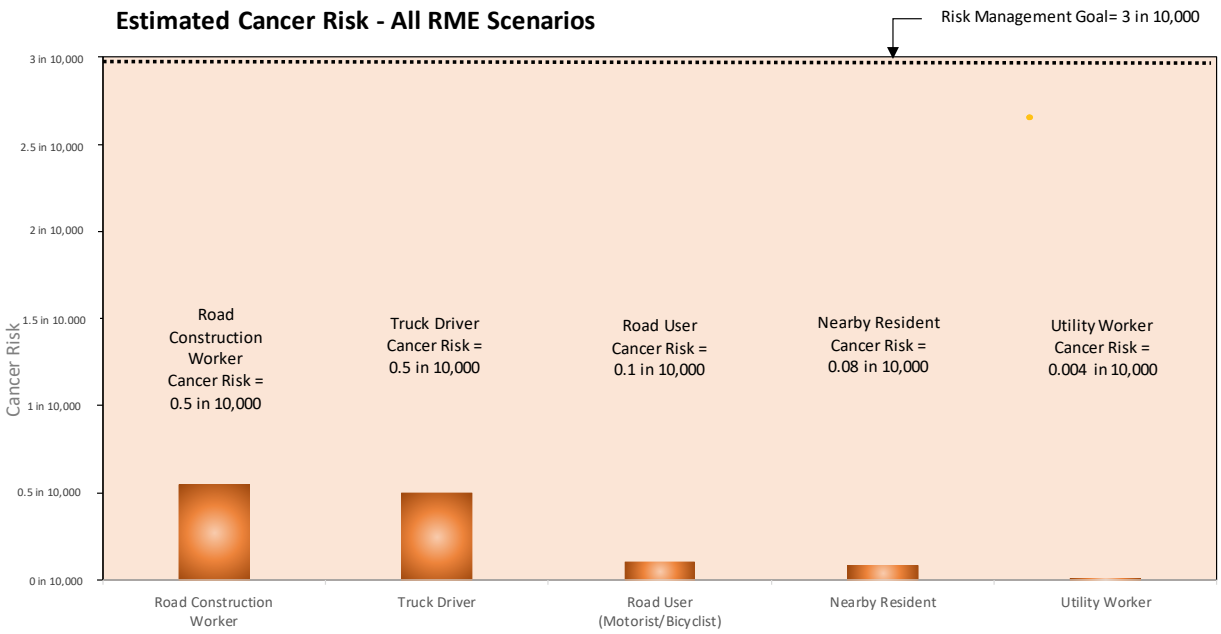


Figure ES-3 Estimated Cancer Risks



[1] The mrem is a common unit of radiation dose. In this report, “dose” refers to effective dose, which simply means that when a person is exposed to a uniform radiation (i.e., external gamma radiation), that all of the doses to the different organs are weighted by their radiosensitivity and added together.

1 INTRODUCTION

1.1 Background

The risk assessment described in this report is provided in support of a petition ("Petition") for EPA approval of the beneficial use of PG. While many potential beneficial uses of PG can, and have been contemplated, the current risk assessment is focused on the potential beneficial uses of PG for the construction of roads.

1.2 Risk Level Criteria

The approach to risk assessment for use of PG in road construction is based on EPA guidance and regulation regarding the appropriate risk benchmark for judging reuse of PG (i.e., specified in EPA's Phosphogypsum Petition Guidance [2005] and EPA's 1992 NESHAP as noted below). In addition, generally accepted national and international procedures for relating radiation dose to risk are considered. This latter consideration includes the rationale for using risk of fatal cancer as the endpoint for radiation exposure.

For present purposes, the guidance provided in EPA's 1992 NESHAP regulation to establish the target lifetime dose and cancer mortality risk for PG reuse is adopted. Specifically, EPA stated (NESHAP, 1992) *"certain uses of phosphogypsum may be considered acceptable so long as those uses are restricted to limit the estimated lifetime risk to any individual to no more than 3 in 10 thousand.*" [i.e., a lifetime risk of 3/10,000]. Consistent with standards for radiological protection this refers to cancer mortality as a clear endpoint of exposure. As discussed below, this also is approximate for all calculated detrimental effects.

The International Commission on Radiological Protection (ICRP) sets out the basis for evaluating health effects from radiological exposure along with recommendations for using specific values for regulatory purposes. While there are broad uncertainty bounds at low-dose exposures, the assumption of a linear relationship between exposure and risk is maintained regardless of the possibility of a threshold below which there is no risk. Within this band, ICRP in Publication 103 (2007) has identified specific exposure values for consideration.

ICRP provides analyses for detriment-adjusted cancers that include non-fatal cancers and other types of effects. That calculated value is 5.5% per Sievert. On the basis of model uncertainty and epidemiological evidence[4] the ICRP (2007) offers this judgement given the numerical proximity of the two values (fatal and detriment-adjusted):

> "*It is therefore the recommendation of the Commission that the approximated overall fatal risk coefficient of 5% per Sv* [i.e., 5/10,000,000 per mrem] *on which current international*

[4] Epidemiological information on radiation-associated risks comes from many sources: studies of the survivors of the atomic bombings in Japan; groups exposed in their working environment; patients irradiated in the course of medical procedures; and people exposed to environmental sources of radiation.

> *radiation safety standards are based continues to be appropriate for the purposes of radiological protection."*

For our risk analysis, we use a dose conversion expressed in terms of millirems or mrem[5]. One Sievert is equivalent to 100 rems or 100,000 mrems. Translating from the 5% risk per Sievert recommended by the ICRP for regulatory purposes, to risk per mrem yields 5 x 10^{-7} risk per mrem.

The current analysis estimates the annual dose for each of the exposure scenarios, summed over the associated years of exposure to provide a total dose which is then converted to a risk (of fatal cancer) using a dose-to-risk conversion factor of 5x10^{-7} (i.e. 5/10,000,000).

Our use of 5 x 10^{-7} as a dose to risk conversion as set forth by ICRP is consistent with EPA risk assessment procedures.[6] The EPA (2011) provides cancer risk factors for uniform whole-body exposures of low-dose gamma radiation to the entire population, and reports an estimated 90% confidence interval for cancer mortality of 2.8% to 10% per Gray (Gy)[7] (i.e., from 2.8 x 10^{-7} to 10 x 10^{-7} per mrem). This range is essentially the same dose to risk conversion range derived by ICRP.

The value we use is also consistent with the perspective of the National Council on Radiation Protection and Measurements (NCRP) on this matter. The most recent report of the NCRP (2018) (Report No. 180) provides detailed discussion of the risks from exposure to ionizing radiation and states that:

> "*The value of 5 % per Sv* [i.e., 5/10,000,000 per mrem] *is a rounded value for radiation detriment used to inform all the NCRP recommendations regarding stochastic effects*."

Thus, the risk estimates derived for PG are conservative assumptions based on a linear relationship between dose and risk for the very low dose exposures derived for this report. The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) (2011) notes that below doses of 100 to 200 milligray (mGy) (roughly equivalent to 10,000 to 20,000 mrem): "*epidemiological studies alone are unlikely to be able to identify significant elevations in risk*." Despite this, we have used EPA's assumption that the risk is proportional to the dose no matter how small the dose. This concept is referred to as linear-no-threshold or LNT.

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[5] The mrem is a common unit of radiation dose. In this report, "dose" refers to effective dose, which simply means that when a person is exposed to a uniform radiation (i.e., external gamma radiation), that all of the doses to the different organs are weighted by their radiosensitivity and added together.

[6] Similarly, the international community has widely adopted the International Atomic Energy Agency (IAEA) determination that 1 millisievert (1 mSv) per year is the acceptable level of radiation exposure (for example, the European Union [EU] regulations). See International Atomic Energy Agency, Radiation Protection and Management of NORM Residues in the Phosphate Industry, Safety Report Series No. 78, IAEA, Vienna, 2013, p. 165. The IAEA and EU determinations are also based on the International Commission on Radiological Protection, The 2007 Recommendations of the International Commission on Radiological Protection, ICRP Publication No. 103, March 2007, p. 55, Table 5 - p. 97, Table 8 - p. 116.

[7] For practical purposes for gamma radiation, 1 Gy = 1 Sv = 100 rem = 100,000 mrem.

The ICRP and NCRP recommended value of 5 x 10^{-4} risk per rem (5 x 10^{-7} per millirem) is used in the Petition and this risk assessment report to convert radiation dose to risk.

1.3 Report Outline

As previously indicated, this risk assessment describes the potential uses of PG in road construction and lays out the potential associate exposure pathways for workers and members of the public who work in the construction of roads, who live proximate to roads constructed from PG, and those who use the roads once constructed. At EPA's request, the ultimate disposition of a PG roadway has also been evaluated. This evaluation was therefore, expanded to include a Reclaimer exposure scenario. It should be noted, however, this reclaimer scenario is not viewed as a reasonable maximum exposure (RME), given the nature and use of planned and constructed public roads.

This risk assessment evaluates the use of PG in road construction, which represents an opportunity for use of PG in support of transportation infrastructure. The following three road construction uses for PG are considered:

1. Road base – PG and soil mixture
2. Road pavement – PG in concrete
3. Road base and pavement – PG in both

Chapter 2: Study Approach. This Chapter describes the scenarios selected for risk assessment, potential receptors and exposure pathways (via use of conceptual site models), the basic models used to perform the risk assessment, and the development of model parameters and the assumptions needed to support the risk assessment.

Chapter 3: Dose and Risk Estimates. Provides the dose and risk estimates, and an evaluation of the ultimate disposition of a PG roadway.

Chapter 4: Discussion. Reviews the risk assessment results and provides a risk context.

Chapter 5: References. Provides the references for materials cited in the risk assessment.

Appendices

Appendix A: Bibliography. Provides an extended list of relevant materials

Appendix B: Excel Workbook with Exposure Parameters

Appendix C: RESRAD Output

Appendix D: MicroShield® Output

2 STUDY APPROACH

This Chapter provides a description of the exposure scenarios for each of the possible uses of PG in road construction. In addition, the models, key assumptions and model parameters used in the analysis are described. Further information on the assumptions and model parameters is presented in Appendix B of this report.

2.1 Conceptual Exposure Model

The focus of this petition is on the use of PG in road construction. The use of PG was considered in the road base and in paving mixed with cement for the concrete surface. A conceptual exposure model was developed for the following uses:

- PG in road base during construction with no surface material present.
- PG in road base (mixed with soil and compacted) and PG in the concrete paving on the road surface.
- Road base without PG and PG in the concrete paving on the road surface.

The selected example road was a four-lane county road with two lanes in each direction. This type of road is common in rural, suburban and urban settings. Choice of this road type permits evaluation of construction workers, nearby residents, bicyclists and motorists, and utility workers. The road dimensions are 15 m wide (about 12 feet [ft] per lane) and 100 m long (segment length) for modelling exposures. The thickness of the road base containing PG and road surface (i.e., pavement) are 0.25 m and 0.12 m respectively consistent with the EPA BID (1992). Exposure scenarios include construction periods and post-construction. Each exposure scenario is defined in terms of nature of activity, proximity, and duration.

2.1.1 Receptors and Potentially Complete Exposure Pathways

Five exposure scenarios were defined, including receptors who would reasonably be expected to receive a dose either during or after construction (Table 2.1). These receptors include the truck driver hauling PG to the road construction site or the concrete production facility, the construction worker building the road, the resident living near the road both during and after construction and the road user, including a driver and bicyclist. In addition, a worker who spends time working on a buried utility in a trench cutting through the road and road base was assessed.

A variety of potential exposure pathways were reviewed and those potentially resulting in a non-negligible dose were selected[8]. These included direct radiological exposure from the volumes of material with PG, and ingestion and inhalation of fugitive dust. Table 2.1 presents the receptors, exposure pathways,

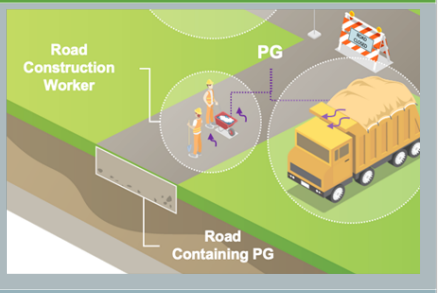
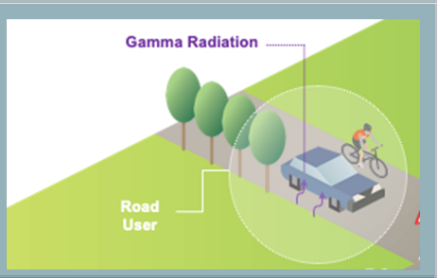
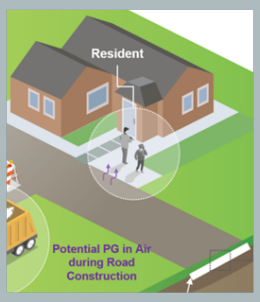
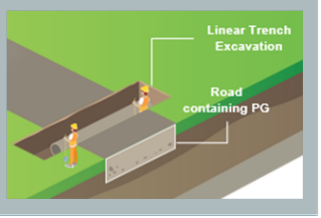
[8] Various authors have reviewed the potential doses arising from the use of PG in road construction, among them, the EPA in their BID (EPA 1992). Exposure pathways other than those discussed in this report were shown by EPA to have doses and risks an order of magnitude or more below those discussed in this report.

emission source, and type of exposure. Figure 2.1 shows graphical depictions of these exposure scenarios. No other pathway was determined as viable or would result in a non-negligible dose.

Table 2.1 Exposures, Receptors and Complete Exposure Pathways

Exposure Scenario	Exposure	Exposure Pathway
Truck driver-PG to construction site)	Gamma radiation	Direct external exposure
Road Construction Worker	Gamma radiation & PG dust	Direct external exposure Inhalation /Incidental ingestion of dust
Utility worker	Gamma radiation & PG dust	Direct external exposure Inhalation /Incidental ingestion of dust
Road User (bicycle or auto)	Gamma radiation	Direct external exposure
Nearest Resident	Gamma radiation & PG dust	Direct external exposure Inhalation /Incidental ingestion of dust

Figure 2.1 Graphical Representation of Complete Exposure Pathways

Receptor	Conceptual Site Model	
Road Construction Worker	▪ PG in road base: Exposure via external gamma, inhalation, incidental ingestion (RESRAD)	
Road User (motorist/ bicyclist)	▪ PG in road base and paving: Exposure via external gamma (RESRAD)	
Resident Living Near Road	▪ PG in road base and paving: Exposure via external gamma (all years) (MicroShield®) ▪ PG in road base: Exposure via incidental ingestion and inhalation during construction (35 days) (RESRAD)	
Truck Driver	▪ PG road base material in transit: Exposure via external gamma (MicroShield®)	
Utility Worker	▪ PG in road base: Exposure via external gamma (MicroShield®) ▪ PG in road base: Exposure via incidental ingestion and inhalation modeled (RESRAD)	

2.2 Source Term

The source term used in the dose calculations and risk assessment is the average radium-226 measured in various PG stacks in Central Florida conducted by EPA in 1988 (EPA, 1988). The measured isotopes were Ra-226, U-234, U-238, Th-230. Po-210 and Pb-210 (dry weight). These radionuclides were assumed to be in secular equilibrium. For the source term, the primary radionuclide is Ra-226 and its daughters. The Th-232 chain was ignored as the concentration of Th-232 in PG was shown to be less than 1 picocuries per gram (pCi/g) (EPA, 1988) which would not result in a measurable incremental dose.

It is also noted that the activity of U-238, U-235 and Th-230 is relatively low: U-238 and U-234 activity of 3.2 pCi/g and Th-230 activity of 5 pCi/g. These isotopes were included although the dose is also negligible since they are not gamma emitters and at best may contribute to small increment of ingestion or inhalation dose. Table 2.2 presents the PG source terms.

Table 2.2 PG Source Terms

Radionuclide Concentrations				
PG Concentration (Source)				
Radionuclide	Concentration (pCi/g)			Comments
U-238	2.9	±	0.5	EPA 1988 Page 4-12
Th-234	2.9	±	0.5	Equilibrium with U-238
Pa-234m	2.9	±	0.5	Equilibrium with U-238
U-234	3.2	±	0.5	EPA 1988 Page 4-12
Th-230	5	±	0.4	EPA 1988 Page 4-12
Ra-226	27	±	0.4	
Rn-222	27	±	0.4	Equilibrium with Ra-226
Po-218	27	±	0.4	Equilibrium with Ra-226
Pb-214	27	±	0.4	Equilibrium with Ra-226
Bi-214	27	±	0.4	Equilibrium with Ra-226
Po-214	27	±	0.4	Equilibrium with Ra-226
Pb-210	27	±	5.4	Equilibrium with Ra-226
Bi-210	27	±	5.4	Equilibrium with Pb-210
Po-210	27	±	5.4	Equilibrium with Ra-226

Notes:
1 Calculated from average 2σ uncertainty (percent)
2 The following activity ratios from EPA 1988 Page 4-12, Table 4-7 were used:
Ra-226 / U-238 = 9.2
Th-230 / U-238 = 1.7
U-234 / U-238 = 1.1
3 Th-234 and Pa-234m were assumed to be in equilibrium with U-238 and the remaining progeny were assumed to be in equilibrium with Ra-226.

The level of radium-226 within PG stacks varies. To address this, we have assumed for purpose of illustration, an empirical average concentration of 27 pCi. Ra-226 in PG (USEPA 1988). Recent measurements of radioactivity (notably Ra-226) in multiple PG stacks confirm the applicability of the forgoing radionuclide source term. However, as discussed later in Chapter 5 of this report, the doses and consequent risks can be scaled on the basis of the Ra-226 concentration by ratioing the average Ra-226 concentration in PG proposed for use in road construction to the doses and risks calculated assuming 27 pCi/g.

Road base is presumed to be up to a 50/50 mixture of PG and soil[9]. This reduces the source concentration by ½ relative to the raw PG source (Table 2.3). The concentration of radionuclides in concrete paving is assumed to be 2.25% PG, based on PG 15% by weight in cement and cement 15% by weight in concrete resulting in proportional reductions in concentrations (Table 2.4).

Table 2.3 Radionuclide Concentrations in Road Base

Radionuclide	Concentration (pCi/g)	Concentration (pCi/cc)
U-238	1.5	3.3
Th-234	1.5	3.3
Pa-234m	1.5	3.3
U-234	1.6	3.6
Th-230	2.5	5.6
Ra-226	13.5	30.4
Rn-222	**13.5**	**30.4**
Po-218	13.5	30.4
Pb-214	13.5	30.4
Bi-214	13.5	30.4
Po-214	13.5	30.4
Pb-210	13.5	30.4
Bi-210	13.5	30.4
Po-210	13.5	30.4

pCi/cc = picocuries per cubic centimeter

[9] A 50:50 mixture of PG and local construction materials such as sand is likely to be an overestimate of the actual mix. The EPA for example in their 1992 BID use a1:2 mix of PG:sand. This is also the ratio in the Polk and Columbia county roads constructed by FIPR with input on the design and testing of the roads from the University of Miami and the Bureau of Materials & Research, the Florida Department of Transportation. The ratio of PG:soil, the use of additives such as cement and thickness of road base for example, will vary depending on the specifications provided by the appropriate authority (i.e., local, state or national Transportation departments). Further, The U.S. Federal Highway Administration (FHWA) Use Guidelines for Waste and By-product Materials in Pavement Construction at 4-17 (1998) (available at https://rosap.ntl.bts.gov/view/dot/38365) which suggests that the limits of blending recycle material in pavement materials ranges from 50% or less for boiler slag to about 55 for fly ash.

Table 2.4 Radionuclide Concentrations in Road Surface

Radionuclide	Concentration (pCi/g)	Concentration (pCi/cc)
U-238	0.066	0.1
Th-234	0.066	0.1
Pa-234m	0.066	0.1
U-234	0.073	0.1
Th-230	0.11	0.2
Ra-226	0.61	1.215
Rn-222	0.61	1.215
Po-218	0.61	1.215
Pb-214	0.61	1.215
Bi-214	0.61	1.215
Po-214	0.61	1.215
Pb-210	0.61	1.215
Bi-210	0.61	1.215
Po-210	0.61	1.215

Notes:

1 The following activity ratios from EPA 1988 Page 4-12, Table 4-7 were used:
Ra-226 / U-238 = 9.2
Th-230 / U-238 = 1.7
U-234 / U-238 = 1.1
2 Th-234 and Pa-234m were assumed to be in equilibrium with U-238 and the remaining progeny were assumed to be in equilibrium with Ra-226.

2.3 Models Used in Risk Assessment

The selected exposure computer codes (models) used to determine the dose for the various exposure pathways were RESRAD and MicroShield®. These codes are used throughout the industry for dose assessments, risk assessment (RESRAD) and gamma exposure and shielding determination for simple configurations (MicroShield®). These codes have been used by EPA, DOE, and DOD extensively for a variety of situations where NORM has resulted in doses to the public or workers. Each of these Codes have benefits and limitations and are used here for appropriate specific configurations. These codes are described in more detail in the next sections. In addition, where required, spread sheet calculations using Excel were used and as appropriate, described later in this report.

It is noted that these codes have replaced those used previously by EPA to evaluate doses and risks in their 1982 Basic Information Document – Potential Uses of Phosphogypsum and Associated Risk (EPA May 1992). The codes used at the time were the PATHRAE code (aka PATHRAE_EPA) and MicroShield®. The latter, MicroShield, was used to augment the results of the PATHRAE analysis. The PATHRAE dose assessment model was published in 1987 (EPA 1987) and while still available, is not currently used.

2.3.1 RESRAD

RESRAD Onsite (RESRAD) is one of a series of codes designed by Argonne National Laboratories for the Department of Energy for the purpose of estimating doses to an individual located on top of radioactively contaminated soils (http://resrad.evs.anl.gov/ accessed 9 12 2019).

Dose calculations are scenario driven using nine exposure pathways. This risk assessment for PG used in road construction includes the following three applicable pathways: (1) direct external radiation from radionuclides in soil, (2) inhalation of airborne radionuclides resuspended or volatilizing from soil, and (3) incidental ingestion of soil. Input information needed for the calculation includes characteristics of the PG material, and properties of surface soil and exposure pattern strata.

For the external radiation dose, the dose is first calculated for an individual exposed continuously to radiation from an infinite depth and lateral extent. The dose point is at a distance of 1 m from the ground surface. Four adjustment factors are applied which are:

- Occupancy and shielding factor – fraction of time indoors and the reduction in the gamma exposure from the structure
- Depth and cover factor – adjustment for source thickness and depth

The default RESRAD model parameters are further discussed in Appendix A of the RESRAD User Manual. While useful for many exposure scenarios, RESRAD cannot calculate doses from complex geometry or shielding other than a finite slab of varying thicknesses and shapes. Also, doses at dose points other than at one meter above the ground surface cannot be calculated.

2.3.2 MicroShield®

MicroShield® is a commercially available gamma ray dose assessment and shielding code (Grove Software https://www.radiationsoftware.com/) that is widely used in determining gamma ray doses, designing radiation shields, estimating source strength from radiation measurements and minimizing exposure. It uses a point-kernel method for exposure rate calculations and, as such, reduces the computational burden which is inherent in Monte Carlo codes such as MCNP the Monte Carlo N-Particle Transport Code.

In the point kernel method, the radiation source is cut up into elementary cells (point kernels). Each point kernel is transmitted through a material using deterministic methods (i.e. attenuation coefficients, buildup factors etc.) which are typically based on the energy of the gamma ray kernel. Each kernel gives a contribution to the dose at the selected dose point (HPS Chabot reference). MicroShield® is capable of using sixteen different source geometries: 1) Point, 2) Line, 3) Disk, 4) Rectangular Area - Vertical, 5) Rectangular Area - Horizontal, 6) Sphere, 7) Cylinder Volume - Side Shields, 8) Cylinder Volume - End Shields, 9) Cylinder Surface - Internal Dose Point, 10) Cylinder Surface - External Dose Point, 11) Annular Cylinder - Internal Dose Point, 12) Annular Cylinder - External Dose Point, 13) Rectangular Volume, 14) Truncated Cone, 15) Infinite Plane, and 16) Infinite Slab.

For the current risk assessment, the rectangular volume best reflects the use of PG in a road base. Shields can be used on the source geometries such as a shield between a truck driver and the carried load of PG (i.e., the driver is shielded by the steel in the truck box).

MicroShield® also contains a wide variety of custom source and shield material. In addition, the code allows for input of different source and shield materials with different densities and atomic weight percentages which provide for the calculation of attenuation and build-up factors. For example, phosphogypsum is a source material in the truck box for the truck driver scenario.

While having broad applicability, there are nonetheless limitations to the use of MicroShield®. The principle limitation is that it is not an exposure pathway code; only doses from direct gamma exposure can be calculated. It was not designed to evaluate ingestion, inhalation, radon or other pathways. It also has limitations on the geometric/shielding configurations which it can accept. For example, while MicroShield® can calculate doses at off road locations in the case of a nearest resident, it cannot calculate the effects of a cap on the road surface at nearest resident dose point locations off the road. These were estimated using other methods.

2.3.3 Spreadsheet Calculations

While the reclaimer scenario is not considered a reasonable maximum exposure (RME) scenario, the scenario was included in the current assessment at the request of EPA.

For the reclaimer scenario, a combination of RESRAD and spreadsheet calculations were used. Gamma doses were estimated using RESRAD and a Spreadsheet model was used to derive radon flux estimates using accepted approaches (USNRC Regulatory Guide 3.64). In particular, this approach was used to calculate radon flux into a home built on a decommissioned road.

2.4 Approach to Developing Model Inputs and Parameters

This section presents the parameters used in MicroShield® and/or RESRAD. A detailed parameter list is included in Appendix B.

Model inputs and exposure parameters were developed to portray reasonable maximum exposure (RME) scenarios that are developed from a combination of assumptions such that use of alternative assumptions are more likely than not to result in a lower dose (and risk). The RME scenario considers the highest exposure that might reasonably be expected to occur, one that is well above the average case of exposure but within the range of possibility and is intended to provide the basis for estimating the maximum individual risk (MIR). Use of the RME to model baseline human health risks is a conservative approach, in that it yields upper-bound cancer risk and non-cancer hazard estimates (USEPA, 1989) and as discussed in a later Section of this report, alternative assumptions are more likely than not to result in lower exposures and doses than those calculated for the RME.

The model parameters used in the current assessment are a combination of default RESRAD parameters (dose conversion factors for example), default EPA RME exposure parameters (soil ingestion rates and resident exposure duration for example) and parameters such as duration of exposure for road construction workers that were developed as reasonable upper bound values.

The road construction worker exposure duration of 5 years is a conceptual timeframe that represents a portion of industry tenure that would be constructing roads with PG. For example, 80% of the 25-year worker tenure recommended by USEPA (2014) is 20 years and 5 years assuming 25% of that time is spent constructing roads with PG. As another example, a 5-year exposure duration equates to 70% of the Florida Department of Transportation's (DOT's) largest project, the "I-4 Ultimate", which was a $2.3 billion, 21 mile stretch of roadway that took 7 years to complete[10]. Additionally, assuming 70% of two Florida DOT projects with the largest schedule over-runs, which average approximately 3 years for 2010-2017[11], the result would be constructing roads with PG equated to approximately 4 years. Actual exposure to PG in road construction is likely less than 5 years.

Exposure duration is a sensitive parameter in considering dose over an entire exposure period, thus, also in considering cancer risk. Table B.2 in Appendix B summarizes the evaluation of exposure duration for a number of the RME receptors, including a comparison between previous work, various guidance, and values used in this assessment.

As noted above, the hypothetical reclaimer scenario is not considered to be a reasonable maximum exposure (RME) scenario but is nonetheless discussed in a later Section (Section 3.4) for completeness.

2.4.1 Baseline Parameters for Microshield

The following parameter values were used in the MicroShield® calculations:

Densities/Composition

- Source density - The source density was 2.25 g/cc which is standard for concrete.
- Phosphogypsum density - the density of phosphogypsum was 1.12 g/cc (EPA, 1988).
- Air – the density of air 0.00122 g/cc (MicroShield® handbook).
- Concrete composition – The atomic composition and weight percent were from MicroShield® standard (MicroShield® User's manual).
- Phosphogypsum composition - The atomic composition and weight percent were taken from (EPA, 1988).

[10] Florida DOT "I-4 Ultimate": https://i4ultimate.com/project-info/ and https://i4ultimate.com/documents/2014/09/2014-09-05-I-4-Ultimate-Fact%20Sheet.pdf.

[11] Florida Transportation Commission Performance and Production Review Reports, FY2010-2011 through FY2016-2017: http://www.ftc.state.fl.us/reports/pandpreview.shtm. Preliminary calculations for a subset of projects, excluding projects that appear to involve other primary activities such as railway and signal work.

- Soil Composition – The atomic composition and weight percent were taken from Federal Guidance Report 13 (EPA, 1999).

Other Input Parameters

Build-up – The source material was selected as the build-up material as that is assumed to provide the greatest dose for the receptor locations.

Integration Parameters – As noted in a point kernel code the dose is the sum of numeric integration of each kernel dose over the X, Y and Z direction. These need to be selected in MicroShield® to assure the calculated dose converges to a fixed value. Normally these were set to X=20, Y=40, Z=40 but vary with the scenario.

Radionuclides

Source term included radium and all the daughters in secular equilibrium. The radium concentration was 13.5 pCi/g (Ra-226). It was converted to pCi/cc and increased by a factor of ten half-lives and input into MicroShield®. The decay function in MicroShield® was then used to decay the source by ten half-lives which generated all the daughters including the branching ratios.

It is also noted that PG has some minor activity of U-238 through Th-230, the initial portion of the U-238 decay chain. The activity was a few pCi/g (2 to 3 pCi/g). These radionuclides were not considered further in all the dose calculations because the addition dose from this group was shown to be less than about 0.1%.

2.4.2 Baseline Parameters for RESRAD

The following parameter values were used in the RESRAD calculations:

Densities/Composition

- Density of compacted road base and concrete paving - The density of 2.25 g/cc, standard for concrete, was used for road base and road surface for all scenarios, and for soil cover and concrete foundation density for the reclaimer scenario.
- Road area – 1,500 square meters (m^2), 15 m wide by 100 m in length, as described previously in Section 2.1.
- Road base and road surface thickness – 0.25 m and 0.12m, respectively, as previously describe in Section 2.1.

Exposure and Transport Parameters

- Soil ingestion rates – A soil ingestion rate of 82.5 grams per year (g/year) was used for road construction workers and utility workers and 36.5 g/year was used for road users and nearby

resident receptors. These values are consistent with current EPA defaults within the Superfund Program for workers (i.e., 330 milligrams per day [mg/day]) and residents (i.e., 100 mg/day) (EPA, 2014).

- Outdoor time fractions – the following outdoor time fractions were assumed, based on the time each receptor is at the road construction site, on the completed road, or living near the completed road:
  - Road construction worker – 2,000 working hours per year. Fraction = 2,000 hrs / (365 days x 24 hours/day) = 0.23
  - Road user – 500 commuting hours per year. Fraction = 500 hrs / (365 days x 24 hours/day) = 0.06
  - Nearby resident and reclaimer resident – RESRAD default (ANL, 2015), Section 9.6, page 246.
  - Utility worker - 8 hours/day, 5 days/week, for 4 weeks = 160 working hours per year. Fraction = 160 hours / (365 days x 24 hours/day) = 0.018

- Inhalation rates – The RESRAD default inhalation rate of 8,400 cubic meters per year (m^3/yr) was used for the nearby resident receptor. A higher inhalation rate of 11,400 m^3/yr was assumed for road construction workers and utility workers. This value was the RESRAD version 6 default for industrial workers and assumes an hourly rate of 1.3 m^3/hr (EPA 1997).
- Mass loading to air – The mass loading factor of 0.0002 grams per cubic meter) g/m^3 for road construction workers and utility workers was used. This value was described in RESRAD support documentation (ANL, 2015) as the upper end of 98th percentile range for PM2.5 concentrations in ambient air. For the nearby resident receptor, a mass loading factor of 0.0001 g/m^3 was used, which is consistent with the EPA BID value of 100 micrograms per cubic meter (µg/m^3).
- Indoor dust infiltration factor – A RESRAD default value of 0.04 was used.

Other Input Parameters

Cover depth – No cover was assumed for the road construction worker who was assumed to work on PG amended road base. A cover depth equal to the road surface thickness was used for the road user receptor, accounting for shielding of road base by the road surface of the completed roadway. A cover depth of 0.2 m was used for reclaimer resident, accounting for 4 inches (10 cm) of stone cover and a 4-inch (10 cm) concrete slab for indoor exposure.

Radionuclides

Source term included radium and all the daughters in road base and/or road surface as described previously in Section 2.2.

3 ESTIMATED DOSES

The estimated doses to the various receptors are discussed below. These include receptors considered in the original 1992 BID and additional receptors requested by EPA. The original receptors were: the road construction worker ("construction worker" in the 1992 BID), the nearest resident ("member of the critical population group-CPG" 1992 BID), road user motorist ("person diving on road" 1992 BID) and reclaimer. The last, the reclaimer, while not considered as a reasonable maximum exposure (RME) scenario, for this work has been assessed as described in Section 3.4.

Based on discussions with EPA additional receptors were requested to be considered. These included a utility worker working in the PG mix portion of the road, the truck driver delivering the PG to the road construction site, and a bicyclist.

The following Table 3.1 provides a summary of the estimated doses for each scenario. As seen from the Table, all the doses are well below the reference dose (cancer risk management goal) of 600 mrem (the dose equivalent of a total risk criteria of 3 in 10,000.

Table 3.1 Dose and Risk Summary for RME Scenarios

Receptor	CSM	Annual Dose (mrem/year)	Exposure Duration (years)	Exposure Dose (mrem)	Estimated Cancer Risk
Reasonable Maximum Exposure Scenarios					
Road Construction Worker	PG in Road Base	22	5	110	0.5 in 10,000
Road User (Motorist/Bicyclist)	PG in Road Base & Surface	1	26	28	0.1 in 10,000
Truck Driver	PG-Containing Material for Road Base	18.6	5	93	0.5 in 10,000
Nearby Resident[1]	PG in Road Base & Surface	--	26	16	0.08 in 10,000
Utility Worker	PG in Road Base	0.8	1	0.8	0.004 in 10,000
		EPA Cancer Risk Management Goal		600	3 in 10,000

All estimated cancer risks below this goal.

[1] *Nearby Resident Annual Dose Year 1 = 1.1 mrem/year; Annual Dose Years 2-26 = 0.6 mrem/year*

The basis for the dose calculations is described in the following Sections.

3.1 Road Construction

3.1.1 Road Construction Worker

This scenario assumes a road construction worker works directly on the surface of the road as it is being constructed, 2,000 hours/year for 5 years. Although some road construction workers are on equipment during the workday which would provide shielding from external gamma exposure, shielding has not been included in the calculations. This approach provides additional conservatism in the estimates of dose to the RME road construction worker. Doses are calculated from the conceptual site models using the computer code RESRAD. The doses are from direct exposure from gamma emission from PG, and inhalation and ingestion from potential dust emission during construction. In all three CSMs the active road

area is 100 m long by 15 m wide, while thicknesses vary with the CSM. As the model used was RESRAD, the exposure point is at one meter above the surface, the RESRAD default. In addition, it was assumed the road construction worker moves around the surface of the road and the direct dose was calculated as the average of the dose at the road center and at the edge of the road. The calculated annual doses from all exposure routes are as follows:

- PG in road base (no cover) – 22 mrem/year.
- PG in road base and in concrete paving – 4 mrem/year.
- Road base without PG and PG in the concrete paving – 0.8 mrem/year.

The first shows the most conservative dose is associated with PG in the road base with no pavement cover. This is the most conservative scenario as road construction workers would spend a portion of time on paved roadway. For the case with PG in the pavement on the road base, the pavement acts as a shield reducing the surface dose. While the PG in the pavement provides a small contribution to the surface dose, the isotopic concentration is much lower, as is the thickness.

Assuming the road construction worker is exposed on the road base with no cover for a period of 5 years, the total dose is 110 mrem or a risk of 0.5 in 10,000.

3.2 Living Proximate

3.2.1 Resident Living Near Road

This scenario assumes a resident lives close to the site of the road as it is being constructed and after construction. In the first case, no shielding (road shoulders, etc.) was assumed during construction. After construction, a shoulder was established. During construction MicroShield® was used to determine the doses at various distances from the road. A rectangular volume was assumed, 15 m wide, 100 m long and 0.25 m thick. The contribution to the receptor is from the side face during construction and the surface of the road following construction. That is the contribution from the side of the road – the 25 cm thickness 100-meter long face and the contribution from the 15 meter by 100 meter surface of the road. Doses were determined at 20 ft and 50 ft from the edge of the road at a receptor height of 1 meter above the road surface. The distance of 20 ft is considered representative of urban settings with houses at a minimum separation from the road edge (urban setting may also have more shielding). The distance of 50 ft is representative of more suburban setting where separation distances between roads and homes are expected to be greater. The calculated dose rates were:

- At 20 ft – 1.14 micro Roentgen per hour (µR/hr) (and where 1 µR = 0.001 mrem, 1.14 x 10^{-3} mrem/hr)
- 50 ft - 0.32 µR/hr (0.32 x 10^{-3} mrem/hr).

These dose rates, calculated as described below, are quite low compared to background and are conservative.

This is expected as for the side face, only the initial two ft (60 cm) of road will contribute gamma radiation. Gammas originating deeper than 50 to 60 cm into the road will be shielded by the road material. For the dose from the surface face, the pathways (allowable angles) to the receptor decrease as the distance from the road edge increases. This field of view of the road surface will continue to decrease the further away a receptor is from the road edge. At a sufficient distance from the receptor the road appears as a line source.

After construction, shielding of the PG amended road base is provided by the fill in the road shoulders and the concrete paving.

Some inherent limitations with the MicroShield® code prevent the geometry of the shielding for this configuration to be calculated directly. Specifically, the shield and receptor heights must be the same, which is not the case here with a 25 cm shield and 100 cm receptor. However, estimates of the reduction in dose were determined. For the dose from the 25 cm edge of the road, a six-foot (2-meter) soil "road shoulder" was assumed and calculated using MicroShield®. This reduced the dose from this face by six orders of magnitude – essentially zero dose. The second face contributing to the dose is the road surface. The dose from the top face of the road is reduced by the concrete paving. A five- to six-inch (13 to 15 cm) concrete shield will reduce the surface dose by a factor if 3 to 4 (Schiager, 1974). Assuming linearity, the estimated dose using a reduction factor of 3.5 following construction of shoulder and placement of road surface over road base, the estimated gamma dose rates at the prior distances are:

- 20 ft – 0.33 µR/hr (0.33×10^{-3} mrem/hr)
- 50 ft - 0.1 µR /hr (0.1×10^{-3} mrem/hr).

The level of residential exposure to radiation from PG used in road construction depends upon whether the PG road base is unshielded and the distance from the edge of the road to nearest RME residence. In all residential scenarios (urban and other locations), we assumed the PG road base is not paved during the first 35 days of construction; therefore, the exposure is higher during this brief period than after the road is completed.

The evaluation assessed urban roads using an RME distance to the nearest residence of 20 ft. But in urban locations, there is more shielding provided by sidewalks and other urban infrastructure; therefore, residential exposure is likely to be lower than the simple estimate.

For roads in non-urban settings, this Report calculates exposure for receptors at both 20 ft and 50 ft from the edge of the road. For this analysis, we used professional judgment to establish an RME distance at 50 ft from the road to the non-urban residence. We also calculated exposure using a distance of 20 ft, to illustrate the degree to which radiation levels decrease with distance.

Exposures of nearby urban, suburban, and rural residences to radiation associated with PG use in roads are reduced not only by the shielding afforded by the road itself but also as a result of distance from the source. At a distance of 20 ft from the completed road, the radiation is already a small fraction of background levels and compared to levels of naturally-occurring radiation would be indistinguishable from natural

variability of naturally-occurring radiation. This already low level of gamma exposure decreases by an additional 70% between 20 and 50 ft and continues to rapidly decline with distance from the road. Therefore, the exposures considered at 20 ft and 50 ft from the road represent reasonable maximum exposures for residences; residences located further away from a road constructed using PG would be much lower and again indistinguishable from the variability in naturally occurring background.

An estimate of the gamma external dose for the above is as follows. Residence time per year in the residence is 350 days/year (EPA,1991 OWSER 9285). Road construction is expected to be 5 weeks exposing the resident to a road with no shield (pavement) for 35 days (840 hours). The dose at different distances from the road is dose rate times the construction period. The additional dose for the remainder of the year (315 days) uses the shielded dose rate. The total residence time is 26 years or an additional 25 years residence. The total dose during this period ranges from 73 mrem for the closest resident, 20 ft from the road edge to 20 mrem at 50 ft. The average annual dose from natural background is about 310 mrem per year, inclusive of radon. The average annual dose from external gamma is about 82 mrem per year (for further context discussion, see Section 5. Table 3.2 presents the calculation details for all the distances.

Table 3.2 Calculation Details for all Distances

Distance from Road	Dose During Construction in Year 1*		Dose After Construction in Year 1*		Dose After Construction in Years 2 - 26*			
	Rate	Dose	Rate	Dose	Rate	Dose	Total Dose	% gamma background
feet	µR/hr	mrem	µR/hr	mrem	µR/hr	mrem	mrem	%
20	1.14	0.96	0.33	2.5	0.33	69.3	72.8	3.4
50	0.32	0.27	0.1	0.70	0.1	19	20.0	0.9

*For dose during construction - Multiply rate by 840 hours.
*For dose after construction in Year 1 – Multiply rate by 7560 hours.
*For dose for Year 2 to 26 – Multiply by 210,000 hours.
*Divide by 1,000 to convert µR to mrem.

The above results are further reduced by consideration of a “shielding” factor for gamma exposure during time spent inside the house. For present purposes, the RESRAD default shielding factor of 0.7 can be applied for time indoors. Assuming that an individual spends about 70% of his or her time indoors and 30% of his/her time out of doors, then the dose rates and resulting doses are shown in Table 3.3.

Table 3.3 Calculation Details for all Distances with Indoor Shielding

Distance from Road	Dose During Construction in Year 1*		Dose After Construction in Year 1*		Dose After Construction in Years 2 - 26*			
	Rate	Dose	Rate	Dose	Rate	Dose	Total Dose	% gamma background
feet	µR/hr	mrem	µR/hr	mrem	µR/hr	mrem	mrem	%
20	0.90	0.76	0.26	1.98	0.26	54.7	57.5	2.7%
50	0.25	0.21	0.08	0.55	0.08	15.0	15.8	0.7%

*For dose during construction - Multiply rate by 840 hours.
*For dose after construction in Year 1 – Multiply rate by 7560 hours.
*For dose for Year 2 to 26 – Multiply by 210,000 hours.
*Divide by 1,000 to convert µR to mrem.

Calculated doses for incidental ingestion and inhalation during construction are 0.28 mrem and 0.01 mrem, respectively. The annual dose for the first year including 35 days of construction and all exposure pathways of a resident 50 ft from the road is about 1.1 mrem/yr. In subsequent years after construction the annual dose is 0.60 mrem/yr. Assuming the resident is exposed for a period of 26 years, the total dose is 16.1 mrem or a risk of 0.08 in 10,000.

Exposure to children was considered in the risk assessment. Exposure parameters such as ingestion rate and inhalation rate for children are generally higher per unit body mass than for adults; however, childhood is of a shorter duration than adulthood. The dose coefficients for ingestion and inhalation that were used in RESRAD from ICRP 72 vary by about two times; however, dose coefficients for external radiation that were used in RESRAD from ICRP 60 do not vary any age group. Since the bulk of the dose is from external radiation and the portion of the exposure duration as a child is a relatively short, the amount of possible increase in ingestion and inhalation dose for exposure during childhood is small and nominal to the total annual dose. Overall, including the doses received as a child do not have a material effect on the dose assessment and associated risks.

3.3 Road Users

3.3.1 Road Users – Motorist/Bicyclist

Two road users were considered for this scenario, a driver and a bicyclist. In both instances they were assumed to travel on a final constructed road with PG in the road base and the paving. The dose to either road user was calculated as 1.1 mrem/yr. No reduction was provided to the driver as the floor and auto body shielding are assumed negligible given the current materials used thin plastic/metal. Conservatively assuming these road users commute on the road for a period of 26 years, the total dose is 28 mrem or a risk of 0.1 in 10,000.

3.3.2 Utility Worker

The utility worker dose was calculated using MicroShield®. It was assumed that a trench was cut across the road. The utility worker was assumed to work in the middle of the trench about one meter from the face of the road. The dose point was 7.5 m from the road edge, 51 m from the road end and 0.25 m high. The isotopes in the PG were Ra-226 in secular equilibrium with the daughters. The activity was taken as 13.5 pCi/g as the PG was mixed with road surface material at a 1:1 ratio. The calculated hourly dose was 2.08 µR/hr. This was doubled to take into account the other half of the road giving a dose or 4.2 µR/hr. The MicroShield® output in Appendix D.

The direct exposure dose to the utility worker was calculated assuming the utility worker spends 160 hours per year in the PG road. Multiplying the hours worked by 0.0042 mrem/hr results in an external annual dose of 0.67 mrem/yr.

The ingestion and inhalation doses (0.15 mrem/yr and 0.01 mrem/yr) were calculated from RESRAD and was assumed the same as the road construction worker reduced by the hours worked in the trench. The total dose was then estimated by adding external dose which leads to an annual dose of 0.8 mrem/yr. Assuming the utility worker is exposed for a period of 1 year, the total dose is also 0.8 mrem or a risk of 0.004 in 10,000.

3.3.3 Truck Driver

Another receptor is the truck driver who transports PG from the PG stack to the site of the road construction. The truck is assumed to be a standard dump truck. The dose to the truck driver was calculated using MicroShield®. The geometry selected was a rectangular volume, with the dimensions of the roll-off portion being 17 ft long, 4.5 ft high and 7 ft wide which is the average for a 20-ton dump truck. The dose point was one meter from the center of the roll-off front face, where the driver would be sitting. The truck was assumed to be filled with phosphogypsum with a density of 1.12 grams per cubic centimeter ($g/cm^{3)}$ which is somewhat lighter than soil. The isotopes in the PG were Ra-226 in secular equilibrium with the daughters. The activity was assumed 27 pCi/g as the PG was not yet mixed with road surface material. No credit or reduction was taken for the shielding effects of the truck cab. The calculated hourly dose was 19 µR/hr. The MicroShield® output is presented in Appendix D. The annual dose was calculated assuming the driver hauls material for the entire year (2000 hours), however the roll off is only filled half the driving time (1,000 hours). Multiplying the hourly dose by the time hauling PG results in an estimated annual dose of 18.6 mrem/yr. Assuming the truck driver is exposed for a period of 5 years, the total dose is 93 mrem or a risk of 0.5 in 10,000.

3.4 Ultimate Disposition Evaluation

The EPA PG use regulations require an assessment of the risk from the ultimate disposition of PG or any product in which the PG is incorporated. 40 C.F.R. § 61.206. The ultimate disposition of a new road constructed with PG or any product containing PG is considered in terms of what is the reasonable maximum exposure for ultimate disposition.

The RME for ultimate disposition of a new road constructed with PG is that it serves as an established part of municipal (county, state and/or federal) infrastructure and as such would require periodic repair and expansion as needed. These activities could include removing the surface, grinding and reusing or disposing of the materials consistent with federal and state and local regulations. Exposures and risks associated with maintenance of roads and reuse of construction materials are expected to be comparable or less than those detailed in the risk assessment for road construction. It is also noted that as part of road construction, no excess PG is expected to be left over. Road builders avoid transporting extra material to a construction site and would mix in any remaining PG to avoid additional handling.

The sustainability of roads and the reuse of road construction materials are key aspects of guidance and plans for roads under the jurisdictions of the Federal Highway Administration and state Departments of Transportation. The in-place abandonment of municipal infrastructure and allowance for construction of residences on top of these abandoned roads runs counter to sustainable infrastructure projects involving road construction. In any case, the construction activities required for road maintenance result in less exposure than during the original road construction (i.e., the construction activities on scale). Thus, the risk is less than those calculated in this report for the road construction.

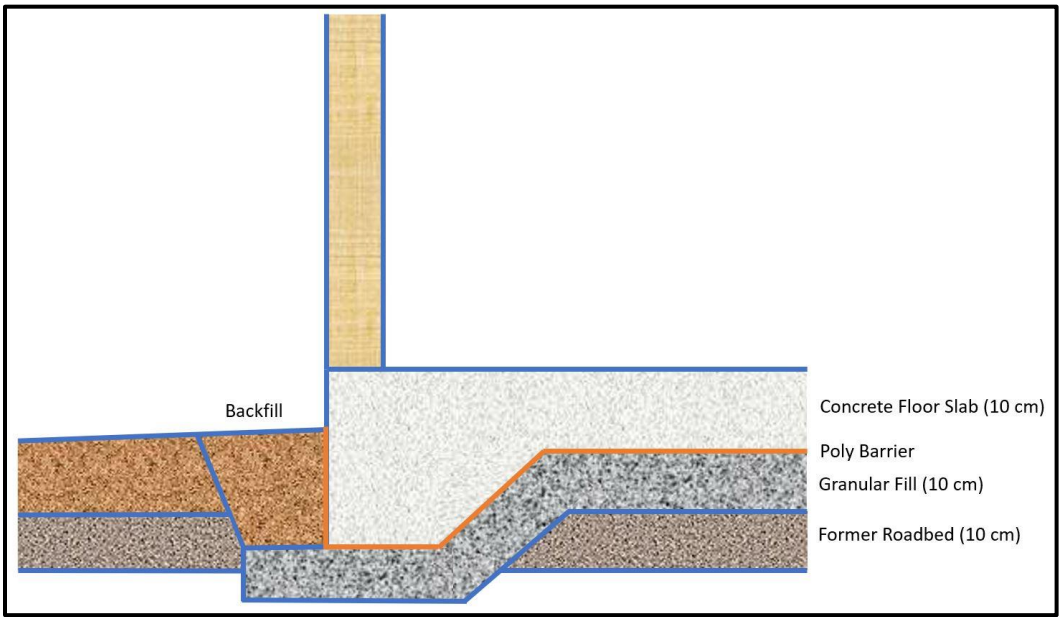
3.4.1 Reclaimer Exposure Scenario

At EPA's request, this report includes a reclaimer scenario, which is not considered as a reasonable maximum exposure (RME) scenario. The reclaimer scenario assumes that the home is a bungalow constructed slab on grade with a 4-inch underlying slab and a 4-inch gravel base underlying the slab. The basic scenario takes credit for a vapor barrier but takes no credit for any radon mitigation that might be required for local building codes.

As with the case of the nearby resident, the house is presumed to be occupied for 26 years.

The configuration of the slab on grade construction is for the reclaimer scenario is illustrated in Figure 3.1.

Figure 3.1 Slab on Grade Construction for Reclaimer Scenario



In broad terms, the reclaimer scenario assumes the following:

- Exposure to the reclaimer would be through gamma radiation and the inhalation of Radon (Rn-222) and progeny.
- The reclaimer is assumed to be exposed for 26 years with approximately 75% of his/her time onsite and indoors.

Radon Exposure and Dose

The key assumptions are as follows:

- The road surface has crumbled and has been removed as part of site preparation (50 years after closure also as assumed by the EPA in their 1992 BID).
- Site grading for construction will almost certainly reduce the thickness of the layer containing PG; however, for present purposes, we have assumed that site preparation will reduce the PG layer to about 10 centimeters (cm) in thickness and the concentration of Ra-226 in the remaining layer to about 10 pCi/g.
- Radon flux is reduced due to a 6-millimeter (mm) poly layer as a moisture barrier currently common in building codes. Such a layer would be expected to reduce the radon flux by at least a factor of 10 (Kitto and Perazzo, 2010).

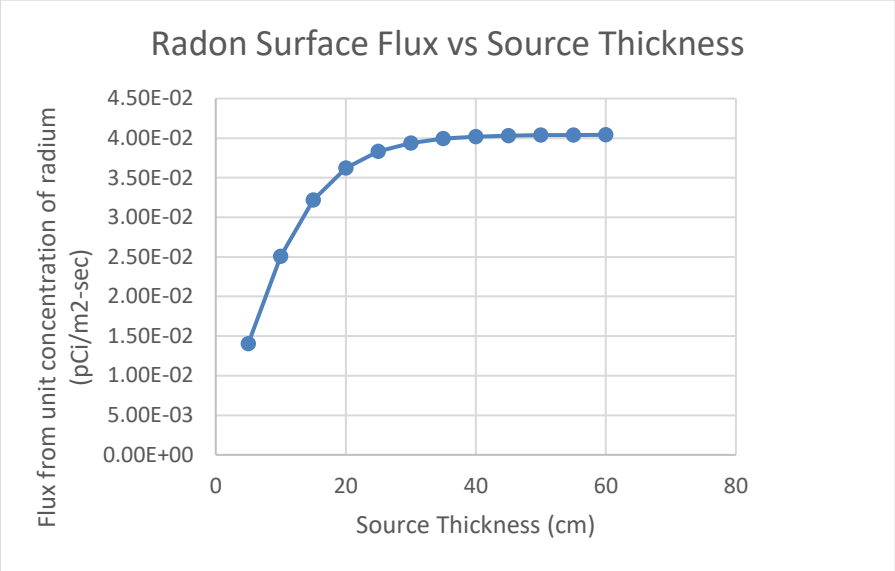
Figure 3.2 illustrates the effect of source thickness on radon flux. Radon flux increases with increasing source thickness up to an approximate thickness of 35 cm. For source thicknesses greater than

approximately 35 cm, radon flux is approximately constant due to the greater diffusion distance and substantive decay that occurs below the surface.

Figure 3.2 shows the calculated radon flux from a bare (uncovered) surface of a PG amended soil layer. The figure assumes a unit concentration of Ra-226 radium in the PG amended surface (i.e., 1 pCi/g). The assumed diffusion coefficient is $4x10^{-4}$ square centimeters per second (cm^2/s) and the emanation E=0.062 (See Rogers *et.al*, 1994 and Chauhan 2015). The radon flux was calculated using the formula in USNRC Reg Guide 3.64. (USNRC 1989).

Thus, the values shown in Figure 3.2 should be multiplied by 10 pCi/g to yield the associated radon flux. For the current assumptions, i.e., 10 cm thick layer of amended PG at 10 pCi/g, radon flux through the surface of a PG amended soil layer 10 cm thick would be about 0.25 pCi/m^2-s. Further, the concrete slab (assumed 10 cm thick) would reduce the radon flux through the slab into the home to about 0.09 pCi/m^2-s. Due to the 6-mm poly vapour barrier will further reduce the radon flux by a factor of 10 (or more). The resulting radon flux into the home is 0.009 pCi/m^2-s.

Figure 3.2 Effect of Source Thickness on Radon Surface Flux



The dose from exposure to radon and progeny was estimated using spreadsheets.

As outlined above, the estimated radon flux into the home is about 0.009 pCi/m^2-s. The calculations to convert this flux to a dose are as follows:

Assuming a notional slab on grade house:

A = 100 m^2 (i.e. 10 x 10) } UNSCEAR 2000 Appendix B

V = 250 m^3

S = Source term

= area (m^2) x flux (pCi/m^2.s)

= 100 m^2 x 0.009 pCi/m^2.s

Rn = "radon inventory"

Where s = seconds

Neglecting Rn in outside air and assuming steady state between radon coming into the home and dilution through home ventilation (air changes), we can derive the following equation:

$$Vd\ (CRn)/dt = S - V.C.\ ACH\ (\text{adjustments to s}) - \lambda VC$$

For d(CRn)/dt = 0 the above reduces to

$$C = \frac{S}{V\ (ACH\ (\text{adjustments to s}) + \lambda)}$$

For current assumption:

$$C \text{ picocuries per liter [pCi/L]} = \frac{100\ m^2 \times 0.009\ \frac{pCi}{m^2.s}}{250\ m^3 \times \left(\frac{1\ hr}{3600\ s/hr} + 2.1 \times 10^{-6}\right) \times \frac{1000\ L}{m^3}}$$

$$\approx 0.013\ pCi/L$$

For context, the National Residential Radon Survey (NRRS) carried out by the U.S. Environmental Protection Agency (EPA) completed in 1991, reports measured radon gas concentrations in U.S. homes at an average of about 46.3 ± 4.4 Becquerel per cubic meter (Bq/m^3) (one standard error) (as cited in NCRP 2019, Report No. 160, Section 3.5.2). Converting from Bq/m^3 to pCi/L, this converts to an average indoor radon level of about 1.25 pCi/L with a one standard deviation at about 0.12 pCi/L. The estimated incremental indoor radon level arising from residual PG under the residence is less than one standard deviation of background. NCRP 160 also indicates that typical outdoor levels of radon are about 15 Bq/m3 or 0.4 pCi/L. Thus, the predicted incremental indoor radon level attributable to PG under the home is small by comparison to either the variation in indoor levels or the typical outdoor level of ambient radon.

Assuming an equilibrium factor of 0.4 and 6000 hours per year of time indoors leads to an exposure of about 0.4 WLM and assuming a 1000 mrem per WLM conversion factor[12] (NCRP 160) this converts to a dose of about 1.8 mrem/year.

Gamma Dose

[12] The conversion factor from WLM to dose has been and continues to be the subject of much discussion. During the initial development of the risk assessment, the use of 400 mrem per WLM was discussed. Upon review, it was decided that the use of 1000 mrem per WLM should be used. The notional value of 1000 mrem per WLM was adopted by NCRP 160. It should be emphasized that most of the risk arising from exposure to radon decay occurs in smokers. See for example discussions in UNSCEAR 2006 Annex E and ICRP reports 115 and 126. In addition, Darby et.al. (2004) indicate that based on a European study of the risks of residential radon, that in the absence of other causes of death, the absolute risks of lung cancer by age 75 years would be about 25 times greater for cigarette smokers than non-smokers. The EPA (2016) provides tables that allow comparison of risks to smokers and non-smokers which show the risk to smokers is a factor of about 10 or so greater than the risk to non-smokers (and former smokers). The lower dose conversion factor might be appropriate for a population of non (or former) smokers.

RESRAD was run for indoor gamma exposure dose for the reclaimer scenario. Indoor exposure (75% onsite and indoors to be consistent with radon assumptions) was modelled for a 100 m^2 source underlying a 10 m by 10 m residence. The 4-inch (10 cm) thick layer of PG amended soil is overlain by a 4-inch layer of cover (10 cm) and a 4-inch (10 cm) thick layer of concrete (floor slab). Neither of these layers are credited for reducing radon flux into the home, but both result in a substantial reduction in gamma levels anticipated on top of the floor slab where people would be exposed.

The gamma dose estimate was performed using RESRAD and for the above assumptions, amount to about 1.2 mrem/y.

Thus, as presented in Table 3.4, for the above assumptions, the dose to a reclaimer is estimated at about 3 mrem/y. Assuming the reclaimer is exposed for a period of 26 years, the total dose is also 78 mrem or a risk of 0.4 in 10,000.

As noted in the discussion of the ultimate disposition scenarios (road abandonment, and the construction of a home on the abandoned road) is not an RME exposure. The fact that this extreme exposure scenario corresponds to a risk below the EPA risk management level confirms that the lesser exposure in the ultimate disposition scenario need not include a numerical risk assessment. (see discuss in section 5 below.)

Table 3.4 Evaluation of Ultimate Disposition of PG Road

Receptor	CSM	Annual Dose (mrem/year)	Exposure Duration (years)	Exposure Dose (mrem)	Estimated Cancer Risk
Hypothetical Scenario Beyond RME for Screening Purposes					
Reclaimer Resident:	PG in Road Base	3	26	78	0.4 in 10,000
		EPA Cancer Risk Management Goal		600	3 in 10,000

Estimated cancer risk below this goal.

3.5 Comparison of Doses and Risks from 1992 BID to Current Estimates

During a meeting with EPA, the EPA indicated that it would be necessary for them to consider how information developed since their 1992 BID might change their risk assessment assumptions. A detailed comparison of models and assumptions used in the 1992 BID and the present report is extremely complex and beyond the scope of the present report. Nonetheless, we have attempted a very "high level" and preliminary overview of the main differences that we could readily identify between the dose and risk results provided in EPA's 1992 BID and those previously discussed in this report.

The EPA in their 1992 BID considered 4 scenarios for use of PG in roads, two which involve use of PG in a secondary road as road base and two which involve use of PG in a concrete road surface:

- For the road base, the EPA assumed a Ra-226 concentration of 30 pCi/g and a 1:2 dilution of PG with soils for a road base concentration of 10 pCi/g. The road base was assumed 0.25 m thick and 30 feet (9.15m) wide and that the road base is covered with a 0.12 m (5 in) thickness of asphalt.
- For use of PG in a concrete road surface, the EPA assumed the road surface incorporates 15% PG by weight and an average Ra-226 concentration of 30 pCi/g (i.e., Ra-226 at 4.5 pCi/g) 0.12 m thick (5 in) and 24 feet wide (7.32 m). The road base under the surface is as described above.

The EPA considered a road construction worker, a person driving on the road (road user) and a nearby receptor (assumed living proximate to the road). The EPA also considered a reclaimer who builds a house on an abandoned road base after the road surface has been removed.

The 1992 BID estimated radiation doses and risks from one year of exposure demonstrated that for practical purposes:

- Dose to a road construction worker is dominated by direct gamma;
- Dose to a road user is only from gamma radiation; and,
- Exposure to the critical population group member (nearby resident 100 m from the edge of the road) is dominated by external gamma radiation.

Calculating the dose and risk from the assumed duration of exposure is done be multiplying the dose or risk from one year of exposure by the number of years a receptor is exposed. As discussed in the 1992 BID, the reclaimer was specified at 70 years of exposure. Clearly, this is an extremely conservative assumption and as discussed elsewhere, this assessment assumes residency of 26 years being the upper end (upper 90th percentile, EPA 2014) of how long someone spends at a particular residence.

The analysis described in the current risk assessment (this report) makes the following key assumptions, a Ra-226 concentration in PG of 27 pCi/g, a 1:1 dilution of PG with soils (higher PG to soil than EPA's 1:2 PG to soil in 1992), and a road thickness of 0.25 m (the same as in 1992). The current risk assessment considers the same receptors as did EPA in 1992 as well as two additional receptors suggested by the EPA, namely, the truck driver transporting PG to the construction site and a utility worker who works some time in a trench cutting across a road constructed with PG.

The following bullet points provide a few additional comparisons between the 1992 BID risk assessment and the current assessment:

- The EPA (at Table 4-16 for a road base of PG and sand) provided results for a variety of Ra-226 concentrations in PG, the highest of which is 26 pCi/g, comparable to our notional assumption of 27 pCi/g.
- The EPA report has four tables of annual doses and associated risks from a single year of exposure:

- For the road construction worker, the EPA considered workers standing on the road base and unshielded as also assumed for the current risk assessment. The current risk assessment assumes a worker moves around over the road surface and is exposed at the average of the gamma fields at the centre and edge of the road. While not fully clear, the EPA in 1992 may have assumed a worker was always in the centre of the road which would largely account in the difference between gamma doses estimated in 1992 and now.
- The road user is assumed in both cases to drive on a road with PG base and a cover (in 1992 asphalt or cement) and in the present analysis, for purpose of illustration concrete road surface was assumed. Only annual dose and risk are available from the 1992 risk assessment. The 1992 EPA risk assessment used a 0.6 shielding for the road user, but rather than determine the degree to which vehicles have changed the amount of metal in the under carriage of cars, the current risk assessment takes no credit for shielding provided by the vehicle which however would provide some level of shielding which is a conservative assumption and could reasonably be considered.
- The dose to the nearby resident is dominated by exposure to gamma radiation which decreases rapidly with increasing distance from the edge of the road. The 1992 risk assessment assumed the nearest resident at 100m (a bit over 300ft) from the edge of the road. The current assessment considers the RME exposure scenario to be a resident whose home is 50 ft from the edge of the road (an urban resident whose home is at 20 ft from the road is also calculated to illustrated the change in exposure levels with distance.
- The current risk assessment considered two receptors beyond those considered in the 1992 BID (truck driver and utility worker).

Both risk assessments considered a reclaimer scenario with exposures from gamma radiation and radon. Both assume the surface is removed. The 1992 analysis assumes the home is built directly on the road base and the current assessment assumes that site preparation and grading take place which reduces the thickness and to a lesser degree, the concentration of residual road base. The 1992 BID does not indicate how the risk from radon was calculated (dose from radon was not reported in the 1992 BID). The 1992 BID assumed 70 years residency and the current assessment assumed a 26-year residency (the upper 90th percentile). The current assessment also assumes a 6 ml poly layer which is standard as a vapor barrier in home construction.

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4 RISK DISTRIBUTION DISCUSSION

This risk assessment describes the potential uses of PG in road construction and lays out the potential associated exposure pathways for workers and members of the public who work in the construction of roads or who live proximate to roads constructed from PG and those who use the roads once constructed. As described earlier, the receptor scenarios were selected and designed to have reasonable maximum exposures, doses and risk.

The RME exposure assumptions and parameters were selected to estimate a radiation dose that is consistent with the "reasonable" upper end of the range of plausible exposures. Accordingly, they are generally more likely than not to overestimate the doses and associated risks arising from the proposed alternative use of PG in road construction.

The RME receptors are used to calculate the dose (i.e., the amount of radiation to which the individual in the exposure scenario receives over a particular unit of time). The associated risk is assumed to increase in direct proportion to the dose calculated for the RME (i.e., if the RME increases by a factor of two, the risk increases by a factor of two).

The risks were calculated for each exposure scenario and receptor as follows:

- The dose to the RME is calculated for each year of exposure;
- The total dose is calculated by multiplying the annual dose to the RME by the assumed years of exposure (exposure duration);
- The total radiation dose is converted to risk using a radiation dose to risk conversion factor of 5 in 10,000,000 per mrem;
- The total risk is compared to the EPA's total cancer risk goal for new PG uses of 3 in 10,000 (which is equal to a total dose of 600 mrem).

The total doses estimated for each of the road exposure scenarios described earlier in the report are summarized in the following Table 4.1. The table also summarizes the corresponding risks arising from the duration of exposure assumed for each scenario and receptor.

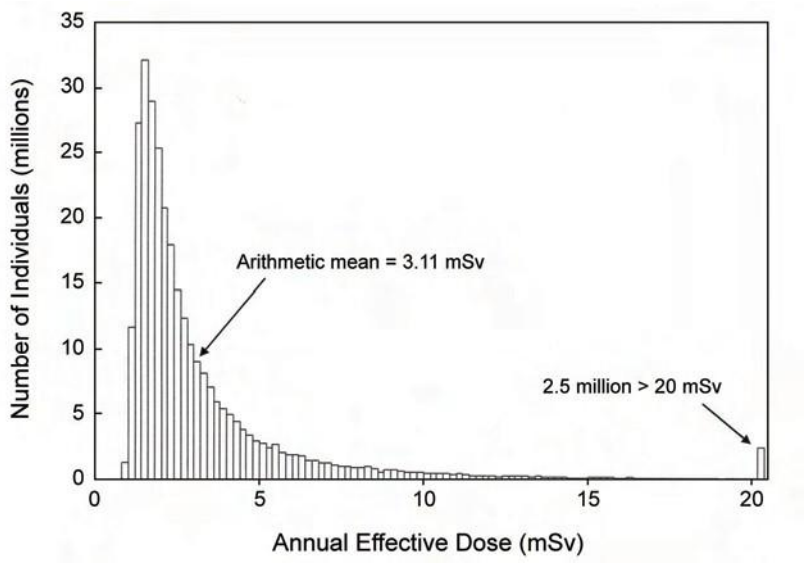
Table 4.1 Dose and Risk Summary for All Scenarios

Receptor	CSM	Exposure Duration (years)	Exposure Dose (mrem)	Estimated Cancer Risk	Background Dose from Exposure Duration (mrem)	Exposure Dose Percentage of Background Dose (%)
Reasonable Maximum Exposure Scenarios						
Road Construction Worker	PG in Road Base	5	110	0.5 in 10,000	1550	7%
Road User (Motorist/Bicyclist)	PG in Road Base & Surface	26	28	0.1 in 10,000	8060	0.3%
Truck Driver	PG-Containing Material for Road Base	5	93	0.5 in 10,000	1550	6%
Nearby Resident	PG in Road Base & Surface	26	16	0.08 in 10,000	8060	0.2%
Utility Worker	PG in Road Base	1	0.8	0.004 in 10,000	310	0.3%
	EPA Cancer Risk Management Goal		600	3 in 10,000	600	

Estimated cancer risk below this goal.

All of the predicted risks for the RME receptors are below the EPAs reference risk factor for new uses of PG of 3 in 10,000. As previously explained, the average annual dose to anyone in the US is about 310 mrem per year (as per NCRP 160). As illustrated in Figure 4.1, there is a wide distribution of dose to people living in the USA arising from natural background sources including, gamma radiation from terrestrial sources and the inhalation of radon and its short-lived decay products. As illustrated in the figure, a substantial number of people living in the US receive an annual dose greater than 10 mSv (i.e., an annual dose greater than 1000 mrem).

Figure 4.1 Background Dose Distribution



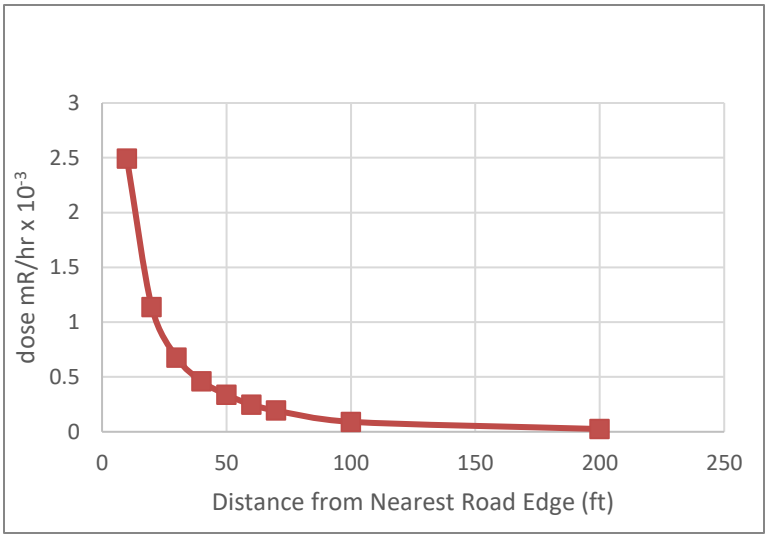
Frequency distribution of annual effective dose (millisievert) for ubiquitous background radiation for members of the U.S. population, 2006. (adapted from Figure 3.20 of NCRP 160)

Risk distribution across a local population is also affected by these factors. The intent of the risk assessment is to predict dose (and risk) for the groups considered likely to be most exposed. The risk assessment does not reflect the general exposures to the entire population. Most public receptors would receive much lower doses than those estimated for these RME receptor groups since most people are located much further from the sources or have shorter exposure periods.

By selecting conservative parameters at the upper end of expected distribution ranges the results are targeted for reasonably extreme cases and do not represent expected results for the more typical local populations of potentially exposed individuals. The assumption of 26 years residency in a home is considered by EPA to be an RME scenario, because it is the upper 90th percentile, i.e., 90 percent of people live in the same home for 26 years or less (EPA 2014). The assumption of a 1:1 ratio mixing of PG with local construction road base materials (sands for example), the EPA assumed a 1:2 mixing of PG with native soils; and the assumption that the proximate resident lives in a home 50 ft from the edge of the road (EPA assumed 330 ft or 100 m).

Exposures and dose are highly dependent on proximity to the PG road and exposure and decrease rapidly with distance from the road as clearly illustrated in the following Figure 4.2.

Figure 4.2 Dose Rate with Distance from Road



Dose vs distance from edge of road at height of 1 m above road surface.

As previously noted, external gamma dose is the dominant contributor to dose. Thus, the incremental dose attributed to PG in a road rapidly becomes lost in the natural dose from background (i.e., there is no additional risk beyond a few hundred ft from the edge of the road).

Thus, other individuals possibly exposed are expected to have notable reductions of exposure duration or proximity results dose well below reasonable maximum scenario values.

5 CONCLUSIONS

The risk assessment for use of PG in road construction is based on EPA guidance and regulation regarding the appropriate risk benchmark for judging reuse of PG. Specifically, the current risk assessment adopts the EPA's target that

> "…*certain uses of phosphogypsum may be considered acceptable so long as those uses are restricted to limit the estimated lifetime risk to any individual to no more than 3 in 10 thousand" (see the Petition for a full discussion of the regulatory history)*.

The annual doses to an RME receptor for each of the scenarios was estimated for both annual exposure and for the assumed duration of total exposure. The total exposure risks were estimated based on duration of exposure for each of the scenarios and receptors.

The results discussed in the previous sections of this report are generally dominated by gamma radiation exposure, which is sensitive to the proximity of the receptor to the PG based road. The gamma radiation exposure rate is also affected by the shielding created by the upper cover layer of the road above the PG road base. As a result, the highest exposure rates are limited in duration to the construction period.

The factors of proximity and duration associated with the most dominant exposure pathway of gamma radiation from an unshielded road base results in limited opportunities for high exposures, doses and risk. The population will have limited or negligible exposure to unshielded road base.

Table 4-1 provides a summary of the results of the calculation for all receptor scenarios. The annual doses estimated for the various receptors arising from the use of PG in road construction are small. Indeed, they represent a small fraction of the unavoidable dose from natural background radiation of about 310 mrem/yr.

The total dose arising from the full duration of exposure is well below the dose of 600 mrem which is equivalent to the total risk of 3 in 10,000.

Overall, the use of PG in road construction will result in very small doses (to reasonably maximally exposed receptors) and total risks that are well below EPA's reference total risk goal.

It should be noted that the risk assessment was based on a nominal radium-226 value of 27 pCi/g, a value based on previous work by the EPA and published information on radium-226 levels in PG. All other factors the same, the potential doses and risks arising from the use of PG in road construction can be scaled on the basis of relative concentrations of radium-226 in PG. For example, the risks to a road construction worker arising from the use of PG containing, for example, 30 pCi/g of radium-226 would be about 0.5 in 10,000 (i.e., 0.5/10,000 x 30/27).

This concept is further illustrated in the following Table 5.1 which illustrates how the dose to a road construction worker, the most exposed individual RME considered in the current assessment, scales by concentration of Ra-226 in PG and assuming all other factors remain the same.

Table 5.1 Illustrating Scaling Risks by Ra-226 in PG

Average Ra-226 in PG*** (pCi/g)	Exposure Duration Dose* Mrem	Risk**
10	40.7	0.20 per 10,000
20	81.5	0.41 per 10,000
27	110	0.55 per 10,000
30	122	0.61 per 10,000
35	143	0.71 per 10,000
40	163	0.81 per 10,000
50	204	1.02 per 10,000

*For an assumed duration of construction on PG roads of 5 years. Dose scaled from 110 mrem based on PG concentration (e.g. For 10 pCi/g: 40.7 mrem = 110 mrem x 10/27).

**Risk is calculated for each dose value (e.g. For 10 pCi/g: 40.7 mrem x 5 x 10^{-7} per mrem = 0.2 in 10,000)

*** Although we are not aware of any PG with average Ra-226 concentrations anywhere near 148 pCi/g, such PG could in principle be used for road construction and still achieve the EPAs safe level of a risk of 3 in 10,000.

For context, consider the following comparisons to unavoidable natural background radiation described below.

Background radiation experienced by U.S. citizens is comprised of naturally occurring radiation, other sources such as medical examinations, and exposure to products in commerce also contribute to an individual's exposure. Information on the unavoidable exposures from natural background can help provide perspective on the incremental exposures estimated for the current risk assessment.

There are many sources of information on radiation exposures at the state and national levels. For illustration purposes, this risk assessment uses a value of 310 mrem/year as a national average for naturally occurring radiation as provided by the National Council on Radiation Protection & Measurements (NCRP), Report No. 160 (NCRP Online, September 24, 2019). This information is broadly used by the EPA and others to communicate information on natural background radiation (USEPA, September 24, 2019).

The primary components of naturally occurring background radiation as discussed in NCRP Report No 160 include the following national average values: radon (228 mrem), cosmic (33 rem), internal (i.e., from diet and drink), and terrestrial (21 mrem). While the value of 310 mrem/year provides a national average, naturally occurring background varies widely up to and above 1,000 mrem/year or more as previously illustrated in Figure 4.1.

Natural background doses also vary geographically with some states having higher and some lower naturally occurring exposure levels. Figure 5.1 developed by S. Cohen & Associates (2005) provides an overview of spatial variations in naturally occurring radiation through most states. As shown in the figure,

the ranges used to categorize state levels of naturally occurring background radiation ranges from 100 to more than 1,000 mrem/year for a substantial portion of the US population as previously illustrated.

Figure 5.1 Background Dose Distribution

Average annual natural background doses (mrem/year) based on cosmic radiation, terrestrial radiation, and mean indoor radon levels (from S Cohen & Associates, 2005)

Table 4-1 provides a summary of the results of the calculation for all receptor scenarios. The annual doses estimated for the various receptors arising from the use of PG in road construction are small and indeed, a small fraction of the unavoidable dose from natural background radiation of about 310 mrem/yr.

The total dose arising from the full duration of exposure is well below the dose of 600 mrem which is equivalent to the total risk of 3 in 10,000.

Overall, the use of PG in road construction will result in very small doses (to reasonably maximally exposed receptors) and risks that are well below EPA's reference risk goal. The use of PG in road construction can be done safely and results in doses that are a small fraction of those arising from natural background radiation.

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APPENDIX A

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APPENDIX A – Bibliography

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APPENDIX B

Excel File with Common and Scenario-Specific Parameters

APPENDIX B – EXCEL FILE WITH COMMON AND SCENARIO-SPECIFIC PARAMETERS

The following tables provide detailed documentation of the assumptions and modelling parameters used throughout this assessment.

Table B-1: Modeling Input Parameters and Assumptions

Parameter	Units	Value	Receptor(s)	Basis/Comments
Title				
Radionuclide transformations	-	ICRP 38	All	
External, inhalation, and ingestion dose conversion factors	-	ICRP 60	All	
Internal dose library	-	ICRP 72 (Adult)	All	
External dose library	-	ICRP 60	All	
Cut-off half life	d	1	All	
Set Pathways				
External gamma (RESRAD)	-	-	RCW, RU, RR	
External gamma (MicroShield®) [1]	-	-	TD, UW, NR	Geometry and receptor location make a MicroShield® better modeling choice.
Incidental Soil Ingestion/Dust Inhalation (RESRAD)	-	-	RCW, NR, UW	
Radon Inhalation (Calculated)	-	-	RR	Equation from U.S. Nuclear Regulatory Commission Regulatory Guidance 3.64 (June 1989)
Soil Concentrations				
PG concentrations	pCi/g	Road Base & Paving		refer to "Rad Concentrations" table
Contaminated Zone				
Area of contaminated zone	m^2	1,500	All	road width = 15 meters, length = 100 meters, area = 1,500 m2
Thickness of contaminated zone (Road base)	m	0.25	RCW, TD, UW	Road base thickness
Thickness of contaminated zone (Decommissioned road base)	m	0.25	RR	Thickness of layer with road base following decommissioning.
Thickness of contaminated zone (Road Surface)	m	0.12	RCW, RU, NR	Road paving thickness
Thickness of contaminated zone (Road base & Surface Shielding)	m	0.25	RCW, RU, NR	Road base thickness
Cover and Contaminated Zone				
Cover depth	m	0	RCW, RU-Paving, NR	No cover
Cover depth	m	0.12	RU-Road base	Paving surface shielding
Cover depth	m	0.3	RR	6 inch cover and 6 inch slab
Density of cover material	g/cm^3	2.25	RR	Road base and surface, construction aggregate, concrete foundation density
Cover erosion rate	m/yr	-	All	No erosion
Density of contaminated zone	g/cm^3	2.25	RCW, RU, UW, NR, RR	Road base and surface, construction aggregate, concrete foundation density
Density of contaminated zone	g/cm^3	1.12	TD	Phosphogypsum density

Table B-1: Modeling Input Parameters and Assumptions

Parameter	Units	Value	Receptor(s)	Basis/Comments
Occupancy				
Inhalation rate	m^3/yr	11,400	RCW, UW	RESRAD 6 User's Manual (2001) Table 2.3; inhalation rate for an industrial worker, assumes an hourly rate of 1.3 m3/hr (EPA 1997)
Inhalation rate	m^3/yr	8,400	NR	RESRAD Onsite 7.2 default
Mass loading for inhalation (worker)	g/cm^3	0.0002	RCW, UW	RESRAD documentation in ANL 2015, Section 3.6.2, pg. 112; upper end of 98th percentile range for PM2.5 concentrations in ambient air.
Mass loading for inhalation (user, resident)	g/cm^3	0.0001	NR	RESRAD Onsite 7.2 default, consistent with EPA BID (100 µg/m3)
Indoor dust filtration factor	-	0.4	NR	RESRAD Onsite 7.2 default
Exposure duration	Receptor-Specific:			Used outside of RESRAD and MicroShield® to determine cancer risks
Road Construction Worker (RCW)	yr	5		
Truck Driver (TD)	yr	5		
Road Users (Motorist/Bicyclist) (RU)	yr	26		
Nearby Resident (NR)	yr	26		
Utility Worker (UW)	yr	1		
Reclaimer Resident (RR)	yr	26		
Outdoor time fraction	Receptor-Specific:			
Road Construction Worker (RCW)	-	0.23		2,000 working hours per year. Fraction = 2,000 hrs /(365 days x 24 hrs/day) = 0.23
Truck Driver (TD)	-	NA		Not needed in MicroShield®
Road Users (Motorist/Bicyclist) (RU)	-	0.06		500 commuting hours per year. Fraction = 500 hrs /(365 days x 24 hrs/day) = 0.06
Nearby Resident (NR)	-	0.25		RESRAD default in ANL 2015, Section 9.6, pg. 246.
Utility Worker (UW)	-	0.018		8 hours/day, 5 days/week, for 4 weeks = 160 working hours per year. Fraction = 160 hrs /(365 days x 24 hrs/day) = 0.018
Reclaimer Resident (RR)	-	0.75		Assumed for consistency with radon model.

Table B-1: Modeling Input Parameters and Assumptions

Parameter	Units	Value	Receptor(s)	Basis/Comments
Shape - External Radiation Area Factors				
Shape of contaminated zone	-	non-circular		
Road Construction Worker (RCW), Road User (RU), Reclaimer Resident (RR) Receptor Location	-	50,50	RCW - Center, RU, RR	Road centered around x=50, y=50, width = 15 m, length = 100 m
Road Construction Worker (RCW) Receptor Location	-	57,50	RCW - Edge	Edge of road at x=57, y=50, width = 15 m, length = 100 m
Ingestion Pathway, Dietary Data				
Incidental soil ingestion rate (worker)	g/yr	82.5	RCW, UW	330 mg/day per OSWER 2014
Incidental soil ingestion rate (nearby resident)	g/yr	36.5	RCW, NR, UW	100 mg/day per OSWER 2014
Radon Inhalation Pathway				
Diffusion coefficient	cm^2/s	0.0004	RR	Rogers et al. (1994)
Radon emanation coefficient	unitless	0.062	RR	Chuahan and Kumar (2015)

Notes:

d = days

g/yr = grams per year

pCi/g = picocuries per gram

m = meters

m^2 = square meters

m^3/yr = cubic meters per year

yr = years

cm^2/s = square centimeter per second

Receptor Codes:

RCW = Road Construction Worker

TD = Truck Driver

RU = Road Users (Motorist/Bicyclist)

NR = Nearby Resident

UW = Utility Worker

RR = Reclaimer (Resident)

[1] See Risk Assessment Report for additional MicroShield® input parameters.

APPENDIX C

RESRAD Output

APPENDIX C – RESRAD OUTPUT

The following RESRAD Output files provide detailed documentation of the modelling runs and results shown within the software.

RESRAD Modelling Results

Road Construction Worker – Road Base No Cover_Center

Summary : Road Construction Worker - PG in Road Base (Center)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RB_CENTER070319.RAD

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Summary : Road Construction Worker - PG in Road Base (Center)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RB_CENTER070319.RAD

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	At-218 (Source: ICRP 60)	4.878E-03	4.878E-03	DCF1(1)
A-1	Bi-210 (Source: ICRP 60)	5.476E-03	5.476E-03	DCF1(2)
A-1	Bi-214 (Source: ICRP 60)	9.325E+00	9.325E+00	DCF1(3)
A-1	Pa-234 (Source: ICRP 60)	1.088E+01	1.088E+01	DCF1(4)
A-1	Pa-234m (Source: ICRP 60)	9.867E-02	9.867E-02	DCF1(5)
A-1	Pb-210 (Source: ICRP 60)	1.981E-03	1.981E-03	DCF1(6)
A-1	Pb-214 (Source: ICRP 60)	1.243E+00	1.243E+00	DCF1(7)
A-1	Po-210 (Source: ICRP 60)	4.934E-05	4.934E-05	DCF1(8)
A-1	Po-214 (Source: ICRP 60)	4.840E-04	4.840E-04	DCF1(9)
A-1	Po-218 (Source: ICRP 60)	5.326E-05	5.326E-05	DCF1(10)
A-1	Ra-226 (Source: ICRP 60)	2.915E-02	2.915E-02	DCF1(11)
A-1	Rn-222 (Source: ICRP 60)	2.186E-03	2.186E-03	DCF1(12)
A-1	Th-230 (Source: ICRP 60)	1.071E-03	1.071E-03	DCF1(13)
A-1	Th-234 (Source: ICRP 60)	2.130E-02	2.130E-02	DCF1(14)
A-1	Tl-210 (Source: ICRP 60)	1.661E+01	1.661E+01	DCF1(15)
A-1	U-234 (Source: ICRP 60)	3.439E-04	3.439E-04	DCF1(16)
A-1	U-238 (Source: ICRP 60)	7.961E-05	7.961E-05	DCF1(17)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Bi-210	3.441E-04	3.441E-04	DCF2(1)
B-1	Pb-210	2.072E-02	2.072E-02	DCF2(2)
B-1	Po-210	1.591E-02	1.591E-02	DCF2(3)
B-1	Ra-226	3.515E-02	3.515E-02	DCF2(4)
B-1	Rn-222+D	1.073E-04	0.000E+00	DCF2(5)
B-1	Th-230	3.700E-01	3.700E-01	DCF2(6)
B-1	Th-234+D	2.849E-05	2.849E-05	DCF2(7)
B-1	U-234	3.478E-02	3.478E-02	DCF2(8)
B-1	U-238	2.960E-02	2.960E-02	DCF2(9)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Bi-210	4.810E-06	4.810E-06	DCF3(1)
D-1	Pb-210	2.553E-03	2.553E-03	DCF3(2)
D-1	Po-210	4.440E-03	4.440E-03	DCF3(3)
D-1	Ra-226	1.036E-03	1.036E-03	DCF3(4)
D-1	Rn-222+D	9.249E-07	0.000E+00	DCF3(5)
D-1	Th-230	7.770E-04	7.770E-04	DCF3(6)
D-1	Th-234+D	1.259E-05	1.258E-05	DCF3(7)
D-1	U-234	1.813E-04	1.813E-04	DCF3(8)
D-1	U-238	1.665E-04	1.665E-04	DCF3(9)
D-34	Food transfer factors:			
D-34	Bi-210 , plant/soil concentration ratio, dimensionless	1.000E-01	1.000E-01	RTF(1,1)
D-34	Bi-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(1,2)
D-34	Bi-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-04	5.000E-04	RTF(1,3)
D-34				
D-34	Pb-210 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pb-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(2,2)
D-34	Pb-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(2,3)
D-34				

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Po-210 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(3,1)
D-34	Po-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(3,2)
D-34	Po-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.400E-04	3.400E-04	RTF(3,3)
D-34				
D-34	Ra-226 , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Ra-226 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,2)
D-34	Ra-226 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,3)
D-34				
D-34	Rn-222+D , plant/soil concentration ratio, dimensionless	0.000E+00	0.000E+00	RTF(5,1)
D-34	Rn-222+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	0.000E+00	0.000E+00	RTF(5,2)
D-34	Rn-222+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	0.000E+00	0.000E+00	RTF(5,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(6,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(6,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(6,3)
D-34				
D-34	Th-234+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(7,1)
D-34	Th-234+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(7,2)
D-34	Th-234+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(7,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(8,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(8,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(8,3)
D-34				
D-34	U-238 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(9,1)
D-34	U-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(9,2)
D-34	U-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(9,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Bi-210 , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Bi-210 , crustacea and mollusks	1.000E+01	1.000E+01	BIOFAC(1,2)
D-5				
D-5	Pb-210 , fish	3.000E+02	3.000E+02	BIOFAC(2,1)
D-5	Pb-210 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(2,2)
D-5				
D-5	Po-210 , fish	1.000E+02	1.000E+02	BIOFAC(3,1)
D-5	Po-210 , crustacea and mollusks	2.000E+04	2.000E+04	BIOFAC(3,2)
D-5				
D-5	Ra-226 , fish	5.000E+01	5.000E+01	BIOFAC(4,1)
D-5	Ra-226 , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(4,2)
D-5				
D-5	Rn-222+D , fish	0.000E+00	0.000E+00	BIOFAC(5,1)
D-5	Rn-222+D , crustacea and mollusks	0.000E+00	0.000E+00	BIOFAC(5,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(6,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(6,2)
D-5				
D-5	Th-234+D , fish	1.000E+02	1.000E+02	BIOFAC(7,1)
D-5	Th-234+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(7,2)
D-5				

Summary : Road Construction Worker - PG in Road Base (Center)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RB_CENTER070319.RAD

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(8,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(8,2)
D-5				
D-5	U-238 , fish	1.000E+01	1.000E+01	BIOFAC(9,1)
D-5	U-238 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(9,2)

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

Summary : Road Construction Worker - PG in Road Base (Center)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RB_CENTER070319.RAD

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.500E+03	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	2.500E-01	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	not used	3.000E+00	---	T(3)
R011	Times for calculations (yr)	not used	1.000E+01	---	T(4)
R011	Times for calculations (yr)	not used	3.000E+01	---	T(5)
R011	Times for calculations (yr)	not used	1.000E+02	---	T(6)
R011	Times for calculations (yr)	not used	3.000E+02	---	T(7)
R011	Times for calculations (yr)	not used	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Bi-210	1.350E+01	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Pb-210	1.350E+01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Po-210	1.350E+01	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Ra-226	1.350E+01	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Rn-222	1.350E+01	0.000E+00	---	S1(5)
R012	Initial principal radionuclide (pCi/g): Th-230	2.500E+00	0.000E+00	---	S1(6)
R012	Initial principal radionuclide (pCi/g): Th-234	1.500E+00	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): U-234	1.600E+00	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): U-238	1.500E+00	0.000E+00	---	S1(9)
R012	Concentration in groundwater (pCi/L): Bi-210	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Po-210	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): Rn-222	not used	0.000E+00	---	W1(5)
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---	W1(6)
R012	Concentration in groundwater (pCi/L): Th-234	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(9)
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)	2.250E+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)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	not used	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	not used	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	not used	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	not used	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	not used	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	not used	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	not used	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	not used	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	not used	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	not used	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	not used	1	---	NS
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	not used	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Bi-210				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	not used	0.000E+00	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	not used	0.000E+00	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.232E+00	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+02	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+02	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.876E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Po-210				
R016	Contaminated zone (cm**3/g)	1.000E+01	1.000E+01	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+01	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+01	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.764E-02	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)

Summary : Road Construction Worker - PG in Road Base (Center)
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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.267E-02	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for Rn-222				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	not used	0.000E+00	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	not used	0.000E+00	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.232E+00	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.481E-05	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for Th-234				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.481E-05	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.773E-02	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(9)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(9,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.773E-02	ALEACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)
R017	Inhalation rate (m**3/yr)	1.140E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	2.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	1.000E+00	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	0.000E+00	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.300E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	-1.000E+00	1.000E+00	-1 shows non-circular AREA.	FS

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	4.250E+00	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	8.500E+00	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	1.275E+01	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	1.700E+01	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	2.125E+01	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	2.550E+01	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	2.975E+01	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	3.400E+01	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	3.825E+01	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	4.250E+01	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	4.675E+01	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	5.100E+01	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	1.000E+00	1.000E+00	---	FRACA(1)
R017	Ring 2	1.000E+00	2.732E-01	---	FRACA(2)
R017	Ring 3	5.000E-01	0.000E+00	---	FRACA(3)
R017	Ring 4	3.400E-01	0.000E+00	---	FRACA(4)
R017	Ring 5	2.600E-01	0.000E+00	---	FRACA(5)
R017	Ring 6	2.100E-01	0.000E+00	---	FRACA(6)
R017	Ring 7	1.800E-01	0.000E+00	---	FRACA(7)
R017	Ring 8	1.500E-01	0.000E+00	---	FRACA(8)
R017	Ring 9	1.400E-01	0.000E+00	---	FRACA(9)
R017	Ring 10	1.200E-01	0.000E+00	---	FRACA(10)
R017	Ring 11	1.100E-01	0.000E+00	---	FRACA(11)
R017	Ring 12	7.100E-02	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	8.250E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI

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Site-Specific Parameter Summary (continued)

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

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

Summary : Road Construction Worker - PG in Road Base (Center)
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Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	1500.00 square meters	Bi-210	1.350E+01
Thickness:	0.25 meters	Pb-210	1.350E+01
Cover Depth:	0.00 meters	Po-210	1.350E+01
		Ra-226	1.350E+01
		Rn-222	1.350E+01
		Th-230	2.500E+00
		Th-234	1.500E+00
		U-234	1.600E+00
		U-238	1.500E+00

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

t (years):	0.000E+00	1.000E+00
TDOSE(t):	2.866E+01	2.817E+01
M(t):	1.146E+00	1.127E+00

Maximum TDOSE(t): 2.866E+01 mrem/yr at t = 0.000E+00 years

Summary : Road Construction Worker - PG in Road Base (Center)
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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-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	3.596E-04	0.0000	2.284E-04	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.603E-02	0.0006
Pb-210	1.864E-02	0.0007	2.738E-02	0.0010	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.157E+00	0.0404
Po-210	6.047E-05	0.0000	6.972E-03	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.060E-01	0.0177
Ra-226	2.581E+01	0.9007	3.484E-02	0.0012	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.780E-01	0.0097
Rn-222	6.296E-01	0.0220	1.379E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.907E-04	0.0000
Th-230	1.592E-03	0.0001	6.748E-02	0.0024	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.687E-02	0.0013
Th-234	4.563E-03	0.0002	2.980E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.413E-05	0.0000
U-234	1.155E-04	0.0000	4.024E-03	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.456E-03	0.0002
U-238	4.300E-02	0.0015	3.213E-03	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.019E-03	0.0002
Total	2.651E+01	0.9250	1.442E-01	0.0050	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.004E+00	0.0700

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.662E-02	0.0006
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.203E+00	0.0420
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.131E-01	0.0179
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.612E+01	0.9116
Rn-222	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.301E-01	0.0220
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	1.059E-01	0.0037
Th-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	4.598E-03	0.0002
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	9.596E-03	0.0003
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	5.123E-02	0.0018
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.866E+01	1.0000

*Sum of all water independent and dependent pathways.

Summary : Road Construction Worker - PG in Road Base (Center)
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	2.967E-07	0.0000	3.420E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.483E-03	0.0001
Pb-210	1.826E-02	0.0006	3.140E-02	0.0011	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.480E+00	0.0525
Po-210	8.890E-06	0.0000	1.025E-03	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.440E-02	0.0026
Ra-226	2.604E+01	0.9244	3.524E-02	0.0013	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.131E-01	0.0111
Rn-222	7.838E-06	0.0000	1.347E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.347E-04	0.0000
Th-230	3.694E-03	0.0001	6.748E-02	0.0024	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.689E-02	0.0013
Th-234	1.250E-07	0.0000	1.010E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.294E-09	0.0000
U-234	1.134E-04	0.0000	3.954E-03	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.360E-03	0.0002
U-238	4.674E-02	0.0017	3.157E-03	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.964E-03	0.0002
Total	2.611E+01	0.9269	1.423E-01	0.0051	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.918E+00	0.0681

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.517E-03	0.0001
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.530E+00	0.0543
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.543E-02	0.0027
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.639E+01	0.9368
Rn-222	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.560E-04	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	1.081E-01	0.0038
Th-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	1.284E-07	0.0000
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	9.428E-03	0.0003
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	5.486E-02	0.0019
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.817E+01	1.0000

*Sum of all water independent and dependent pathways.

Summary : Road Construction Worker - PG in Road Base (Center)
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Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	2.920E-05	6.626E-30
Bi-210	Po-210	1.000E+00	1.202E-03	1.864E-04
Bi-210	∑DSR(j)		1.231E-03	1.864E-04
Pb-210	Pb-210	1.000E+00	4.938E-02	4.744E-02
Pb-210	Bi-210	1.000E+00	1.070E-03	1.053E-03
Pb-210	Po-210	1.000E+00	3.863E-02	6.483E-02
Pb-210	∑DSR(j)		8.908E-02	1.133E-01
Po-210	Po-210	1.000E+00	3.800E-02	5.587E-03
Ra-226	Ra-226	1.000E+00	2.815E-02	2.778E-02
Ra-226	Rn-222+D	1.000E+00	1.906E+00	1.923E+00
Ra-226	Pb-210	1.000E+00	6.841E-04	2.042E-03
Ra-226	Bi-210	1.000E+00	1.464E-05	4.476E-05
Ra-226	Po-210	1.000E+00	3.937E-04	1.962E-03
Ra-226	∑DSR(j)		1.935E+00	1.955E+00
Rn-222+D	Rn-222+D	1.000E+00	4.664E-02	1.605E-33
Rn-222+D	Pb-210	1.000E+00	2.073E-05	2.037E-05
Rn-222+D	Bi-210	1.000E+00	4.566E-07	4.520E-07
Rn-222+D	Po-210	1.000E+00	1.622E-05	2.777E-05
Rn-222+D	∑DSR(j)		4.667E-02	4.859E-05
Th-230	Th-230	1.000E+00	4.196E-02	4.196E-02
Th-230	Ra-226	1.000E+00	6.111E-06	1.823E-05
Th-230	Rn-222+D	1.000E+00	4.115E-04	1.250E-03
Th-230	Pb-210	1.000E+00	9.787E-08	6.908E-07
Th-230	Bi-210	1.000E+00	2.059E-09	1.498E-08
Th-230	Po-210	1.000E+00	4.477E-08	5.297E-07
Th-230	∑DSR(j)		4.238E-02	4.323E-02
Th-234+D	Th-234+D	1.000E+00	3.065E-03	8.398E-08
Th-234+D	U-234	1.000E+00	1.465E-09	1.593E-09
Th-234+D	Th-230	1.000E+00	4.196E-14	1.413E-13
Th-234+D	Ra-226	1.000E+00	3.768E-18	3.032E-17
Th-234+D	Rn-222+D	1.000E+00	2.494E-16	2.060E-15
Th-234+D	Pb-210	1.000E+00	4.143E-20	7.509E-19
Th-234+D	Bi-210	1.000E+00	8.522E-22	1.609E-20
Th-234+D	Po-210	1.000E+00	1.480E-20	4.721E-19
Th-234+D	∑DSR(j)		3.065E-03	8.557E-08

Summary : Road Construction Worker - PG in Road Base (Center)
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Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years 0.000E+00	1.000E+00
U-234	U-234	1.000E+00	5.997E-03	5.892E-03
U-234	Th-230	1.000E+00	1.878E-07	5.588E-07
U-234	Ra-226	1.000E+00	1.827E-11	1.268E-10
U-234	Rn-222+D	1.000E+00	1.214E-09	8.622E-09
U-234	Pb-210	1.000E+00	2.171E-13	3.302E-12
U-234	Bi-210	1.000E+00	4.491E-15	7.088E-14
U-234	Po-210	1.000E+00	8.226E-14	2.137E-12
U-234	∑DSR(j)		5.997E-03	5.892E-03
U-238	U-238	5.400E-05	2.856E-07	2.806E-07
U-238	U-238	9.999E-01	5.289E-03	5.196E-03
U-238	Th-234+D	9.999E-01	2.887E-02	3.138E-02
U-238	U-234	9.999E-01	7.022E-09	2.347E-08
U-238	Th-230	9.999E-01	1.352E-13	1.086E-12
U-238	Ra-226	9.999E-01	9.173E-18	1.618E-16
U-238	Rn-222+D	9.999E-01	5.988E-16	1.090E-14
U-238	Pb-210	9.999E-01	8.014E-20	3.092E-18
U-238	Bi-210	9.999E-01	1.620E-21	6.562E-20
U-238	Po-210	9.999E-01	2.439E-20	1.691E-18
U-238	∑DSR(j)		3.416E-02	3.657E-02

The DSR includes contributions from associated (half-life ≤ 1 day) daughters.

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

Nuclide (i)	t= 0.000E+00	1.000E+00
Bi-210	2.031E+04	1.341E+05
Pb-210	2.807E+02	2.206E+02
Po-210	6.578E+02	4.474E+03
Ra-226	1.292E+01	1.279E+01
Rn-222	5.356E+02	5.145E+05
Th-230	5.899E+02	5.783E+02
Th-234	8.156E+03	2.922E+08
U-234	4.169E+03	4.243E+03
U-238	7.319E+02	6.836E+02

Summary : Road Construction Worker - PG in Road Base (Center)
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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

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Bi-210	1.350E+01	0.000E+00	1.231E-03	2.031E+04	1.231E-03	2.031E+04
Pb-210	1.350E+01	1.000E+00	1.133E-01	2.206E+02	8.908E-02	2.807E+02
Po-210	1.350E+01	0.000E+00	3.800E-02	6.578E+02	3.800E-02	6.578E+02
Ra-226	1.350E+01	0.0864 ± 0.0002	1.975E+00	1.266E+01	1.935E+00	1.292E+01
Rn-222	1.350E+01	0.000E+00	4.667E-02	5.356E+02	4.667E-02	5.356E+02
Th-230	2.500E+00	1.000E+00	4.323E-02	5.783E+02	4.238E-02	5.899E+02
Th-234	1.500E+00	0.000E+00	3.065E-03	8.156E+03	3.065E-03	8.156E+03
U-234	1.600E+00	0.000E+00	5.997E-03	4.169E+03	5.997E-03	4.169E+03
U-238	1.500E+00	0.3657 ± 0.0007	3.692E-02	6.772E+02	3.416E-02	7.319E+02

Summary : Road Construction Worker - PG in Road Base (Center)
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Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide	Parent	THF(i)	DOSE(j,t), mrem/yr	
(j)	(i)		t= 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	3.943E-04	8.116E-29
Bi-210	Pb-210	1.000E+00	1.444E-02	1.421E-02
Bi-210	Ra-226	1.000E+00	1.977E-04	6.043E-04
Bi-210	Rn-222	1.000E+00	6.164E-06	6.102E-06
Bi-210	Th-230	1.000E+00	5.147E-09	3.745E-08
Bi-210	Th-234	1.000E+00	1.278E-21	2.414E-20
Bi-210	U-234	1.000E+00	7.185E-15	1.134E-13
Bi-210	U-238	9.999E-01	2.430E-21	9.843E-20
Bi-210	∑DOSE(j)		1.504E-02	1.482E-02
Po-210	Bi-210	1.000E+00	1.622E-02	2.517E-03
Po-210	Pb-210	1.000E+00	5.215E-01	8.752E-01
Po-210	Po-210	1.000E+00	5.131E-01	7.543E-02
Po-210	Ra-226	1.000E+00	5.315E-03	2.648E-02
Po-210	Rn-222	1.000E+00	2.190E-04	3.750E-04
Po-210	Th-230	1.000E+00	1.119E-07	1.324E-06
Po-210	Th-234	1.000E+00	2.220E-20	7.081E-19
Po-210	U-234	1.000E+00	1.316E-13	3.419E-12
Po-210	U-238	9.999E-01	3.658E-20	2.537E-18
Po-210	∑DOSE(j)		1.056E+00	9.800E-01
Pb-210	Pb-210	1.000E+00	6.666E-01	6.405E-01
Pb-210	Ra-226	1.000E+00	9.236E-03	2.756E-02
Pb-210	Rn-222	1.000E+00	2.798E-04	2.749E-04
Pb-210	Th-230	1.000E+00	2.447E-07	1.727E-06
Pb-210	Th-234	1.000E+00	6.214E-20	1.126E-18
Pb-210	U-234	1.000E+00	3.474E-13	5.284E-12
Pb-210	U-238	9.999E-01	1.202E-19	4.638E-18
Pb-210	∑DOSE(j)		6.761E-01	6.683E-01
Ra-226	Ra-226	1.000E+00	3.800E-01	3.751E-01
Ra-226	Th-230	1.000E+00	1.528E-05	4.556E-05
Ra-226	Th-234	1.000E+00	5.652E-18	4.548E-17
Ra-226	U-234	1.000E+00	2.924E-11	2.029E-10
Ra-226	U-238	9.999E-01	1.376E-17	2.428E-16
Ra-226	∑DOSE(j)		3.800E-01	3.751E-01
Rn-222	Ra-226	1.000E+00	2.573E+01	2.596E+01
Rn-222	Rn-222	1.000E+00	6.296E-01	0.000E+00
Rn-222	Th-230	1.000E+00	1.029E-03	3.124E-03
Rn-222	Th-234	1.000E+00	3.741E-16	3.089E-15
Rn-222	U-234	1.000E+00	1.942E-09	1.379E-08
Rn-222	U-238	9.999E-01	8.982E-16	1.636E-14
Rn-222	∑DOSE(j)		2.636E+01	2.596E+01
Th-230	Th-230	1.000E+00	1.049E-01	1.049E-01
Th-230	Th-234	1.000E+00	6.294E-14	2.120E-13
Th-230	U-234	1.000E+00	3.004E-07	8.941E-07
Th-230	U-238	9.999E-01	2.027E-13	1.629E-12
Th-230	∑DOSE(j)		1.049E-01	1.049E-01

Summary : Road Construction Worker - PG in Road Base (Center)
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Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00
Th-234	Th-234	1.000E+00	4.598E-03	1.260E-07
Th-234	U-238	9.999E-01	4.330E-02	4.706E-02
Th-234	∑DOSE(j)		4.790E-02	4.706E-02
U-234	Th-234	1.000E+00	2.198E-09	2.389E-09
U-234	U-234	1.000E+00	9.595E-03	9.427E-03
U-234	U-238	9.999E-01	1.053E-08	3.521E-08
U-234	∑DOSE(j)		9.595E-03	9.427E-03
U-238	U-238	5.400E-05	4.284E-07	4.209E-07
U-238	U-238	9.999E-01	7.933E-03	7.794E-03
U-238	∑DOSE(j)		7.934E-03	7.794E-03

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

Summary : Road Construction Worker - PG in Road Base (Center)
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Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	1.350E+01	3.063E-24
Bi-210	Pb-210	1.000E+00	0.000E+00	1.155E+01
Bi-210	Ra-226	1.000E+00	0.000E+00	3.223E-01
Bi-210	Rn-222	1.000E+00	0.000E+00	4.960E-03
Bi-210	Th-230	1.000E+00	0.000E+00	1.264E-05
Bi-210	Th-234	1.000E+00	0.000E+00	4.515E-18
Bi-210	U-234	1.000E+00	0.000E+00	2.353E-11
Bi-210	U-238	9.999E-01	0.000E+00	1.067E-17
Bi-210	∑S(j):		1.350E+01	1.188E+01
Po-210	Bi-210	1.000E+00	0.000E+00	6.623E-02
Po-210	Pb-210	1.000E+00	0.000E+00	9.479E+00
Po-210	Po-210	1.000E+00	1.350E+01	1.985E+00
Po-210	Ra-226	1.000E+00	0.000E+00	1.689E-01
Po-210	Rn-222	1.000E+00	0.000E+00	4.049E-03
Po-210	Th-230	1.000E+00	0.000E+00	4.992E-06
Po-210	Th-234	1.000E+00	0.000E+00	1.366E-18
Po-210	U-234	1.000E+00	0.000E+00	7.521E-12
Po-210	U-238	9.999E-01	0.000E+00	2.722E-18
Po-210	∑S(j):		1.350E+01	1.170E+01
Pb-210	Pb-210	1.000E+00	1.350E+01	1.297E+01
Pb-210	Ra-226	1.000E+00	0.000E+00	3.685E-01
Pb-210	Rn-222	1.000E+00	0.000E+00	5.568E-03
Pb-210	Th-230	1.000E+00	0.000E+00	1.471E-05
Pb-210	Th-234	1.000E+00	0.000E+00	5.371E-18
Pb-210	U-234	1.000E+00	0.000E+00	2.786E-11
Pb-210	U-238	9.999E-01	0.000E+00	1.292E-17
Pb-210	∑S(j):		1.350E+01	1.335E+01
Ra-226	Ra-226	1.000E+00	1.350E+01	1.332E+01
Ra-226	Th-230	1.000E+00	0.000E+00	1.076E-03
Ra-226	Th-234	1.000E+00	0.000E+00	6.472E-16
Ra-226	U-234	1.000E+00	0.000E+00	3.088E-09
Ra-226	U-238	9.999E-01	0.000E+00	2.087E-15
Ra-226	∑S(j):		1.350E+01	1.333E+01
Rn-222	Ra-226	1.000E+00	0.000E+00	1.218E+01
Rn-222	Rn-222	1.000E+00	1.350E+01	4.647E-31
Rn-222	Th-230	1.000E+00	0.000E+00	9.699E-04
Rn-222	Th-234	1.000E+00	0.000E+00	5.740E-16
Rn-222	U-234	1.000E+00	0.000E+00	2.746E-09
Rn-222	U-238	9.999E-01	0.000E+00	1.825E-15
Rn-222	∑S(j):		1.350E+01	1.218E+01
Th-230	Th-230	1.000E+00	2.500E+00	2.500E+00
Th-230	Th-234	1.000E+00	0.000E+00	3.270E-12
Th-230	U-234	1.000E+00	0.000E+00	1.428E-05
Th-230	U-238	9.999E-01	0.000E+00	1.567E-11
Th-230	∑S(j):		2.500E+00	2.500E+00

Summary : Road Construction Worker - PG in Road Base (Center)
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Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00
Th-234	Th-234	1.000E+00	1.500E+00	4.110E-05
Th-234	U-238	9.999E-01	0.000E+00	1.476E+00
Th-234	∑S(j):		1.500E+00	1.476E+00
U-234	Th-234	1.000E+00	0.000E+00	3.983E-07
U-234	U-234	1.000E+00	1.600E+00	1.572E+00
U-234	U-238	9.999E-01	0.000E+00	3.786E-06
U-234	∑S(j):		1.600E+00	1.572E+00
U-238	U-238	5.400E-05	8.100E-05	7.958E-05
U-238	U-238	9.999E-01	1.500E+00	1.474E+00
U-238	∑S(j):		1.500E+00	1.474E+00

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

RESCALC.EXE execution time = 23.29 seconds

RESRAD Modelling Results

Road Construction Worker – Road Base No Cover_Edge

Summary : Road Construction Worker - PG in Road Base (Edge)
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Part I: Mixture Sums and Single Radionuclide Guidelines

Summary : Road Construction Worker - PG in Road Base (Edge)
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Dose Conversion Factor (and Related) Parameter Summary
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	At-218 (Source: ICRP 60)	4.878E-03	4.878E-03	DCF1(1)
A-1	Bi-210 (Source: ICRP 60)	5.476E-03	5.476E-03	DCF1(2)
A-1	Bi-214 (Source: ICRP 60)	9.325E+00	9.325E+00	DCF1(3)
A-1	Pa-234 (Source: ICRP 60)	1.088E+01	1.088E+01	DCF1(4)
A-1	Pa-234m (Source: ICRP 60)	9.867E-02	9.867E-02	DCF1(5)
A-1	Pb-210 (Source: ICRP 60)	1.981E-03	1.981E-03	DCF1(6)
A-1	Pb-214 (Source: ICRP 60)	1.243E+00	1.243E+00	DCF1(7)
A-1	Po-210 (Source: ICRP 60)	4.934E-05	4.934E-05	DCF1(8)
A-1	Po-214 (Source: ICRP 60)	4.840E-04	4.840E-04	DCF1(9)
A-1	Po-218 (Source: ICRP 60)	5.326E-05	5.326E-05	DCF1(10)
A-1	Ra-226 (Source: ICRP 60)	2.915E-02	2.915E-02	DCF1(11)
A-1	Rn-222 (Source: ICRP 60)	2.186E-03	2.186E-03	DCF1(12)
A-1	Th-230 (Source: ICRP 60)	1.071E-03	1.071E-03	DCF1(13)
A-1	Th-234 (Source: ICRP 60)	2.130E-02	2.130E-02	DCF1(14)
A-1	Tl-210 (Source: ICRP 60)	1.661E+01	1.661E+01	DCF1(15)
A-1	U-234 (Source: ICRP 60)	3.439E-04	3.439E-04	DCF1(16)
A-1	U-238 (Source: ICRP 60)	7.961E-05	7.961E-05	DCF1(17)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Bi-210	3.441E-04	3.441E-04	DCF2(1)
B-1	Pb-210	2.072E-02	2.072E-02	DCF2(2)
B-1	Po-210	1.591E-02	1.591E-02	DCF2(3)
B-1	Ra-226	3.515E-02	3.515E-02	DCF2(4)
B-1	Rn-222+D	1.073E-04	0.000E+00	DCF2(5)
B-1	Th-230	3.700E-01	3.700E-01	DCF2(6)
B-1	Th-234+D	2.849E-05	2.849E-05	DCF2(7)
B-1	U-234	3.478E-02	3.478E-02	DCF2(8)
B-1	U-238	2.960E-02	2.960E-02	DCF2(9)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Bi-210	4.810E-06	4.810E-06	DCF3(1)
D-1	Pb-210	2.553E-03	2.553E-03	DCF3(2)
D-1	Po-210	4.440E-03	4.440E-03	DCF3(3)
D-1	Ra-226	1.036E-03	1.036E-03	DCF3(4)
D-1	Rn-222+D	9.249E-07	0.000E+00	DCF3(5)
D-1	Th-230	7.770E-04	7.770E-04	DCF3(6)
D-1	Th-234+D	1.259E-05	1.258E-05	DCF3(7)
D-1	U-234	1.813E-04	1.813E-04	DCF3(8)
D-1	U-238	1.665E-04	1.665E-04	DCF3(9)
D-34	Food transfer factors:			
D-34	Bi-210 , plant/soil concentration ratio, dimensionless	1.000E-01	1.000E-01	RTF(1,1)
D-34	Bi-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(1,2)
D-34	Bi-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-04	5.000E-04	RTF(1,3)
D-34				
D-34	Pb-210 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pb-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(2,2)
D-34	Pb-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(2,3)
D-34				

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Po-210 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(3,1)
D-34	Po-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(3,2)
D-34	Po-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.400E-04	3.400E-04	RTF(3,3)
D-34				
D-34	Ra-226 , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Ra-226 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,2)
D-34	Ra-226 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,3)
D-34				
D-34	Rn-222+D , plant/soil concentration ratio, dimensionless	0.000E+00	0.000E+00	RTF(5,1)
D-34	Rn-222+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	0.000E+00	0.000E+00	RTF(5,2)
D-34	Rn-222+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	0.000E+00	0.000E+00	RTF(5,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(6,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(6,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(6,3)
D-34				
D-34	Th-234+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(7,1)
D-34	Th-234+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(7,2)
D-34	Th-234+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(7,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(8,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(8,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(8,3)
D-34				
D-34	U-238 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(9,1)
D-34	U-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(9,2)
D-34	U-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(9,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Bi-210 , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Bi-210 , crustacea and mollusks	1.000E+01	1.000E+01	BIOFAC(1,2)
D-5				
D-5	Pb-210 , fish	3.000E+02	3.000E+02	BIOFAC(2,1)
D-5	Pb-210 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(2,2)
D-5				
D-5	Po-210 , fish	1.000E+02	1.000E+02	BIOFAC(3,1)
D-5	Po-210 , crustacea and mollusks	2.000E+04	2.000E+04	BIOFAC(3,2)
D-5				
D-5	Ra-226 , fish	5.000E+01	5.000E+01	BIOFAC(4,1)
D-5	Ra-226 , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(4,2)
D-5				
D-5	Rn-222+D , fish	0.000E+00	0.000E+00	BIOFAC(5,1)
D-5	Rn-222+D , crustacea and mollusks	0.000E+00	0.000E+00	BIOFAC(5,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(6,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(6,2)
D-5				
D-5	Th-234+D , fish	1.000E+02	1.000E+02	BIOFAC(7,1)
D-5	Th-234+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(7,2)
D-5				

Summary : Road Construction Worker - PG in Road Base (Edge)
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Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(8,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(8,2)
D-5				
D-5	U-238 , fish	1.000E+01	1.000E+01	BIOFAC(9,1)
D-5	U-238 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(9,2)

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

Summary : Road Construction Worker - PG in Road Base (Edge)
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Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.500E+03	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	2.500E-01	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	not used	3.000E+00	---	T(3)
R011	Times for calculations (yr)	not used	1.000E+01	---	T(4)
R011	Times for calculations (yr)	not used	3.000E+01	---	T(5)
R011	Times for calculations (yr)	not used	1.000E+02	---	T(6)
R011	Times for calculations (yr)	not used	3.000E+02	---	T(7)
R011	Times for calculations (yr)	not used	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Bi-210	1.350E+01	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Pb-210	1.350E+01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Po-210	1.350E+01	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Ra-226	1.350E+01	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Rn-222	1.350E+01	0.000E+00	---	S1(5)
R012	Initial principal radionuclide (pCi/g): Th-230	2.500E+00	0.000E+00	---	S1(6)
R012	Initial principal radionuclide (pCi/g): Th-234	1.500E+00	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): U-234	1.600E+00	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): U-238	1.500E+00	0.000E+00	---	S1(9)
R012	Concentration in groundwater (pCi/L): Bi-210	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Po-210	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): Rn-222	not used	0.000E+00	---	W1(5)
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---	W1(6)
R012	Concentration in groundwater (pCi/L): Th-234	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(9)
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)	2.250E+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)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH

Summary : Road Construction Worker - PG in Road Base (Edge)
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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	not used	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	not used	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	not used	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	not used	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	not used	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	not used	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	not used	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	not used	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	not used	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	not used	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	not used	1	---	NS
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	not used	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Bi-210				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	not used	0.000E+00	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	not used	0.000E+00	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.232E+00	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+02	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+02	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.876E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Po-210				
R016	Contaminated zone (cm**3/g)	1.000E+01	1.000E+01	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+01	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+01	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.764E-02	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)

Summary : Road Construction Worker - PG in Road Base (Edge)
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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.267E-02	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for Rn-222				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	not used	0.000E+00	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	not used	0.000E+00	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.232E+00	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.481E-05	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for Th-234				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.481E-05	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.773E-02	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(9)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(9,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.773E-02	ALEACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)
R017	Inhalation rate (m**3/yr)	1.140E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	2.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	1.000E+00	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	0.000E+00	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.300E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	-1.000E+00	1.000E+00	-1 shows non-circular AREA.	FS

Summary : Road Construction Worker - PG in Road Base (Edge)
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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	4.417E+00	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	8.833E+00	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	1.325E+01	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	1.767E+01	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	2.208E+01	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	2.650E+01	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	3.092E+01	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	3.533E+01	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	3.975E+01	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	4.417E+01	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	4.858E+01	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	5.300E+01	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	5.000E-01	1.000E+00	---	FRACA(1)
R017	Ring 2	5.000E-01	2.732E-01	---	FRACA(2)
R017	Ring 3	5.000E-01	0.000E+00	---	FRACA(3)
R017	Ring 4	4.400E-01	0.000E+00	---	FRACA(4)
R017	Ring 5	2.800E-01	0.000E+00	---	FRACA(5)
R017	Ring 6	2.200E-01	0.000E+00	---	FRACA(6)
R017	Ring 7	1.800E-01	0.000E+00	---	FRACA(7)
R017	Ring 8	1.500E-01	0.000E+00	---	FRACA(8)
R017	Ring 9	1.300E-01	0.000E+00	---	FRACA(9)
R017	Ring 10	1.200E-01	0.000E+00	---	FRACA(10)
R017	Ring 11	1.100E-01	0.000E+00	---	FRACA(11)
R017	Ring 12	4.600E-02	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	8.250E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI

Summary : Road Construction Worker - PG in Road Base (Edge)
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Site-Specific Parameter Summary (continued)

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

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

Summary : Road Construction Worker - PG in Road Base (Edge)
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Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	1500.00 square meters	Bi-210	1.350E+01
Thickness:	0.25 meters	Pb-210	1.350E+01
Cover Depth:	0.00 meters	Po-210	1.350E+01
		Ra-226	1.350E+01
		Rn-222	1.350E+01
		Th-230	2.500E+00
		Th-234	1.500E+00
		U-234	1.600E+00
		U-238	1.500E+00

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

t (years):	0.000E+00	1.000E+00
TDOSE(t):	1.606E+01	1.576E+01
M(t):	6.422E-01	6.304E-01

Maximum TDOSE(t): 1.606E+01 mrem/yr at t = 0.000E+00 years

Summary : Road Construction Worker - PG in Road Base (Edge)
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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-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	1.873E-04	0.0000	2.284E-04	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.603E-02	0.0010
Pb-210	9.695E-03	0.0006	2.738E-02	0.0017	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.157E+00	0.0720
Po-210	3.168E-05	0.0000	6.972E-03	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.060E-01	0.0315
Ra-226	1.354E+01	0.8434	3.484E-02	0.0022	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.780E-01	0.0173
Rn-222	3.303E-01	0.0206	1.379E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.907E-04	0.0000
Th-230	8.311E-04	0.0001	6.748E-02	0.0042	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.687E-02	0.0023
Th-234	2.386E-03	0.0001	2.980E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.413E-05	0.0000
U-234	5.958E-05	0.0000	4.024E-03	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.456E-03	0.0003
U-238	2.248E-02	0.0014	3.213E-03	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.019E-03	0.0003
Total	1.391E+01	0.8662	1.442E-01	0.0090	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.004E+00	0.1248

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.645E-02	0.0010
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.194E+00	0.0743
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.130E-01	0.0320
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	1.385E+01	0.8629
Rn-222	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.309E-01	0.0206
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	1.052E-01	0.0066
Th-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	2.420E-03	0.0002
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	9.540E-03	0.0006
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	3.071E-02	0.0019
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	1.606E+01	1.0000

*Sum of all water independent and dependent pathways.

Summary : Road Construction Worker - PG in Road Base (Edge)
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	1.554E-07	0.0000	3.420E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.483E-03	0.0002
Pb-210	9.498E-03	0.0006	3.140E-02	0.0020	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.480E+00	0.0939
Po-210	4.657E-06	0.0000	1.025E-03	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.440E-02	0.0047
Ra-226	1.366E+01	0.8670	3.524E-02	0.0022	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.131E-01	0.0199
Rn-222	4.077E-06	0.0000	1.347E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.347E-04	0.0000
Th-230	1.934E-03	0.0001	6.748E-02	0.0043	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.689E-02	0.0023
Th-234	6.537E-08	0.0000	1.010E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.294E-09	0.0000
U-234	5.854E-05	0.0000	3.954E-03	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.360E-03	0.0003
U-238	2.443E-02	0.0016	3.157E-03	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.964E-03	0.0003
Total	1.370E+01	0.8693	1.423E-01	0.0090	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.918E+00	0.1217

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.517E-03	0.0002
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.521E+00	0.0965
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.543E-02	0.0048
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	1.401E+01	0.8891
Rn-222	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.522E-04	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	1.063E-01	0.0067
Th-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	6.868E-08	0.0000
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	9.373E-03	0.0006
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	3.255E-02	0.0021
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	1.576E+01	1.0000

*Sum of all water independent and dependent pathways.

Summary : Road Construction Worker - PG in Road Base (Edge)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RB_EDGE_070319.RAD

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	1.651E-05	3.745E-30
Bi-210	Po-210	1.000E+00	1.202E-03	1.864E-04
Bi-210	∑DSR(j)		1.218E-03	1.864E-04
Pb-210	Pb-210	1.000E+00	4.918E-02	4.725E-02
Pb-210	Bi-210	1.000E+00	6.047E-04	5.951E-04
Pb-210	Po-210	1.000E+00	3.863E-02	6.483E-02
Pb-210	∑DSR(j)		8.841E-02	1.127E-01
Po-210	Po-210	1.000E+00	3.800E-02	5.587E-03
Ra-226	Ra-226	1.000E+00	2.523E-02	2.490E-02
Ra-226	Rn-222+D	1.000E+00	9.999E-01	1.009E+00
Ra-226	Pb-210	1.000E+00	6.814E-04	2.033E-03
Ra-226	Bi-210	1.000E+00	8.276E-06	2.530E-05
Ra-226	Po-210	1.000E+00	3.937E-04	1.962E-03
Ra-226	∑DSR(j)		1.026E+00	1.038E+00
Rn-222+D	Rn-222+D	1.000E+00	2.447E-02	8.423E-34
Rn-222+D	Pb-210	1.000E+00	2.064E-05	2.029E-05
Rn-222+D	Bi-210	1.000E+00	2.581E-07	2.555E-07
Rn-222+D	Po-210	1.000E+00	1.622E-05	2.777E-05
Rn-222+D	∑DSR(j)		2.451E-02	4.831E-05
Th-230	Th-230	1.000E+00	4.185E-02	4.185E-02
Th-230	Ra-226	1.000E+00	5.476E-06	1.633E-05
Th-230	Rn-222+D	1.000E+00	2.159E-04	6.558E-04
Th-230	Pb-210	1.000E+00	9.748E-08	6.881E-07
Th-230	Bi-210	1.000E+00	1.164E-09	8.466E-09
Th-230	Po-210	1.000E+00	4.476E-08	5.297E-07
Th-230	∑DSR(j)		4.207E-02	4.252E-02
Th-234+D	Th-234+D	1.000E+00	1.613E-03	4.420E-08
Th-234+D	U-234	1.000E+00	1.457E-09	1.583E-09
Th-234+D	Th-230	1.000E+00	4.185E-14	1.410E-13
Th-234+D	Ra-226	1.000E+00	3.377E-18	2.717E-17
Th-234+D	Rn-222+D	1.000E+00	1.309E-16	1.081E-15
Th-234+D	Pb-210	1.000E+00	4.126E-20	7.480E-19
Th-234+D	Bi-210	1.000E+00	4.817E-22	9.096E-21
Th-234+D	Po-210	1.000E+00	1.480E-20	4.720E-19
Th-234+D	∑DSR(j)		1.613E-03	4.578E-08

Summary : Road Construction Worker - PG in Road Base (Edge)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RB_EDGE_070319.RAD

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years 0.000E+00	1.000E+00
U-234	U-234	1.000E+00	5.962E-03	5.857E-03
U-234	Th-230	1.000E+00	1.873E-07	5.574E-07
U-234	Ra-226	1.000E+00	1.638E-11	1.136E-10
U-234	Rn-222+D	1.000E+00	6.369E-10	4.524E-09
U-234	Pb-210	1.000E+00	2.163E-13	3.289E-12
U-234	Bi-210	1.000E+00	2.538E-15	4.006E-14
U-234	Po-210	1.000E+00	8.226E-14	2.137E-12
U-234	∑DSR(j)		5.962E-03	5.858E-03
U-238	U-238	5.400E-05	2.852E-07	2.801E-07
U-238	U-238	9.999E-01	5.280E-03	5.188E-03
U-238	Th-234+D	9.999E-01	1.519E-02	1.652E-02
U-238	U-234	9.999E-01	6.981E-09	2.334E-08
U-238	Th-230	9.999E-01	1.348E-13	1.083E-12
U-238	Ra-226	9.999E-01	8.221E-18	1.450E-16
U-238	Rn-222+D	9.999E-01	3.142E-16	5.721E-15
U-238	Pb-210	9.999E-01	7.982E-20	3.080E-18
U-238	Bi-210	9.999E-01	9.157E-22	3.709E-20
U-238	Po-210	9.999E-01	2.439E-20	1.691E-18
U-238	∑DSR(j)		2.048E-02	2.170E-02

The DSR includes contributions from associated (half-life ≤ 1 day) daughters.

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

Nuclide (i)	t= 0.000E+00	1.000E+00
Bi-210	2.052E+04	1.341E+05
Pb-210	2.828E+02	2.219E+02
Po-210	6.579E+02	4.475E+03
Ra-226	2.436E+01	2.409E+01
Rn-222	1.020E+03	5.175E+05
Th-230	5.942E+02	5.879E+02
Th-234	1.550E+04	5.460E+08
U-234	4.193E+03	4.268E+03
U-238	1.221E+03	1.152E+03

Summary : Road Construction Worker - PG in Road Base (Edge)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RB_EDGE_070319.RAD

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

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Bi-210	1.350E+01	0.000E+00	1.218E-03	2.052E+04	1.218E-03	2.052E+04
Pb-210	1.350E+01	1.000E+00	1.127E-01	2.219E+02	8.841E-02	2.828E+02
Po-210	1.350E+01	0.000E+00	3.800E-02	6.579E+02	3.800E-02	6.579E+02
Ra-226	1.350E+01	0.0875 ± 0.0002	1.047E+00	2.387E+01	1.026E+00	2.436E+01
Rn-222	1.350E+01	0.000E+00	2.451E-02	1.020E+03	2.451E-02	1.020E+03
Th-230	2.500E+00	1.000E+00	4.252E-02	5.879E+02	4.207E-02	5.942E+02
Th-234	1.500E+00	0.000E+00	1.613E-03	1.550E+04	1.613E-03	1.550E+04
U-234	1.600E+00	0.000E+00	5.962E-03	4.193E+03	5.962E-03	4.193E+03
U-238	1.500E+00	0.3657 ± 0.0007	2.191E-02	1.141E+03	2.048E-02	1.221E+03

Summary : Road Construction Worker - PG in Road Base (Edge)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RB_EDGE_070319.RAD

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	2.228E-04	4.227E-29
Bi-210	Pb-210	1.000E+00	8.163E-03	8.034E-03
Bi-210	Ra-226	1.000E+00	1.117E-04	3.415E-04
Bi-210	Rn-222	1.000E+00	3.484E-06	3.449E-06
Bi-210	Th-230	1.000E+00	2.909E-09	2.117E-08
Bi-210	Th-234	1.000E+00	7.225E-22	1.364E-20
Bi-210	U-234	1.000E+00	4.061E-15	6.410E-14
Bi-210	U-238	9.999E-01	1.374E-21	5.563E-20
Bi-210	∑DOSE(j)		8.501E-03	8.379E-03
Po-210	Bi-210	1.000E+00	1.622E-02	2.517E-03
Po-210	Pb-210	1.000E+00	5.215E-01	8.752E-01
Po-210	Po-210	1.000E+00	5.130E-01	7.543E-02
Po-210	Ra-226	1.000E+00	5.315E-03	2.648E-02
Po-210	Rn-222	1.000E+00	2.189E-04	3.749E-04
Po-210	Th-230	1.000E+00	1.119E-07	1.324E-06
Po-210	Th-234	1.000E+00	2.219E-20	7.081E-19
Po-210	U-234	1.000E+00	1.316E-13	3.419E-12
Po-210	U-238	9.999E-01	3.658E-20	2.537E-18
Po-210	∑DOSE(j)		1.056E+00	9.800E-01
Pb-210	Pb-210	1.000E+00	6.639E-01	6.379E-01
Pb-210	Ra-226	1.000E+00	9.199E-03	2.745E-02
Pb-210	Rn-222	1.000E+00	2.787E-04	2.738E-04
Pb-210	Th-230	1.000E+00	2.437E-07	1.720E-06
Pb-210	Th-234	1.000E+00	6.190E-20	1.122E-18
Pb-210	U-234	1.000E+00	3.460E-13	5.263E-12
Pb-210	U-238	9.999E-01	1.197E-19	4.620E-18
Pb-210	∑DOSE(j)		6.734E-01	6.657E-01
Ra-226	Ra-226	1.000E+00	3.406E-01	3.361E-01
Ra-226	Th-230	1.000E+00	1.369E-05	4.083E-05
Ra-226	Th-234	1.000E+00	5.065E-18	4.076E-17
Ra-226	U-234	1.000E+00	2.620E-11	1.818E-10
Ra-226	U-238	9.999E-01	1.233E-17	2.176E-16
Ra-226	∑DOSE(j)		3.406E-01	3.362E-01
Rn-222	Ra-226	1.000E+00	1.350E+01	1.362E+01
Rn-222	Rn-222	1.000E+00	3.304E-01	0.000E+00
Rn-222	Th-230	1.000E+00	5.398E-04	1.639E-03
Rn-222	Th-234	1.000E+00	1.963E-16	1.621E-15
Rn-222	U-234	1.000E+00	1.019E-09	7.238E-09
Rn-222	U-238	9.999E-01	4.713E-16	8.582E-15
Rn-222	∑DOSE(j)		1.383E+01	1.362E+01
Th-230	Th-230	1.000E+00	1.046E-01	1.046E-01
Th-230	Th-234	1.000E+00	6.278E-14	2.115E-13
Th-230	U-234	1.000E+00	2.996E-07	8.918E-07
Th-230	U-238	9.999E-01	2.022E-13	1.625E-12
Th-230	∑DOSE(j)		1.046E-01	1.046E-01

Summary : Road Construction Worker - PG in Road Base (Edge)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RB_EDGE_070319.RAD

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00
Th-234	Th-234	1.000E+00	2.420E-03	6.630E-08
Th-234	U-238	9.999E-01	2.279E-02	2.477E-02
Th-234	∑DOSE(j)		2.521E-02	2.477E-02
U-234	Th-234	1.000E+00	2.185E-09	2.375E-09
U-234	U-234	1.000E+00	9.539E-03	9.372E-03
U-234	U-238	9.999E-01	1.047E-08	3.501E-08
U-234	∑DOSE(j)		9.539E-03	9.372E-03
U-238	U-238	5.400E-05	4.277E-07	4.202E-07
U-238	U-238	9.999E-01	7.921E-03	7.782E-03
U-238	∑DOSE(j)		7.921E-03	7.782E-03

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

Summary : Road Construction Worker - PG in Road Base (Edge)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RB_EDGE_070319.RAD

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	1.350E+01	3.063E-24
Bi-210	Pb-210	1.000E+00	0.000E+00	1.155E+01
Bi-210	Ra-226	1.000E+00	0.000E+00	3.223E-01
Bi-210	Rn-222	1.000E+00	0.000E+00	4.960E-03
Bi-210	Th-230	1.000E+00	0.000E+00	1.264E-05
Bi-210	Th-234	1.000E+00	0.000E+00	4.515E-18
Bi-210	U-234	1.000E+00	0.000E+00	2.353E-11
Bi-210	U-238	9.999E-01	0.000E+00	1.067E-17
Bi-210	∑S(j):		1.350E+01	1.188E+01
Po-210	Bi-210	1.000E+00	0.000E+00	6.623E-02
Po-210	Pb-210	1.000E+00	0.000E+00	9.479E+00
Po-210	Po-210	1.000E+00	1.350E+01	1.985E+00
Po-210	Ra-226	1.000E+00	0.000E+00	1.689E-01
Po-210	Rn-222	1.000E+00	0.000E+00	4.049E-03
Po-210	Th-230	1.000E+00	0.000E+00	4.992E-06
Po-210	Th-234	1.000E+00	0.000E+00	1.366E-18
Po-210	U-234	1.000E+00	0.000E+00	7.521E-12
Po-210	U-238	9.999E-01	0.000E+00	2.722E-18
Po-210	∑S(j):		1.350E+01	1.170E+01
Pb-210	Pb-210	1.000E+00	1.350E+01	1.297E+01
Pb-210	Ra-226	1.000E+00	0.000E+00	3.685E-01
Pb-210	Rn-222	1.000E+00	0.000E+00	5.568E-03
Pb-210	Th-230	1.000E+00	0.000E+00	1.471E-05
Pb-210	Th-234	1.000E+00	0.000E+00	5.371E-18
Pb-210	U-234	1.000E+00	0.000E+00	2.786E-11
Pb-210	U-238	9.999E-01	0.000E+00	1.292E-17
Pb-210	∑S(j):		1.350E+01	1.335E+01
Ra-226	Ra-226	1.000E+00	1.350E+01	1.332E+01
Ra-226	Th-230	1.000E+00	0.000E+00	1.076E-03
Ra-226	Th-234	1.000E+00	0.000E+00	6.472E-16
Ra-226	U-234	1.000E+00	0.000E+00	3.088E-09
Ra-226	U-238	9.999E-01	0.000E+00	2.087E-15
Ra-226	∑S(j):		1.350E+01	1.333E+01
Rn-222	Ra-226	1.000E+00	0.000E+00	1.218E+01
Rn-222	Rn-222	1.000E+00	1.350E+01	4.647E-31
Rn-222	Th-230	1.000E+00	0.000E+00	9.699E-04
Rn-222	Th-234	1.000E+00	0.000E+00	5.740E-16
Rn-222	U-234	1.000E+00	0.000E+00	2.746E-09
Rn-222	U-238	9.999E-01	0.000E+00	1.825E-15
Rn-222	∑S(j):		1.350E+01	1.218E+01
Th-230	Th-230	1.000E+00	2.500E+00	2.500E+00
Th-230	Th-234	1.000E+00	0.000E+00	3.270E-12
Th-230	U-234	1.000E+00	0.000E+00	1.428E-05
Th-230	U-238	9.999E-01	0.000E+00	1.567E-11
Th-230	∑S(j):		2.500E+00	2.500E+00

Summary : Road Construction Worker - PG in Road Base (Edge)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RB_EDGE_070319.RAD

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00
Th-234	Th-234	1.000E+00	1.500E+00	4.110E-05
Th-234	U-238	9.999E-01	0.000E+00	1.476E+00
Th-234	∑S(j):		1.500E+00	1.476E+00
U-234	Th-234	1.000E+00	0.000E+00	3.983E-07
U-234	U-234	1.000E+00	1.600E+00	1.572E+00
U-234	U-238	9.999E-01	0.000E+00	3.786E-06
U-234	∑S(j):		1.600E+00	1.572E+00
U-238	U-238	5.400E-05	8.100E-05	7.958E-05
U-238	U-238	9.999E-01	1.500E+00	1.474E+00
U-238	∑S(j):		1.500E+00	1.474E+00

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

RESCALC.EXE execution time = 23.68 seconds

RESRAD Modelling Results

Road Construction Worker – Road Base with Surface Shield_Center

Summary : Road Construction Worker - PG in Road Base with Shield (Center)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RBSS_CENTER_070319.RAD

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Summary : Road Construction Worker - PG in Road Base with Shield (Center)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RBSS_CENTER_070319.RAD

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	At-218 (Source: ICRP 60)	4.878E-03	4.878E-03	DCF1(1)
A-1	Bi-210 (Source: ICRP 60)	5.476E-03	5.476E-03	DCF1(2)
A-1	Bi-214 (Source: ICRP 60)	9.325E+00	9.325E+00	DCF1(3)
A-1	Pa-234 (Source: ICRP 60)	1.088E+01	1.088E+01	DCF1(4)
A-1	Pa-234m (Source: ICRP 60)	9.867E-02	9.867E-02	DCF1(5)
A-1	Pb-210 (Source: ICRP 60)	1.981E-03	1.981E-03	DCF1(6)
A-1	Pb-214 (Source: ICRP 60)	1.243E+00	1.243E+00	DCF1(7)
A-1	Po-210 (Source: ICRP 60)	4.934E-05	4.934E-05	DCF1(8)
A-1	Po-214 (Source: ICRP 60)	4.840E-04	4.840E-04	DCF1(9)
A-1	Po-218 (Source: ICRP 60)	5.326E-05	5.326E-05	DCF1(10)
A-1	Ra-226 (Source: ICRP 60)	2.915E-02	2.915E-02	DCF1(11)
A-1	Rn-222 (Source: ICRP 60)	2.186E-03	2.186E-03	DCF1(12)
A-1	Th-230 (Source: ICRP 60)	1.071E-03	1.071E-03	DCF1(13)
A-1	Th-234 (Source: ICRP 60)	2.130E-02	2.130E-02	DCF1(14)
A-1	Tl-210 (Source: ICRP 60)	1.661E+01	1.661E+01	DCF1(15)
A-1	U-234 (Source: ICRP 60)	3.439E-04	3.439E-04	DCF1(16)
A-1	U-238 (Source: ICRP 60)	7.961E-05	7.961E-05	DCF1(17)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Bi-210	3.441E-04	3.441E-04	DCF2(1)
B-1	Pb-210	2.072E-02	2.072E-02	DCF2(2)
B-1	Po-210	1.591E-02	1.591E-02	DCF2(3)
B-1	Ra-226	3.515E-02	3.515E-02	DCF2(4)
B-1	Rn-222+D	1.073E-04	0.000E+00	DCF2(5)
B-1	Th-230	3.700E-01	3.700E-01	DCF2(6)
B-1	Th-234+D	2.849E-05	2.849E-05	DCF2(7)
B-1	U-234	3.478E-02	3.478E-02	DCF2(8)
B-1	U-238	2.960E-02	2.960E-02	DCF2(9)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Bi-210	4.810E-06	4.810E-06	DCF3(1)
D-1	Pb-210	2.553E-03	2.553E-03	DCF3(2)
D-1	Po-210	4.440E-03	4.440E-03	DCF3(3)
D-1	Ra-226	1.036E-03	1.036E-03	DCF3(4)
D-1	Rn-222+D	9.249E-07	0.000E+00	DCF3(5)
D-1	Th-230	7.770E-04	7.770E-04	DCF3(6)
D-1	Th-234+D	1.259E-05	1.258E-05	DCF3(7)
D-1	U-234	1.813E-04	1.813E-04	DCF3(8)
D-1	U-238	1.665E-04	1.665E-04	DCF3(9)
D-34	Food transfer factors:			
D-34	Bi-210 , plant/soil concentration ratio, dimensionless	1.000E-01	1.000E-01	RTF(1,1)
D-34	Bi-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(1,2)
D-34	Bi-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-04	5.000E-04	RTF(1,3)
D-34				
D-34	Pb-210 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pb-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(2,2)
D-34	Pb-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(2,3)
D-34				

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Po-210 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(3,1)
D-34	Po-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(3,2)
D-34	Po-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.400E-04	3.400E-04	RTF(3,3)
D-34				
D-34	Ra-226 , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Ra-226 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,2)
D-34	Ra-226 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,3)
D-34				
D-34	Rn-222+D , plant/soil concentration ratio, dimensionless	0.000E+00	0.000E+00	RTF(5,1)
D-34	Rn-222+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	0.000E+00	0.000E+00	RTF(5,2)
D-34	Rn-222+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	0.000E+00	0.000E+00	RTF(5,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(6,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(6,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(6,3)
D-34				
D-34	Th-234+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(7,1)
D-34	Th-234+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(7,2)
D-34	Th-234+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(7,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(8,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(8,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(8,3)
D-34				
D-34	U-238 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(9,1)
D-34	U-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(9,2)
D-34	U-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(9,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Bi-210 , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Bi-210 , crustacea and mollusks	1.000E+01	1.000E+01	BIOFAC(1,2)
D-5				
D-5	Pb-210 , fish	3.000E+02	3.000E+02	BIOFAC(2,1)
D-5	Pb-210 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(2,2)
D-5				
D-5	Po-210 , fish	1.000E+02	1.000E+02	BIOFAC(3,1)
D-5	Po-210 , crustacea and mollusks	2.000E+04	2.000E+04	BIOFAC(3,2)
D-5				
D-5	Ra-226 , fish	5.000E+01	5.000E+01	BIOFAC(4,1)
D-5	Ra-226 , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(4,2)
D-5				
D-5	Rn-222+D , fish	0.000E+00	0.000E+00	BIOFAC(5,1)
D-5	Rn-222+D , crustacea and mollusks	0.000E+00	0.000E+00	BIOFAC(5,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(6,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(6,2)
D-5				
D-5	Th-234+D , fish	1.000E+02	1.000E+02	BIOFAC(7,1)
D-5	Th-234+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(7,2)
D-5				

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(8,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(8,2)
D-5				
D-5	U-238 , fish	1.000E+01	1.000E+01	BIOFAC(9,1)
D-5	U-238 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(9,2)

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

Summary : Road Construction Worker - PG in Road Base with Shield (Center)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RBSS_CENTER_070319.RAD

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.500E+03	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	2.500E-01	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	not used	3.000E+00	---	T(3)
R011	Times for calculations (yr)	not used	1.000E+01	---	T(4)
R011	Times for calculations (yr)	not used	3.000E+01	---	T(5)
R011	Times for calculations (yr)	not used	1.000E+02	---	T(6)
R011	Times for calculations (yr)	not used	3.000E+02	---	T(7)
R011	Times for calculations (yr)	not used	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Bi-210	1.350E+01	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Pb-210	1.350E+01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Po-210	1.350E+01	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Ra-226	1.350E+01	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Rn-222	1.350E+01	0.000E+00	---	S1(5)
R012	Initial principal radionuclide (pCi/g): Th-230	2.500E+00	0.000E+00	---	S1(6)
R012	Initial principal radionuclide (pCi/g): Th-234	1.500E+00	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): U-234	1.600E+00	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): U-238	1.500E+00	0.000E+00	---	S1(9)
R012	Concentration in groundwater (pCi/L): Bi-210	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Po-210	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): Rn-222	not used	0.000E+00	---	W1(5)
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---	W1(6)
R012	Concentration in groundwater (pCi/L): Th-234	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(9)
R013	Cover depth (m)	1.200E-01	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	2.250E+00	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	0.000E+00	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	2.250E+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)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	not used	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	not used	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	not used	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	not used	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	not used	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	not used	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	not used	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	not used	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	not used	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	not used	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	not used	1	---	NS
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	not used	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Bi-210				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	not used	0.000E+00	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	not used	0.000E+00	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.232E+00	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+02	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+02	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.876E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Po-210				
R016	Contaminated zone (cm**3/g)	1.000E+01	1.000E+01	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+01	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+01	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.764E-02	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.267E-02	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for Rn-222				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	not used	0.000E+00	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	not used	0.000E+00	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.232E+00	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.481E-05	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for Th-234				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.481E-05	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.773E-02	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(9)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(9,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.773E-02	ALEACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)
R017	Inhalation rate (m**3/yr)	1.140E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	2.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	1.000E+00	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	0.000E+00	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.300E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	-1.000E+00	1.000E+00	-1 shows non-circular AREA.	FS

Summary : Road Construction Worker - PG in Road Base with Shield (Center)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RBSS_CENTER_070319.RAD

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	4.250E+00	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	8.500E+00	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	1.275E+01	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	1.700E+01	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	2.125E+01	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	2.550E+01	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	2.975E+01	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	3.400E+01	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	3.825E+01	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	4.250E+01	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	4.675E+01	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	5.100E+01	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	1.000E+00	1.000E+00	---	FRACA(1)
R017	Ring 2	1.000E+00	2.732E-01	---	FRACA(2)
R017	Ring 3	5.000E-01	0.000E+00	---	FRACA(3)
R017	Ring 4	3.500E-01	0.000E+00	---	FRACA(4)
R017	Ring 5	2.600E-01	0.000E+00	---	FRACA(5)
R017	Ring 6	2.100E-01	0.000E+00	---	FRACA(6)
R017	Ring 7	1.800E-01	0.000E+00	---	FRACA(7)
R017	Ring 8	1.600E-01	0.000E+00	---	FRACA(8)
R017	Ring 9	1.400E-01	0.000E+00	---	FRACA(9)
R017	Ring 10	1.200E-01	0.000E+00	---	FRACA(10)
R017	Ring 11	1.100E-01	0.000E+00	---	FRACA(11)
R017	Ring 12	7.000E-02	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	8.250E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI

Summary : Road Construction Worker - PG in Road Base with Shield (Center)
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Site-Specific Parameter Summary (continued)

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

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

Summary : Road Construction Worker - PG in Road Base with Shield (Center)
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Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	1500.00 square meters	Bi-210	1.350E+01
Thickness:	0.25 meters	Pb-210	1.350E+01
Cover Depth:	0.12 meters	Po-210	1.350E+01
		Ra-226	1.350E+01
		Rn-222	1.350E+01
		Th-230	2.500E+00
		Th-234	1.500E+00
		U-234	1.600E+00
		U-238	1.500E+00

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

t (years):	0.000E+00	1.000E+00
TDOSE(t):	3.583E+00	3.519E+00
M(t):	1.433E-01	1.407E-01

Maximum TDOSE(t): 3.583E+00 mrem/yr at t = 0.000E+00 years

Summary : Road Construction Worker - PG in Road Base with Shield (Center)
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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-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	5.571E-06	0.0000	4.567E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.206E-03	0.0009
Pb-210	2.033E-04	0.0001	5.476E-03	0.0015	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.313E-01	0.0645
Po-210	5.808E-06	0.0000	1.394E-03	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.012E-01	0.0282
Ra-226	3.075E+00	0.8581	6.968E-03	0.0019	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.560E-02	0.0155
Rn-222	7.519E-02	0.0210	2.759E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.813E-05	0.0000
Th-230	1.264E-04	0.0000	1.350E-02	0.0038	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.374E-03	0.0021
Th-234	3.256E-04	0.0001	5.961E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.827E-06	0.0000
U-234	4.623E-07	0.0000	8.048E-04	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.091E-03	0.0003
U-238	3.067E-03	0.0009	6.427E-04	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.004E-03	0.0003
Total	3.154E+00	0.8801	2.883E-02	0.0080	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.009E-01	0.1119

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.257E-03	0.0009
Pb-210	0.000E+00	0.0000	0.000E+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-01	0.0661
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.026E-01	0.0286
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.137E+00	0.8755
Rn-222	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.530E-02	0.0210
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	2.100E-02	0.0059
Th-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.325E-04	0.0001
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	1.896E-03	0.0005
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	4.713E-03	0.0013
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.583E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : Road Construction Worker - PG in Road Base with Shield (Center)
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	2.849E-08	0.0000	6.840E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.965E-04	0.0001
Pb-210	2.041E-04	0.0001	6.280E-03	0.0018	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.961E-01	0.0841
Po-210	8.539E-07	0.0000	2.050E-04	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.488E-02	0.0042
Ra-226	3.103E+00	0.8818	7.048E-03	0.0020	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.262E-02	0.0178
Rn-222	8.763E-08	0.0000	2.694E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.269E-04	0.0000
Th-230	3.768E-04	0.0001	1.350E-02	0.0038	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.378E-03	0.0021
Th-234	8.921E-09	0.0000	2.020E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.587E-10	0.0000
U-234	4.556E-07	0.0000	7.908E-04	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.072E-03	0.0003
U-238	3.333E-03	0.0009	6.315E-04	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.928E-04	0.0003
Total	3.107E+00	0.8829	2.846E-02	0.0081	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.836E-01	0.1090

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.034E-04	0.0001
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.025E-01	0.0860
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.509E-02	0.0043
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.172E+00	0.9016
Rn-222	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.297E-04	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	2.125E-02	0.0060
Th-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	9.582E-09	0.0000
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	1.863E-03	0.0005
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	4.958E-03	0.0014
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.519E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : Road Construction Worker - PG in Road Base with Shield (Center)
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Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	9.407E-07	2.134E-31
Bi-210	Po-210	1.000E+00	2.404E-04	3.729E-05
Bi-210	∑DSR(j)		2.413E-04	3.729E-05
Pb-210	Pb-210	1.000E+00	9.794E-03	9.410E-03
Pb-210	Bi-210	1.000E+00	3.446E-05	3.392E-05
Pb-210	Po-210	1.000E+00	7.726E-03	1.297E-02
Pb-210	∑DSR(j)		1.755E-02	2.241E-02
Po-210	Po-210	1.000E+00	7.600E-03	1.117E-03
Ra-226	Ra-226	1.000E+00	4.574E-03	4.515E-03
Ra-226	Rn-222+D	1.000E+00	2.276E-01	2.297E-01
Ra-226	Pb-210	1.000E+00	1.357E-04	4.050E-04
Ra-226	Bi-210	1.000E+00	4.717E-07	1.442E-06
Ra-226	Po-210	1.000E+00	7.873E-05	3.923E-04
Ra-226	∑DSR(j)		2.324E-01	2.350E-01
Rn-222+D	Rn-222+D	1.000E+00	5.570E-03	1.917E-34
Rn-222+D	Pb-210	1.000E+00	4.111E-06	4.040E-06
Rn-222+D	Bi-210	1.000E+00	1.471E-08	1.456E-08
Rn-222+D	Po-210	1.000E+00	3.244E-06	5.554E-06
Rn-222+D	∑DSR(j)		5.577E-03	9.609E-06
Th-230	Th-230	1.000E+00	8.349E-03	8.348E-03
Th-230	Ra-226	1.000E+00	9.929E-07	2.962E-06
Th-230	Rn-222+D	1.000E+00	4.914E-05	1.493E-04
Th-230	Pb-210	1.000E+00	1.941E-08	1.370E-07
Th-230	Bi-210	1.000E+00	6.631E-11	4.825E-10
Th-230	Po-210	1.000E+00	8.953E-09	1.059E-07
Th-230	∑DSR(j)		8.399E-03	8.501E-03
Th-234+D	Th-234+D	1.000E+00	2.217E-04	6.073E-09
Th-234+D	U-234	1.000E+00	2.896E-10	3.148E-10
Th-234+D	Th-230	1.000E+00	8.348E-15	2.812E-14
Th-234+D	Ra-226	1.000E+00	6.123E-19	4.927E-18
Th-234+D	Rn-222+D	1.000E+00	2.979E-17	2.460E-16
Th-234+D	Pb-210	1.000E+00	8.218E-21	1.490E-19
Th-234+D	Bi-210	1.000E+00	2.745E-23	5.184E-22
Th-234+D	Po-210	1.000E+00	2.959E-21	9.441E-20
Th-234+D	∑DSR(j)		2.217E-04	6.388E-09

Summary : Road Construction Worker - PG in Road Base with Shield (Center)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RBSS_CENTER_070319.RAD

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years 0.000E+00	1.000E+00
U-234	U-234	1.000E+00	1.185E-03	1.164E-03
U-234	Th-230	1.000E+00	3.736E-08	1.112E-07
U-234	Ra-226	1.000E+00	2.970E-12	2.060E-11
U-234	Rn-222+D	1.000E+00	1.450E-10	1.030E-09
U-234	Pb-210	1.000E+00	4.307E-14	6.550E-13
U-234	Bi-210	1.000E+00	1.446E-16	2.283E-15
U-234	Po-210	1.000E+00	1.645E-14	4.274E-13
U-234	∑DSR(j)		1.185E-03	1.165E-03
U-238	U-238	5.400E-05	5.694E-08	5.594E-08
U-238	U-238	9.999E-01	1.054E-03	1.036E-03
U-238	Th-234+D	9.999E-01	2.088E-03	2.269E-03
U-238	U-234	9.999E-01	1.388E-09	4.640E-09
U-238	Th-230	9.999E-01	2.689E-14	2.161E-13
U-238	Ra-226	9.999E-01	1.491E-18	2.630E-17
U-238	Rn-222+D	9.999E-01	7.152E-17	1.302E-15
U-238	Pb-210	9.999E-01	1.590E-20	6.133E-19
U-238	Bi-210	9.999E-01	5.219E-23	2.114E-21
U-238	Po-210	9.999E-01	4.877E-21	3.383E-19
U-238	∑DSR(j)		3.142E-03	3.305E-03

The DSR includes contributions from associated (half-life ≤ 1 day) daughters.

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

Nuclide (i)	t= 0.000E+00	1.000E+00
Bi-210	1.036E+05	6.705E+05
Pb-210	1.424E+03	1.116E+03
Po-210	3.289E+03	2.237E+04
Ra-226	1.076E+02	1.064E+02
Rn-222	4.482E+03	2.602E+06
Th-230	2.977E+03	2.941E+03
Th-234	1.128E+05	3.914E+09
U-234	2.109E+04	2.147E+04
U-238	7.956E+03	7.564E+03

Summary : Road Construction Worker - PG in Road Base with Shield (Center)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RBSS_CENTER_070319.RAD

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

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Bi-210	1.350E+01	0.000E+00	2.413E-04	1.036E+05	2.413E-04	1.036E+05
Pb-210	1.350E+01	1.000E+00	2.241E-02	1.116E+03	1.755E-02	1.424E+03
Po-210	1.350E+01	0.000E+00	7.600E-03	3.289E+03	7.600E-03	3.289E+03
Ra-226	1.350E+01	0.0872 ± 0.0002	2.372E-01	1.054E+02	2.324E-01	1.076E+02
Rn-222	1.350E+01	0.000E+00	5.577E-03	4.482E+03	5.577E-03	4.482E+03
Th-230	2.500E+00	1.000E+00	8.501E-03	2.941E+03	8.399E-03	2.977E+03
Th-234	1.500E+00	0.000E+00	2.217E-04	1.128E+05	2.217E-04	1.128E+05
U-234	1.600E+00	0.000E+00	1.185E-03	2.109E+04	1.185E-03	2.109E+04
U-238	1.500E+00	0.3393 ± 0.0007	3.338E-03	7.490E+03	3.142E-03	7.956E+03

Summary : Road Construction Worker - PG in Road Base with Shield (Center)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RBSS_CENTER_070319.RAD

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	1.270E-05	0.000E+00
Bi-210	Pb-210	1.000E+00	4.652E-04	4.579E-04
Bi-210	Ra-226	1.000E+00	6.368E-06	1.946E-05
Bi-210	Rn-222	1.000E+00	1.986E-07	1.966E-07
Bi-210	Th-230	1.000E+00	1.658E-10	1.206E-09
Bi-210	Th-234	1.000E+00	4.118E-23	7.776E-22
Bi-210	U-234	1.000E+00	2.314E-16	3.653E-15
Bi-210	U-238	9.999E-01	7.828E-23	3.171E-21
Bi-210	∑DOSE(j)		4.845E-04	4.775E-04
Po-210	Bi-210	1.000E+00	3.245E-03	5.034E-04
Po-210	Pb-210	1.000E+00	1.043E-01	1.750E-01
Po-210	Po-210	1.000E+00	1.026E-01	1.509E-02
Po-210	Ra-226	1.000E+00	1.063E-03	5.296E-03
Po-210	Rn-222	1.000E+00	4.379E-05	7.499E-05
Po-210	Th-230	1.000E+00	2.238E-08	2.648E-07
Po-210	Th-234	1.000E+00	4.439E-21	1.416E-19
Po-210	U-234	1.000E+00	2.632E-14	6.838E-13
Po-210	U-238	9.999E-01	7.316E-21	5.074E-19
Po-210	∑DOSE(j)		2.113E-01	1.960E-01
Pb-210	Pb-210	1.000E+00	1.322E-01	1.270E-01
Pb-210	Ra-226	1.000E+00	1.832E-03	5.467E-03
Pb-210	Rn-222	1.000E+00	5.550E-05	5.454E-05
Pb-210	Th-230	1.000E+00	4.853E-08	3.426E-07
Pb-210	Th-234	1.000E+00	1.233E-20	2.234E-19
Pb-210	U-234	1.000E+00	6.891E-14	1.048E-12
Pb-210	U-238	9.999E-01	2.384E-20	9.200E-19
Pb-210	∑DOSE(j)		1.341E-01	1.326E-01
Ra-226	Ra-226	1.000E+00	6.175E-02	6.095E-02
Ra-226	Th-230	1.000E+00	2.482E-06	7.404E-06
Ra-226	Th-234	1.000E+00	9.184E-19	7.391E-18
Ra-226	U-234	1.000E+00	4.751E-12	3.297E-11
Ra-226	U-238	9.999E-01	2.236E-18	3.945E-17
Ra-226	∑DOSE(j)		6.175E-02	6.095E-02
Rn-222	Ra-226	1.000E+00	3.073E+00	3.101E+00
Rn-222	Rn-222	1.000E+00	7.520E-02	0.000E+00
Rn-222	Th-230	1.000E+00	1.229E-04	3.732E-04
Rn-222	Th-234	1.000E+00	4.468E-17	3.690E-16
Rn-222	U-234	1.000E+00	2.320E-10	1.648E-09
Rn-222	U-238	9.999E-01	1.073E-16	1.953E-15
Rn-222	∑DOSE(j)		3.148E+00	3.101E+00
Th-230	Th-230	1.000E+00	2.087E-02	2.087E-02
Th-230	Th-234	1.000E+00	1.252E-14	4.218E-14
Th-230	U-234	1.000E+00	5.977E-08	1.779E-07
Th-230	U-238	9.999E-01	4.034E-14	3.242E-13
Th-230	∑DOSE(j)		2.087E-02	2.087E-02

Summary : Road Construction Worker - PG in Road Base with Shield (Center)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RBSS_CENTER_070319.RAD

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00
Th-234	Th-234	1.000E+00	3.325E-04	9.110E-09
Th-234	U-238	9.999E-01	3.132E-03	3.404E-03
Th-234	∑DOSE(j)		3.464E-03	3.404E-03
U-234	Th-234	1.000E+00	4.344E-10	4.722E-10
U-234	U-234	1.000E+00	1.896E-03	1.863E-03
U-234	U-238	9.999E-01	2.082E-09	6.959E-09
U-234	∑DOSE(j)		1.896E-03	1.863E-03
U-238	U-238	5.400E-05	8.541E-08	8.390E-08
U-238	U-238	9.999E-01	1.581E-03	1.554E-03
U-238	∑DOSE(j)		1.582E-03	1.554E-03

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

Summary : Road Construction Worker - PG in Road Base with Shield (Center)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RBSS_CENTER_070319.RAD

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	1.350E+01	3.063E-24
Bi-210	Pb-210	1.000E+00	0.000E+00	1.155E+01
Bi-210	Ra-226	1.000E+00	0.000E+00	3.223E-01
Bi-210	Rn-222	1.000E+00	0.000E+00	4.960E-03
Bi-210	Th-230	1.000E+00	0.000E+00	1.264E-05
Bi-210	Th-234	1.000E+00	0.000E+00	4.515E-18
Bi-210	U-234	1.000E+00	0.000E+00	2.353E-11
Bi-210	U-238	9.999E-01	0.000E+00	1.067E-17
Bi-210	∑S(j):		1.350E+01	1.188E+01
Po-210	Bi-210	1.000E+00	0.000E+00	6.623E-02
Po-210	Pb-210	1.000E+00	0.000E+00	9.479E+00
Po-210	Po-210	1.000E+00	1.350E+01	1.985E+00
Po-210	Ra-226	1.000E+00	0.000E+00	1.689E-01
Po-210	Rn-222	1.000E+00	0.000E+00	4.049E-03
Po-210	Th-230	1.000E+00	0.000E+00	4.992E-06
Po-210	Th-234	1.000E+00	0.000E+00	1.366E-18
Po-210	U-234	1.000E+00	0.000E+00	7.521E-12
Po-210	U-238	9.999E-01	0.000E+00	2.722E-18
Po-210	∑S(j):		1.350E+01	1.170E+01
Pb-210	Pb-210	1.000E+00	1.350E+01	1.297E+01
Pb-210	Ra-226	1.000E+00	0.000E+00	3.685E-01
Pb-210	Rn-222	1.000E+00	0.000E+00	5.568E-03
Pb-210	Th-230	1.000E+00	0.000E+00	1.471E-05
Pb-210	Th-234	1.000E+00	0.000E+00	5.371E-18
Pb-210	U-234	1.000E+00	0.000E+00	2.786E-11
Pb-210	U-238	9.999E-01	0.000E+00	1.292E-17
Pb-210	∑S(j):		1.350E+01	1.335E+01
Ra-226	Ra-226	1.000E+00	1.350E+01	1.332E+01
Ra-226	Th-230	1.000E+00	0.000E+00	1.076E-03
Ra-226	Th-234	1.000E+00	0.000E+00	6.472E-16
Ra-226	U-234	1.000E+00	0.000E+00	3.088E-09
Ra-226	U-238	9.999E-01	0.000E+00	2.087E-15
Ra-226	∑S(j):		1.350E+01	1.333E+01
Rn-222	Ra-226	1.000E+00	0.000E+00	1.218E+01
Rn-222	Rn-222	1.000E+00	1.350E+01	4.647E-31
Rn-222	Th-230	1.000E+00	0.000E+00	9.699E-04
Rn-222	Th-234	1.000E+00	0.000E+00	5.740E-16
Rn-222	U-234	1.000E+00	0.000E+00	2.746E-09
Rn-222	U-238	9.999E-01	0.000E+00	1.825E-15
Rn-222	∑S(j):		1.350E+01	1.218E+01
Th-230	Th-230	1.000E+00	2.500E+00	2.500E+00
Th-230	Th-234	1.000E+00	0.000E+00	3.270E-12
Th-230	U-234	1.000E+00	0.000E+00	1.428E-05
Th-230	U-238	9.999E-01	0.000E+00	1.567E-11
Th-230	∑S(j):		2.500E+00	2.500E+00

Summary : Road Construction Worker - PG in Road Base with Shield (Center)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RBSS_CENTER_070319.RAD

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00
Th-234	Th-234	1.000E+00	1.500E+00	4.110E-05
Th-234	U-238	9.999E-01	0.000E+00	1.476E+00
Th-234	∑S(j):		1.500E+00	1.476E+00
U-234	Th-234	1.000E+00	0.000E+00	3.983E-07
U-234	U-234	1.000E+00	1.600E+00	1.572E+00
U-234	U-238	9.999E-01	0.000E+00	3.786E-06
U-234	∑S(j):		1.600E+00	1.572E+00
U-238	U-238	5.400E-05	8.100E-05	7.958E-05
U-238	U-238	9.999E-01	1.500E+00	1.474E+00
U-238	∑S(j):		1.500E+00	1.474E+00

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

RESCALC.EXE execution time = 23.56 seconds

RESRAD Modelling Results

Road Construction Worker – Road Base with Surface Shield_Edge

Summary : Case No. 8: Construction Worker - PG in Road Base with Shield (Edge)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RBSS_EDGE_070319.RAD

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Part I: Mixture Sums and Single Radionuclide Guidelines

Summary : Case No. 8: Construction Worker - PG in Road Base with Shield (Edge)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RBSS_EDGE_070319.RAD

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	At-218 (Source: ICRP 60)	4.878E-03	4.878E-03	DCF1(1)
A-1	Bi-210 (Source: ICRP 60)	5.476E-03	5.476E-03	DCF1(2)
A-1	Bi-214 (Source: ICRP 60)	9.325E+00	9.325E+00	DCF1(3)
A-1	Pa-234 (Source: ICRP 60)	1.088E+01	1.088E+01	DCF1(4)
A-1	Pa-234m (Source: ICRP 60)	9.867E-02	9.867E-02	DCF1(5)
A-1	Pb-210 (Source: ICRP 60)	1.981E-03	1.981E-03	DCF1(6)
A-1	Pb-214 (Source: ICRP 60)	1.243E+00	1.243E+00	DCF1(7)
A-1	Po-210 (Source: ICRP 60)	4.934E-05	4.934E-05	DCF1(8)
A-1	Po-214 (Source: ICRP 60)	4.840E-04	4.840E-04	DCF1(9)
A-1	Po-218 (Source: ICRP 60)	5.326E-05	5.326E-05	DCF1(10)
A-1	Ra-226 (Source: ICRP 60)	2.915E-02	2.915E-02	DCF1(11)
A-1	Rn-222 (Source: ICRP 60)	2.186E-03	2.186E-03	DCF1(12)
A-1	Th-230 (Source: ICRP 60)	1.071E-03	1.071E-03	DCF1(13)
A-1	Th-234 (Source: ICRP 60)	2.130E-02	2.130E-02	DCF1(14)
A-1	Tl-210 (Source: ICRP 60)	1.661E+01	1.661E+01	DCF1(15)
A-1	U-234 (Source: ICRP 60)	3.439E-04	3.439E-04	DCF1(16)
A-1	U-238 (Source: ICRP 60)	7.961E-05	7.961E-05	DCF1(17)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Bi-210	3.441E-04	3.441E-04	DCF2(1)
B-1	Pb-210	2.072E-02	2.072E-02	DCF2(2)
B-1	Po-210	1.591E-02	1.591E-02	DCF2(3)
B-1	Ra-226	3.515E-02	3.515E-02	DCF2(4)
B-1	Rn-222+D	1.073E-04	0.000E+00	DCF2(5)
B-1	Th-230	3.700E-01	3.700E-01	DCF2(6)
B-1	Th-234+D	2.849E-05	2.849E-05	DCF2(7)
B-1	U-234	3.478E-02	3.478E-02	DCF2(8)
B-1	U-238	2.960E-02	2.960E-02	DCF2(9)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Bi-210	4.810E-06	4.810E-06	DCF3(1)
D-1	Pb-210	2.553E-03	2.553E-03	DCF3(2)
D-1	Po-210	4.440E-03	4.440E-03	DCF3(3)
D-1	Ra-226	1.036E-03	1.036E-03	DCF3(4)
D-1	Rn-222+D	9.249E-07	0.000E+00	DCF3(5)
D-1	Th-230	7.770E-04	7.770E-04	DCF3(6)
D-1	Th-234+D	1.259E-05	1.258E-05	DCF3(7)
D-1	U-234	1.813E-04	1.813E-04	DCF3(8)
D-1	U-238	1.665E-04	1.665E-04	DCF3(9)
D-34	Food transfer factors:			
D-34	Bi-210 , plant/soil concentration ratio, dimensionless	1.000E-01	1.000E-01	RTF(1,1)
D-34	Bi-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(1,2)
D-34	Bi-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-04	5.000E-04	RTF(1,3)
D-34				
D-34	Pb-210 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pb-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(2,2)
D-34	Pb-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(2,3)
D-34				

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Po-210 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(3,1)
D-34	Po-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(3,2)
D-34	Po-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.400E-04	3.400E-04	RTF(3,3)
D-34				
D-34	Ra-226 , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Ra-226 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,2)
D-34	Ra-226 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,3)
D-34				
D-34	Rn-222+D , plant/soil concentration ratio, dimensionless	0.000E+00	0.000E+00	RTF(5,1)
D-34	Rn-222+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	0.000E+00	0.000E+00	RTF(5,2)
D-34	Rn-222+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	0.000E+00	0.000E+00	RTF(5,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(6,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(6,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(6,3)
D-34				
D-34	Th-234+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(7,1)
D-34	Th-234+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(7,2)
D-34	Th-234+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(7,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(8,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(8,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(8,3)
D-34				
D-34	U-238 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(9,1)
D-34	U-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(9,2)
D-34	U-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(9,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Bi-210 , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Bi-210 , crustacea and mollusks	1.000E+01	1.000E+01	BIOFAC(1,2)
D-5				
D-5	Pb-210 , fish	3.000E+02	3.000E+02	BIOFAC(2,1)
D-5	Pb-210 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(2,2)
D-5				
D-5	Po-210 , fish	1.000E+02	1.000E+02	BIOFAC(3,1)
D-5	Po-210 , crustacea and mollusks	2.000E+04	2.000E+04	BIOFAC(3,2)
D-5				
D-5	Ra-226 , fish	5.000E+01	5.000E+01	BIOFAC(4,1)
D-5	Ra-226 , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(4,2)
D-5				
D-5	Rn-222+D , fish	0.000E+00	0.000E+00	BIOFAC(5,1)
D-5	Rn-222+D , crustacea and mollusks	0.000E+00	0.000E+00	BIOFAC(5,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(6,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(6,2)
D-5				
D-5	Th-234+D , fish	1.000E+02	1.000E+02	BIOFAC(7,1)
D-5	Th-234+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(7,2)
D-5				

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Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(8,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(8,2)
D-5				
D-5	U-238 , fish	1.000E+01	1.000E+01	BIOFAC(9,1)
D-5	U-238 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(9,2)

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

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Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.500E+03	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	2.500E-01	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	not used	3.000E+00	---	T(3)
R011	Times for calculations (yr)	not used	1.000E+01	---	T(4)
R011	Times for calculations (yr)	not used	3.000E+01	---	T(5)
R011	Times for calculations (yr)	not used	1.000E+02	---	T(6)
R011	Times for calculations (yr)	not used	3.000E+02	---	T(7)
R011	Times for calculations (yr)	not used	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Bi-210	1.350E+01	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Pb-210	1.350E+01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Po-210	1.350E+01	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Ra-226	1.350E+01	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Rn-222	1.350E+01	0.000E+00	---	S1(5)
R012	Initial principal radionuclide (pCi/g): Th-230	2.500E+00	0.000E+00	---	S1(6)
R012	Initial principal radionuclide (pCi/g): Th-234	1.500E+00	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): U-234	1.600E+00	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): U-238	1.500E+00	0.000E+00	---	S1(9)
R012	Concentration in groundwater (pCi/L): Bi-210	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Po-210	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): Rn-222	not used	0.000E+00	---	W1(5)
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---	W1(6)
R012	Concentration in groundwater (pCi/L): Th-234	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(9)
R013	Cover depth (m)	1.200E-01	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	2.250E+00	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	0.000E+00	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	2.250E+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)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	not used	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	not used	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	not used	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	not used	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	not used	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	not used	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	not used	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	not used	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	not used	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	not used	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	not used	1	---	NS
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	not used	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Bi-210				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	not used	0.000E+00	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	not used	0.000E+00	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.232E+00	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+02	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+02	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.876E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Po-210				
R016	Contaminated zone (cm**3/g)	1.000E+01	1.000E+01	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+01	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+01	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.764E-02	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.267E-02	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for Rn-222				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	not used	0.000E+00	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	not used	0.000E+00	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.232E+00	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.481E-05	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for Th-234				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.481E-05	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.773E-02	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(9)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(9,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.773E-02	ALEACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)
R017	Inhalation rate (m**3/yr)	1.140E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	2.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	1.000E+00	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	0.000E+00	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.300E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	-1.000E+00	1.000E+00	-1 shows non-circular AREA.	FS

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	4.417E+00	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	8.833E+00	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	1.325E+01	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	1.767E+01	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	2.208E+01	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	2.650E+01	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	3.092E+01	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	3.533E+01	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	3.975E+01	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	4.417E+01	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	4.858E+01	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	5.300E+01	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	5.000E-01	1.000E+00	---	FRACA(1)
R017	Ring 2	5.000E-01	2.732E-01	---	FRACA(2)
R017	Ring 3	5.000E-01	0.000E+00	---	FRACA(3)
R017	Ring 4	4.400E-01	0.000E+00	---	FRACA(4)
R017	Ring 5	2.800E-01	0.000E+00	---	FRACA(5)
R017	Ring 6	2.200E-01	0.000E+00	---	FRACA(6)
R017	Ring 7	1.800E-01	0.000E+00	---	FRACA(7)
R017	Ring 8	1.500E-01	0.000E+00	---	FRACA(8)
R017	Ring 9	1.300E-01	0.000E+00	---	FRACA(9)
R017	Ring 10	1.200E-01	0.000E+00	---	FRACA(10)
R017	Ring 11	1.100E-01	0.000E+00	---	FRACA(11)
R017	Ring 12	4.600E-02	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	8.250E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI

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

Summary : Case No. 8: Construction Worker - PG in Road Base with Shield (Edge)
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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

Summary : Case No. 8: Construction Worker - PG in Road Base with Shield (Edge)
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Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	1500.00 square meters	Bi-210	1.350E+01
Thickness:	0.25 meters	Pb-210	1.350E+01
Cover Depth:	0.12 meters	Po-210	1.350E+01
		Ra-226	1.350E+01
		Rn-222	1.350E+01
		Th-230	2.500E+00
		Th-234	1.500E+00
		U-234	1.600E+00
		U-238	1.500E+00

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

t (years):	0.000E+00	1.000E+00
TDOSE(t):	2.007E+00	1.966E+00
M(t):	8.028E-02	7.863E-02

Maximum TDOSE(t): 2.007E+00 mrem/yr at t = 0.000E+00 years

Summary : Case No. 8: Construction Worker - PG in Road Base with Shield (Edge)
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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-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	2.786E-06	0.0000	4.567E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.206E-03	0.0016
Pb-210	1.016E-04	0.0001	5.476E-03	0.0027	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.313E-01	0.1152
Po-210	2.906E-06	0.0000	1.394E-03	0.0007	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.012E-01	0.0504
Ra-226	1.538E+00	0.7662	6.968E-03	0.0035	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.560E-02	0.0277
Rn-222	3.761E-02	0.0187	2.759E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.813E-05	0.0000
Th-230	6.320E-05	0.0000	1.350E-02	0.0067	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.374E-03	0.0037
Th-234	1.629E-04	0.0001	5.961E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.827E-06	0.0000
U-234	2.311E-07	0.0000	8.048E-04	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.091E-03	0.0005
U-238	1.534E-03	0.0008	6.427E-04	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.004E-03	0.0005
Total	1.577E+00	0.7859	2.883E-02	0.0144	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.009E-01	0.1997

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.255E-03	0.0016
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.369E-01	0.1180
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.026E-01	0.0511
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	1.600E+00	0.7974
Rn-222	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.771E-02	0.0188
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	2.093E-02	0.0104
Th-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	1.698E-04	0.0001
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	1.896E-03	0.0009
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	3.181E-03	0.0016
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.007E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : Case No. 8: Construction Worker - PG in Road Base with Shield (Edge)
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	1.426E-08	0.0000	6.840E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.965E-04	0.0003
Pb-210	1.021E-04	0.0001	6.280E-03	0.0032	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.961E-01	0.1506
Po-210	4.273E-07	0.0000	2.050E-04	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.488E-02	0.0076
Ra-226	1.552E+00	0.7894	7.048E-03	0.0036	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.262E-02	0.0319
Rn-222	4.381E-08	0.0000	2.694E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.269E-04	0.0001
Th-230	1.885E-04	0.0001	1.350E-02	0.0069	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.378E-03	0.0038
Th-234	4.464E-09	0.0000	2.020E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.587E-10	0.0000
U-234	2.278E-07	0.0000	7.908E-04	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.072E-03	0.0005
U-238	1.668E-03	0.0008	6.315E-04	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.928E-04	0.0005
Total	1.554E+00	0.7904	2.846E-02	0.0145	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.836E-01	0.1951

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.034E-04	0.0003
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.024E-01	0.1538
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.508E-02	0.0077
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	1.621E+00	0.8248
Rn-222	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.297E-04	0.0001
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	2.106E-02	0.0107
Th-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	5.124E-09	0.0000
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	1.863E-03	0.0009
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	3.292E-03	0.0017
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	1.966E+00	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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	7.412E-07	1.682E-31
Bi-210	Po-210	1.000E+00	2.403E-04	3.729E-05
Bi-210	∑DSR(j)		2.411E-04	3.729E-05
Pb-210	Pb-210	1.000E+00	9.794E-03	9.410E-03
Pb-210	Bi-210	1.000E+00	2.715E-05	2.672E-05
Pb-210	Po-210	1.000E+00	7.726E-03	1.297E-02
Pb-210	∑DSR(j)		1.755E-02	2.240E-02
Po-210	Po-210	1.000E+00	7.600E-03	1.117E-03
Ra-226	Ra-226	1.000E+00	4.495E-03	4.436E-03
Ra-226	Rn-222+D	1.000E+00	1.138E-01	1.149E-01
Ra-226	Pb-210	1.000E+00	1.357E-04	4.050E-04
Ra-226	Bi-210	1.000E+00	3.716E-07	1.136E-06
Ra-226	Po-210	1.000E+00	7.873E-05	3.923E-04
Ra-226	∑DSR(j)		1.185E-01	1.201E-01
Rn-222+D	Rn-222+D	1.000E+00	2.786E-03	9.589E-35
Rn-222+D	Pb-210	1.000E+00	4.111E-06	4.040E-06
Rn-222+D	Bi-210	1.000E+00	1.159E-08	1.147E-08
Rn-222+D	Po-210	1.000E+00	3.244E-06	5.554E-06
Rn-222+D	∑DSR(j)		2.793E-03	9.605E-06
Th-230	Th-230	1.000E+00	8.348E-03	8.348E-03
Th-230	Ra-226	1.000E+00	9.757E-07	2.910E-06
Th-230	Rn-222+D	1.000E+00	2.458E-05	7.466E-05
Th-230	Pb-210	1.000E+00	1.941E-08	1.370E-07
Th-230	Bi-210	1.000E+00	5.225E-11	3.802E-10
Th-230	Po-210	1.000E+00	8.952E-09	1.059E-07
Th-230	∑DSR(j)		8.374E-03	8.426E-03
Th-234+D	Th-234+D	1.000E+00	1.132E-04	3.102E-09
Th-234+D	U-234	1.000E+00	2.896E-10	3.147E-10
Th-234+D	Th-230	1.000E+00	8.348E-15	2.812E-14
Th-234+D	Ra-226	1.000E+00	6.017E-19	4.842E-18
Th-234+D	Rn-222+D	1.000E+00	1.490E-17	1.230E-16
Th-234+D	Pb-210	1.000E+00	8.218E-21	1.490E-19
Th-234+D	Bi-210	1.000E+00	2.163E-23	4.084E-22
Th-234+D	Po-210	1.000E+00	2.959E-21	9.441E-20
Th-234+D	∑DSR(j)		1.132E-04	3.416E-09

Summary : Case No. 8: Construction Worker - PG in Road Base with Shield (Edge)
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Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years 0.000E+00	1.000E+00
U-234	U-234	1.000E+00	1.185E-03	1.164E-03
U-234	Th-230	1.000E+00	3.735E-08	1.112E-07
U-234	Ra-226	1.000E+00	2.918E-12	2.025E-11
U-234	Rn-222+D	1.000E+00	7.251E-11	5.150E-10
U-234	Pb-210	1.000E+00	4.307E-14	6.550E-13
U-234	Bi-210	1.000E+00	1.140E-16	1.799E-15
U-234	Po-210	1.000E+00	1.645E-14	4.274E-13
U-234	∑DSR(j)		1.185E-03	1.164E-03
U-238	U-238	5.400E-05	5.694E-08	5.594E-08
U-238	U-238	9.999E-01	1.054E-03	1.036E-03
U-238	Th-234+D	9.999E-01	1.066E-03	1.159E-03
U-238	U-234	9.999E-01	1.388E-09	4.639E-09
U-238	Th-230	9.999E-01	2.689E-14	2.161E-13
U-238	Ra-226	9.999E-01	1.465E-18	2.584E-17
U-238	Rn-222+D	9.999E-01	3.577E-17	6.513E-16
U-238	Pb-210	9.999E-01	1.590E-20	6.133E-19
U-238	Bi-210	9.999E-01	4.112E-23	1.665E-21
U-238	Po-210	9.999E-01	4.877E-21	3.383E-19
U-238	∑DSR(j)		2.121E-03	2.195E-03

The DSR includes contributions from associated (half-life ≤ 1 day) daughters.

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

Nuclide (i)	t= 0.000E+00	1.000E+00
Bi-210	1.037E+05	6.705E+05
Pb-210	1.425E+03	1.116E+03
Po-210	3.289E+03	2.237E+04
Ra-226	2.109E+02	2.081E+02
Rn-222	8.950E+03	2.603E+06
Th-230	2.986E+03	2.967E+03
Th-234	2.208E+05	7.318E+09
U-234	2.109E+04	2.147E+04
U-238	1.179E+04	1.139E+04

Summary : Case No. 8: Construction Worker - PG in Road Base with Shield (Edge)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RBSS_EDGE_070319.RAD

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

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Bi-210	1.350E+01	0.000E+00	2.411E-04	1.037E+05	2.411E-04	1.037E+05
Pb-210	1.350E+01	1.000E+00	2.240E-02	1.116E+03	1.755E-02	1.425E+03
Po-210	1.350E+01	0.000E+00	7.600E-03	3.289E+03	7.600E-03	3.289E+03
Ra-226	1.350E+01	0.0900 ± 0.0002	1.210E-01	2.066E+02	1.185E-01	2.109E+02
Rn-222	1.350E+01	0.000E+00	2.793E-03	8.950E+03	2.793E-03	8.950E+03
Th-230	2.500E+00	1.000E+00	8.426E-03	2.967E+03	8.374E-03	2.986E+03
Th-234	1.500E+00	0.000E+00	1.132E-04	2.208E+05	1.132E-04	2.208E+05
U-234	1.600E+00	0.000E+00	1.185E-03	2.109E+04	1.185E-03	2.109E+04
U-238	1.500E+00	0.3128 ± 0.0006	2.217E-03	1.127E+04	2.121E-03	1.179E+04

Summary : Case No. 8: Construction Worker - PG in Road Base with Shield (Edge)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RBSS_EDGE_070319.RAD

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	1.001E-05	0.000E+00
Bi-210	Pb-210	1.000E+00	3.665E-04	3.607E-04
Bi-210	Ra-226	1.000E+00	5.017E-06	1.534E-05
Bi-210	Rn-222	1.000E+00	1.564E-07	1.549E-07
Bi-210	Th-230	1.000E+00	1.306E-10	9.504E-10
Bi-210	Th-234	1.000E+00	3.244E-23	6.126E-22
Bi-210	U-234	1.000E+00	1.823E-16	2.878E-15
Bi-210	U-238	9.999E-01	6.167E-23	2.498E-21
Bi-210	∑DOSE(j)		3.817E-04	3.762E-04
Po-210	Bi-210	1.000E+00	3.245E-03	5.034E-04
Po-210	Pb-210	1.000E+00	1.043E-01	1.750E-01
Po-210	Po-210	1.000E+00	1.026E-01	1.508E-02
Po-210	Ra-226	1.000E+00	1.063E-03	5.296E-03
Po-210	Rn-222	1.000E+00	4.379E-05	7.498E-05
Po-210	Th-230	1.000E+00	2.238E-08	2.648E-07
Po-210	Th-234	1.000E+00	4.439E-21	1.416E-19
Po-210	U-234	1.000E+00	2.632E-14	6.838E-13
Po-210	U-238	9.999E-01	7.315E-21	5.074E-19
Po-210	∑DOSE(j)		2.113E-01	1.960E-01
Pb-210	Pb-210	1.000E+00	1.322E-01	1.270E-01
Pb-210	Ra-226	1.000E+00	1.832E-03	5.467E-03
Pb-210	Rn-222	1.000E+00	5.550E-05	5.454E-05
Pb-210	Th-230	1.000E+00	4.853E-08	3.426E-07
Pb-210	Th-234	1.000E+00	1.233E-20	2.234E-19
Pb-210	U-234	1.000E+00	6.891E-14	1.048E-12
Pb-210	U-238	9.999E-01	2.384E-20	9.200E-19
Pb-210	∑DOSE(j)		1.341E-01	1.326E-01
Ra-226	Ra-226	1.000E+00	6.068E-02	5.989E-02
Ra-226	Th-230	1.000E+00	2.439E-06	7.276E-06
Ra-226	Th-234	1.000E+00	9.025E-19	7.262E-18
Ra-226	U-234	1.000E+00	4.669E-12	3.240E-11
Ra-226	U-238	9.999E-01	2.197E-18	3.876E-17
Ra-226	∑DOSE(j)		6.068E-02	5.990E-02
Rn-222	Ra-226	1.000E+00	1.537E+00	1.551E+00
Rn-222	Rn-222	1.000E+00	3.761E-02	0.000E+00
Rn-222	Th-230	1.000E+00	6.145E-05	1.866E-04
Rn-222	Th-234	1.000E+00	2.235E-17	1.845E-16
Rn-222	U-234	1.000E+00	1.160E-10	8.241E-10
Rn-222	U-238	9.999E-01	5.365E-17	9.770E-16
Rn-222	∑DOSE(j)		1.575E+00	1.551E+00
Th-230	Th-230	1.000E+00	2.087E-02	2.087E-02
Th-230	Th-234	1.000E+00	1.252E-14	4.218E-14
Th-230	U-234	1.000E+00	5.976E-08	1.779E-07
Th-230	U-238	9.999E-01	4.033E-14	3.242E-13
Th-230	∑DOSE(j)		2.087E-02	2.087E-02

Summary : Case No. 8: Construction Worker - PG in Road Base with Shield (Edge)
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Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00
Th-234	Th-234	1.000E+00	1.698E-04	4.652E-09
Th-234	U-238	9.999E-01	1.599E-03	1.738E-03
Th-234	∑DOSE(j)		1.769E-03	1.738E-03
U-234	Th-234	1.000E+00	4.343E-10	4.721E-10
U-234	U-234	1.000E+00	1.896E-03	1.863E-03
U-234	U-238	9.999E-01	2.081E-09	6.959E-09
U-234	∑DOSE(j)		1.896E-03	1.863E-03
U-238	U-238	5.400E-05	8.541E-08	8.390E-08
U-238	U-238	9.999E-01	1.581E-03	1.554E-03
U-238	∑DOSE(j)		1.582E-03	1.554E-03

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

Summary : Case No. 8: Construction Worker - PG in Road Base with Shield (Edge)
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Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	1.350E+01	3.063E-24
Bi-210	Pb-210	1.000E+00	0.000E+00	1.155E+01
Bi-210	Ra-226	1.000E+00	0.000E+00	3.223E-01
Bi-210	Rn-222	1.000E+00	0.000E+00	4.960E-03
Bi-210	Th-230	1.000E+00	0.000E+00	1.264E-05
Bi-210	Th-234	1.000E+00	0.000E+00	4.515E-18
Bi-210	U-234	1.000E+00	0.000E+00	2.353E-11
Bi-210	U-238	9.999E-01	0.000E+00	1.067E-17
Bi-210	∑S(j):		1.350E+01	1.188E+01
Po-210	Bi-210	1.000E+00	0.000E+00	6.623E-02
Po-210	Pb-210	1.000E+00	0.000E+00	9.479E+00
Po-210	Po-210	1.000E+00	1.350E+01	1.985E+00
Po-210	Ra-226	1.000E+00	0.000E+00	1.689E-01
Po-210	Rn-222	1.000E+00	0.000E+00	4.049E-03
Po-210	Th-230	1.000E+00	0.000E+00	4.992E-06
Po-210	Th-234	1.000E+00	0.000E+00	1.366E-18
Po-210	U-234	1.000E+00	0.000E+00	7.521E-12
Po-210	U-238	9.999E-01	0.000E+00	2.722E-18
Po-210	∑S(j):		1.350E+01	1.170E+01
Pb-210	Pb-210	1.000E+00	1.350E+01	1.297E+01
Pb-210	Ra-226	1.000E+00	0.000E+00	3.685E-01
Pb-210	Rn-222	1.000E+00	0.000E+00	5.568E-03
Pb-210	Th-230	1.000E+00	0.000E+00	1.471E-05
Pb-210	Th-234	1.000E+00	0.000E+00	5.371E-18
Pb-210	U-234	1.000E+00	0.000E+00	2.786E-11
Pb-210	U-238	9.999E-01	0.000E+00	1.292E-17
Pb-210	∑S(j):		1.350E+01	1.335E+01
Ra-226	Ra-226	1.000E+00	1.350E+01	1.332E+01
Ra-226	Th-230	1.000E+00	0.000E+00	1.076E-03
Ra-226	Th-234	1.000E+00	0.000E+00	6.472E-16
Ra-226	U-234	1.000E+00	0.000E+00	3.088E-09
Ra-226	U-238	9.999E-01	0.000E+00	2.087E-15
Ra-226	∑S(j):		1.350E+01	1.333E+01
Rn-222	Ra-226	1.000E+00	0.000E+00	1.218E+01
Rn-222	Rn-222	1.000E+00	1.350E+01	4.647E-31
Rn-222	Th-230	1.000E+00	0.000E+00	9.699E-04
Rn-222	Th-234	1.000E+00	0.000E+00	5.740E-16
Rn-222	U-234	1.000E+00	0.000E+00	2.746E-09
Rn-222	U-238	9.999E-01	0.000E+00	1.825E-15
Rn-222	∑S(j):		1.350E+01	1.218E+01
Th-230	Th-230	1.000E+00	2.500E+00	2.500E+00
Th-230	Th-234	1.000E+00	0.000E+00	3.270E-12
Th-230	U-234	1.000E+00	0.000E+00	1.428E-05
Th-230	U-238	9.999E-01	0.000E+00	1.567E-11
Th-230	∑S(j):		2.500E+00	2.500E+00

Summary : Case No. 8: Construction Worker - PG in Road Base with Shield (Edge)
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Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00
Th-234	Th-234	1.000E+00	1.500E+00	4.110E-05
Th-234	U-238	9.999E-01	0.000E+00	1.476E+00
Th-234	∑S(j):		1.500E+00	1.476E+00
U-234	Th-234	1.000E+00	0.000E+00	3.983E-07
U-234	U-234	1.000E+00	1.600E+00	1.572E+00
U-234	U-238	9.999E-01	0.000E+00	3.786E-06
U-234	∑S(j):		1.600E+00	1.572E+00
U-238	U-238	5.400E-05	8.100E-05	7.958E-05
U-238	U-238	9.999E-01	1.500E+00	1.474E+00
U-238	∑S(j):		1.500E+00	1.474E+00

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

RESCALC.EXE execution time = 28.90 seconds

RESRAD Modelling Results

Road Construction Worker – Road Surface_Center

Summary : Road Construction Worker - PG in Road Surface (Center)
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Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	At-218 (Source: ICRP 60)	4.878E-03	4.878E-03	DCF1(1)
A-1	Bi-210 (Source: ICRP 60)	5.476E-03	5.476E-03	DCF1(2)
A-1	Bi-214 (Source: ICRP 60)	9.325E+00	9.325E+00	DCF1(3)
A-1	Pa-234 (Source: ICRP 60)	1.088E+01	1.088E+01	DCF1(4)
A-1	Pa-234m (Source: ICRP 60)	9.867E-02	9.867E-02	DCF1(5)
A-1	Pb-210 (Source: ICRP 60)	1.981E-03	1.981E-03	DCF1(6)
A-1	Pb-214 (Source: ICRP 60)	1.243E+00	1.243E+00	DCF1(7)
A-1	Po-210 (Source: ICRP 60)	4.934E-05	4.934E-05	DCF1(8)
A-1	Po-214 (Source: ICRP 60)	4.840E-04	4.840E-04	DCF1(9)
A-1	Po-218 (Source: ICRP 60)	5.326E-05	5.326E-05	DCF1(10)
A-1	Ra-226 (Source: ICRP 60)	2.915E-02	2.915E-02	DCF1(11)
A-1	Rn-222 (Source: ICRP 60)	2.186E-03	2.186E-03	DCF1(12)
A-1	Th-230 (Source: ICRP 60)	1.071E-03	1.071E-03	DCF1(13)
A-1	Th-234 (Source: ICRP 60)	2.130E-02	2.130E-02	DCF1(14)
A-1	Tl-210 (Source: ICRP 60)	1.661E+01	1.661E+01	DCF1(15)
A-1	U-234 (Source: ICRP 60)	3.439E-04	3.439E-04	DCF1(16)
A-1	U-238 (Source: ICRP 60)	7.961E-05	7.961E-05	DCF1(17)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Bi-210	3.441E-04	3.441E-04	DCF2(1)
B-1	Pb-210	2.072E-02	2.072E-02	DCF2(2)
B-1	Po-210	1.591E-02	1.591E-02	DCF2(3)
B-1	Ra-226	3.515E-02	3.515E-02	DCF2(4)
B-1	Rn-222+D	1.073E-04	0.000E+00	DCF2(5)
B-1	Th-230	3.700E-01	3.700E-01	DCF2(6)
B-1	Th-234+D	2.849E-05	2.849E-05	DCF2(7)
B-1	U-234	3.478E-02	3.478E-02	DCF2(8)
B-1	U-238	2.960E-02	2.960E-02	DCF2(9)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Bi-210	4.810E-06	4.810E-06	DCF3(1)
D-1	Pb-210	2.553E-03	2.553E-03	DCF3(2)
D-1	Po-210	4.440E-03	4.440E-03	DCF3(3)
D-1	Ra-226	1.036E-03	1.036E-03	DCF3(4)
D-1	Rn-222+D	9.249E-07	0.000E+00	DCF3(5)
D-1	Th-230	7.770E-04	7.770E-04	DCF3(6)
D-1	Th-234+D	1.259E-05	1.258E-05	DCF3(7)
D-1	U-234	1.813E-04	1.813E-04	DCF3(8)
D-1	U-238	1.665E-04	1.665E-04	DCF3(9)
D-34	Food transfer factors:			
D-34	Bi-210 , plant/soil concentration ratio, dimensionless	1.000E-01	1.000E-01	RTF(1,1)
D-34	Bi-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(1,2)
D-34	Bi-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-04	5.000E-04	RTF(1,3)
D-34				
D-34	Pb-210 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pb-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(2,2)
D-34	Pb-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(2,3)
D-34				

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Po-210 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(3,1)
D-34	Po-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(3,2)
D-34	Po-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.400E-04	3.400E-04	RTF(3,3)
D-34				
D-34	Ra-226 , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Ra-226 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,2)
D-34	Ra-226 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,3)
D-34				
D-34	Rn-222+D , plant/soil concentration ratio, dimensionless	0.000E+00	0.000E+00	RTF(5,1)
D-34	Rn-222+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	0.000E+00	0.000E+00	RTF(5,2)
D-34	Rn-222+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	0.000E+00	0.000E+00	RTF(5,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(6,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(6,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(6,3)
D-34				
D-34	Th-234+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(7,1)
D-34	Th-234+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(7,2)
D-34	Th-234+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(7,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(8,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(8,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(8,3)
D-34				
D-34	U-238 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(9,1)
D-34	U-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(9,2)
D-34	U-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(9,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Bi-210 , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Bi-210 , crustacea and mollusks	1.000E+01	1.000E+01	BIOFAC(1,2)
D-5				
D-5	Pb-210 , fish	3.000E+02	3.000E+02	BIOFAC(2,1)
D-5	Pb-210 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(2,2)
D-5				
D-5	Po-210 , fish	1.000E+02	1.000E+02	BIOFAC(3,1)
D-5	Po-210 , crustacea and mollusks	2.000E+04	2.000E+04	BIOFAC(3,2)
D-5				
D-5	Ra-226 , fish	5.000E+01	5.000E+01	BIOFAC(4,1)
D-5	Ra-226 , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(4,2)
D-5				
D-5	Rn-222+D , fish	0.000E+00	0.000E+00	BIOFAC(5,1)
D-5	Rn-222+D , crustacea and mollusks	0.000E+00	0.000E+00	BIOFAC(5,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(6,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(6,2)
D-5				
D-5	Th-234+D , fish	1.000E+02	1.000E+02	BIOFAC(7,1)
D-5	Th-234+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(7,2)
D-5				

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Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(8,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(8,2)
D-5				
D-5	U-238 , fish	1.000E+01	1.000E+01	BIOFAC(9,1)
D-5	U-238 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(9,2)

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

Summary : Road Construction Worker - PG in Road Surface (Center)
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Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.500E+03	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	1.200E-01	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	not used	3.000E+00	---	T(3)
R011	Times for calculations (yr)	not used	1.000E+01	---	T(4)
R011	Times for calculations (yr)	not used	3.000E+01	---	T(5)
R011	Times for calculations (yr)	not used	1.000E+02	---	T(6)
R011	Times for calculations (yr)	not used	3.000E+02	---	T(7)
R011	Times for calculations (yr)	not used	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Bi-210	6.100E-01	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Pb-210	6.100E-01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Po-210	6.100E-01	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Ra-226	6.100E-01	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Rn-222	6.100E-01	0.000E+00	---	S1(5)
R012	Initial principal radionuclide (pCi/g): Th-230	1.100E-01	0.000E+00	---	S1(6)
R012	Initial principal radionuclide (pCi/g): Th-234	7.000E-02	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): U-234	7.000E-02	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): U-238	7.000E-02	0.000E+00	---	S1(9)
R012	Concentration in groundwater (pCi/L): Bi-210	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Po-210	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): Rn-222	not used	0.000E+00	---	W1(5)
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---	W1(6)
R012	Concentration in groundwater (pCi/L): Th-234	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(9)
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)	2.250E+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)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	not used	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	not used	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	not used	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	not used	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	not used	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	not used	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	not used	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	not used	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	not used	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	not used	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	not used	1	---	NS
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	not used	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Bi-210				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	not used	0.000E+00	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	not used	0.000E+00	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.298E+01	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+02	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+02	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.849E-02	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Po-210				
R016	Contaminated zone (cm**3/g)	1.000E+01	1.000E+01	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+01	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+01	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.826E-01	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.640E-02	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for Rn-222				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	not used	0.000E+00	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	not used	0.000E+00	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.298E+01	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.086E-05	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for Th-234				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.086E-05	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.693E-02	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(9)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(9,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.693E-02	ALEACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)
R017	Inhalation rate (m**3/yr)	1.140E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	2.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	1.000E+00	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	0.000E+00	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.300E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	-1.000E+00	1.000E+00	-1 shows non-circular AREA.	FS

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	4.250E+00	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	8.500E+00	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	1.275E+01	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	1.700E+01	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	2.125E+01	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	2.550E+01	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	2.975E+01	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	3.400E+01	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	3.825E+01	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	4.250E+01	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	4.675E+01	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	5.100E+01	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	1.000E+00	1.000E+00	---	FRACA(1)
R017	Ring 2	1.000E+00	2.732E-01	---	FRACA(2)
R017	Ring 3	5.000E-01	0.000E+00	---	FRACA(3)
R017	Ring 4	3.500E-01	0.000E+00	---	FRACA(4)
R017	Ring 5	2.600E-01	0.000E+00	---	FRACA(5)
R017	Ring 6	2.100E-01	0.000E+00	---	FRACA(6)
R017	Ring 7	1.800E-01	0.000E+00	---	FRACA(7)
R017	Ring 8	1.600E-01	0.000E+00	---	FRACA(8)
R017	Ring 9	1.400E-01	0.000E+00	---	FRACA(9)
R017	Ring 10	1.200E-01	0.000E+00	---	FRACA(10)
R017	Ring 11	1.100E-01	0.000E+00	---	FRACA(11)
R017	Ring 12	7.000E-02	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	8.250E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI

Site-Specific Parameter Summary (continued)

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

Summary : Road Construction Worker - PG in Road Surface (Center)
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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

Summary : Road Construction Worker - PG in Road Surface (Center)
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Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	1500.00 square meters	Bi-210	6.100E-01
Thickness:	0.12 meters	Pb-210	6.100E-01
Cover Depth:	0.00 meters	Po-210	6.100E-01
		Ra-226	6.100E-01
		Rn-222	6.100E-01
		Th-230	1.100E-01
		Th-234	7.000E-02
		U-234	7.000E-02
		U-238	7.000E-02

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

t (years):	0.000E+00	1.000E+00
TDOSE(t):	1.051E+00	1.016E+00
M(t):	4.206E-02	4.063E-02

Maximum TDOSE(t): 1.051E+00 mrem/yr at t = 0.000E+00 years

Summary : Road Construction Worker - PG in Road Surface (Center)
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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-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	1.537E-05	0.0000	7.153E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.003E-04	0.0005
Pb-210	7.678E-04	0.0007	9.527E-04	0.0009	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.933E-02	0.0374
Po-210	2.419E-06	0.0000	2.439E-04	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.770E-02	0.0168
Ra-226	9.492E-01	0.9028	1.249E-03	0.0012	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.918E-03	0.0094
Rn-222	2.510E-02	0.0239	4.480E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.530E-05	0.0000
Th-230	6.165E-05	0.0001	2.375E-03	0.0023	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.298E-03	0.0012
Th-234	1.993E-04	0.0002	1.113E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.274E-06	0.0000
U-234	4.985E-06	0.0000	1.395E-04	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.891E-04	0.0002
U-238	1.862E-03	0.0018	1.188E-04	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.856E-04	0.0002
Total	9.772E-01	0.9294	5.087E-03	0.0048	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.914E-02	0.0658

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.228E-04	0.0005
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.105E-02	0.0390
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.795E-02	0.0171
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	9.604E-01	0.9134
Rn-222	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.511E-02	0.0239
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	3.735E-03	0.0036
Th-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	2.006E-04	0.0002
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.336E-04	0.0003
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	2.167E-03	0.0021
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	1.051E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : Road Construction Worker - PG in Road Surface (Center)
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	9.623E-09	0.0000	9.702E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.042E-05	0.0001
Pb-210	7.438E-04	0.0007	1.059E-03	0.0010	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.850E-02	0.0477
Po-210	3.234E-07	0.0000	3.261E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.367E-03	0.0023
Ra-226	9.445E-01	0.9298	1.243E-03	0.0012	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.083E-02	0.0107
Rn-222	2.921E-07	0.0000	4.157E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.903E-05	0.0000
Th-230	1.364E-04	0.0001	2.375E-03	0.0023	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.299E-03	0.0013
Th-234	5.462E-09	0.0000	3.672E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.428E-11	0.0000
U-234	4.805E-06	0.0000	1.345E-04	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.823E-04	0.0002
U-238	1.987E-03	0.0020	1.145E-04	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.801E-04	0.0002
Total	9.474E-01	0.9327	4.960E-03	0.0049	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.344E-02	0.0625

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.140E-05	0.0001
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.030E-02	0.0495
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.400E-03	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	9.566E-01	0.9417
Rn-222	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.974E-05	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	3.810E-03	0.0038
Th-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	5.583E-09	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.216E-04	0.0003
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	2.282E-03	0.0022
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	1.016E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : Road Construction Worker - PG in Road Surface (Center)
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Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	2.717E-05	7.209E-33
Bi-210	Po-210	1.000E+00	8.299E-04	1.171E-04
Bi-210	∑DSR(j)		8.571E-04	1.171E-04
Pb-210	Pb-210	1.000E+00	3.940E-02	3.749E-02
Pb-210	Bi-210	1.000E+00	9.196E-04	8.957E-04
Pb-210	Po-210	1.000E+00	2.699E-02	4.408E-02
Pb-210	∑DSR(j)		6.730E-02	8.246E-02
Po-210	Po-210	1.000E+00	2.942E-02	3.934E-03
Ra-226	Ra-226	1.000E+00	2.340E-02	2.278E-02
Ra-226	Rn-222+D	1.000E+00	1.550E+00	1.543E+00
Ra-226	Pb-210	1.000E+00	4.990E-04	1.472E-03
Ra-226	Bi-210	1.000E+00	1.154E-05	3.478E-05
Ra-226	Po-210	1.000E+00	2.535E-04	1.231E-03
Ra-226	∑DSR(j)		1.574E+00	1.568E+00
Rn-222+D	Rn-222+D	1.000E+00	4.114E-02	1.656E-36
Rn-222+D	Pb-210	1.000E+00	1.513E-05	1.472E-05
Rn-222+D	Bi-210	1.000E+00	3.596E-07	3.518E-07
Rn-222+D	Po-210	1.000E+00	1.039E-05	1.728E-05
Rn-222+D	∑DSR(j)		4.117E-02	3.235E-05
Th-230	Th-230	1.000E+00	3.361E-02	3.361E-02
Th-230	Ra-226	1.000E+00	5.092E-06	1.510E-05
Th-230	Rn-222+D	1.000E+00	3.362E-04	1.013E-03
Th-230	Pb-210	1.000E+00	7.161E-08	5.011E-07
Th-230	Bi-210	1.000E+00	1.631E-09	1.173E-08
Th-230	Po-210	1.000E+00	2.904E-08	3.362E-07
Th-230	∑DSR(j)		3.395E-02	3.464E-02
Th-234+D	Th-234+D	1.000E+00	2.866E-03	7.852E-08
Th-234+D	U-234	1.000E+00	1.165E-09	1.244E-09
Th-234+D	Th-230	1.000E+00	3.341E-14	1.116E-13
Th-234+D	Ra-226	1.000E+00	3.130E-18	2.496E-17
Th-234+D	Rn-222+D	1.000E+00	2.034E-16	1.661E-15
Th-234+D	Pb-210	1.000E+00	3.029E-20	5.428E-19
Th-234+D	Bi-210	1.000E+00	6.762E-22	1.257E-20
Th-234+D	Po-210	1.000E+00	9.644E-21	3.002E-19
Th-234+D	∑DSR(j)		2.866E-03	7.976E-08

Summary : Road Construction Worker - PG in Road Surface (Center)
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Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years 0.000E+00	1.000E+00
U-234	U-234	1.000E+00	4.766E-03	4.593E-03
U-234	Th-230	1.000E+00	1.494E-07	4.411E-07
U-234	Ra-226	1.000E+00	1.517E-11	1.043E-10
U-234	Rn-222+D	1.000E+00	9.892E-10	6.948E-09
U-234	Pb-210	1.000E+00	1.586E-13	2.385E-12
U-234	Bi-210	1.000E+00	3.558E-15	5.531E-14
U-234	Po-210	1.000E+00	5.350E-14	1.357E-12
U-234	∑DSR(j)		4.766E-03	4.594E-03
U-238	U-238	5.400E-05	2.265E-07	2.183E-07
U-238	U-238	9.999E-01	4.194E-03	4.042E-03
U-238	Th-234+D	9.999E-01	2.676E-02	2.856E-02
U-238	U-234	9.999E-01	5.568E-09	1.831E-08
U-238	Th-230	9.999E-01	1.073E-13	8.533E-13
U-238	Ra-226	9.999E-01	7.605E-18	1.327E-16
U-238	Rn-222+D	9.999E-01	4.880E-16	8.767E-15
U-238	Pb-210	9.999E-01	5.856E-20	2.229E-18
U-238	Bi-210	9.999E-01	1.287E-21	5.117E-20
U-238	Po-210	9.999E-01	1.594E-20	1.076E-18
U-238	∑DSR(j)		3.095E-02	3.260E-02

The DSR includes contributions from associated (half-life ≤ 1 day) daughters.

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

Nuclide (i)	t= 0.000E+00	1.000E+00
Bi-210	2.917E+04	2.136E+05
Pb-210	3.715E+02	3.032E+02
Po-210	8.497E+02	6.355E+03
Ra-226	1.588E+01	1.594E+01
Rn-222	6.073E+02	7.727E+05
Th-230	7.363E+02	7.217E+02
Th-234	8.723E+03	3.134E+08
U-234	5.245E+03	5.442E+03
U-238	8.077E+02	7.669E+02

Summary : Road Construction Worker - PG in Road Surface (Center)
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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

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Bi-210	6.100E-01	0.000E+00	8.571E-04	2.917E+04	8.571E-04	2.917E+04
Pb-210	6.100E-01	1.000E+00	8.246E-02	3.032E+02	6.730E-02	3.715E+02
Po-210	6.100E-01	0.000E+00	2.942E-02	8.497E+02	2.942E-02	8.497E+02
Ra-226	6.100E-01	0.0701 ± 0.0001	1.605E+00	1.557E+01	1.574E+00	1.588E+01
Rn-222	6.100E-01	0.000E+00	4.117E-02	6.073E+02	4.117E-02	6.073E+02
Th-230	1.100E-01	1.000E+00	3.464E-02	7.217E+02	3.395E-02	7.363E+02
Th-234	7.000E-02	0.000E+00	2.866E-03	8.723E+03	2.866E-03	8.723E+03
U-234	7.000E-02	0.000E+00	4.766E-03	5.245E+03	4.766E-03	5.245E+03
U-238	7.000E-02	0.3128 ± 0.0006	3.333E-02	7.501E+02	3.095E-02	8.077E+02

Summary : Road Construction Worker - PG in Road Surface (Center)
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Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	1.658E-05	0.000E+00
Bi-210	Pb-210	1.000E+00	5.610E-04	5.464E-04
Bi-210	Ra-226	1.000E+00	7.042E-06	2.122E-05
Bi-210	Rn-222	1.000E+00	2.194E-07	2.146E-07
Bi-210	Th-230	1.000E+00	1.794E-10	1.290E-09
Bi-210	Th-234	1.000E+00	4.734E-23	8.799E-22
Bi-210	U-234	1.000E+00	2.491E-16	3.872E-15
Bi-210	U-238	9.999E-01	9.009E-23	3.582E-21
Bi-210	∑DOSE(j)		5.848E-04	5.678E-04
Po-210	Bi-210	1.000E+00	5.062E-04	7.140E-05
Po-210	Pb-210	1.000E+00	1.646E-02	2.689E-02
Po-210	Po-210	1.000E+00	1.795E-02	2.400E-03
Po-210	Ra-226	1.000E+00	1.546E-04	7.510E-04
Po-210	Rn-222	1.000E+00	6.336E-06	1.054E-05
Po-210	Th-230	1.000E+00	3.194E-09	3.698E-08
Po-210	Th-234	1.000E+00	6.751E-22	2.101E-20
Po-210	U-234	1.000E+00	3.745E-15	9.497E-14
Po-210	U-238	9.999E-01	1.116E-21	7.535E-20
Po-210	∑DOSE(j)		3.508E-02	3.012E-02
Pb-210	Pb-210	1.000E+00	2.403E-02	2.287E-02
Pb-210	Ra-226	1.000E+00	3.044E-04	8.977E-04
Pb-210	Rn-222	1.000E+00	9.230E-06	8.981E-06
Pb-210	Th-230	1.000E+00	7.877E-09	5.512E-08
Pb-210	Th-234	1.000E+00	2.120E-21	3.800E-20
Pb-210	U-234	1.000E+00	1.110E-14	1.670E-13
Pb-210	U-238	9.999E-01	4.099E-21	1.561E-19
Pb-210	∑DOSE(j)		2.434E-02	2.378E-02
Ra-226	Ra-226	1.000E+00	1.428E-02	1.390E-02
Ra-226	Th-230	1.000E+00	5.601E-07	1.661E-06
Ra-226	Th-234	1.000E+00	2.191E-19	1.747E-18
Ra-226	U-234	1.000E+00	1.062E-12	7.301E-12
Ra-226	U-238	9.999E-01	5.323E-19	9.290E-18
Ra-226	∑DOSE(j)		1.428E-02	1.390E-02
Rn-222	Ra-226	1.000E+00	9.456E-01	9.410E-01
Rn-222	Rn-222	1.000E+00	2.510E-02	0.000E+00
Rn-222	Th-230	1.000E+00	3.698E-05	1.115E-04
Rn-222	Th-234	1.000E+00	1.424E-17	1.163E-16
Rn-222	U-234	1.000E+00	6.925E-11	4.863E-10
Rn-222	U-238	9.999E-01	3.416E-17	6.137E-16
Rn-222	∑DOSE(j)		9.708E-01	9.411E-01
Th-230	Th-230	1.000E+00	3.697E-03	3.697E-03
Th-230	Th-234	1.000E+00	2.339E-15	7.815E-15
Th-230	U-234	1.000E+00	1.046E-08	3.087E-08
Th-230	U-238	9.999E-01	7.512E-15	5.973E-14
Th-230	∑DOSE(j)		3.697E-03	3.697E-03

Summary : Road Construction Worker - PG in Road Surface (Center)
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Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00
Th-234	Th-234	1.000E+00	2.006E-04	5.496E-09
Th-234	U-238	9.999E-01	1.873E-03	1.999E-03
Th-234	∑DOSE(j)		2.074E-03	1.999E-03
U-234	Th-234	1.000E+00	8.158E-11	8.707E-11
U-234	U-234	1.000E+00	3.336E-04	3.215E-04
U-234	U-238	9.999E-01	3.898E-10	1.282E-09
U-234	∑DOSE(j)		3.336E-04	3.215E-04
U-238	U-238	5.400E-05	1.586E-08	1.528E-08
U-238	U-238	9.999E-01	2.936E-04	2.830E-04
U-238	∑DOSE(j)		2.936E-04	2.830E-04

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

Summary : Road Construction Worker - PG in Road Surface (Center)
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Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	6.100E-01	1.618E-28
Bi-210	Pb-210	1.000E+00	0.000E+00	4.622E-01
Bi-210	Ra-226	1.000E+00	0.000E+00	1.181E-02
Bi-210	Rn-222	1.000E+00	0.000E+00	1.815E-04
Bi-210	Th-230	1.000E+00	0.000E+00	4.539E-07
Bi-210	Th-234	1.000E+00	0.000E+00	1.723E-19
Bi-210	U-234	1.000E+00	0.000E+00	8.404E-13
Bi-210	U-238	9.999E-01	0.000E+00	4.076E-19
Bi-210	∑S(j):		6.100E-01	4.741E-01
Po-210	Bi-210	1.000E+00	0.000E+00	2.427E-03
Po-210	Pb-210	1.000E+00	0.000E+00	3.684E-01
Po-210	Po-210	1.000E+00	6.100E-01	8.156E-02
Po-210	Ra-226	1.000E+00	0.000E+00	6.076E-03
Po-210	Rn-222	1.000E+00	0.000E+00	1.440E-04
Po-210	Th-230	1.000E+00	0.000E+00	1.768E-07
Po-210	Th-234	1.000E+00	0.000E+00	5.159E-20
Po-210	U-234	1.000E+00	0.000E+00	2.657E-13
Po-210	U-238	9.999E-01	0.000E+00	1.032E-19
Po-210	∑S(j):		6.100E-01	4.586E-01
Pb-210	Pb-210	1.000E+00	6.100E-01	5.805E-01
Pb-210	Ra-226	1.000E+00	0.000E+00	1.507E-02
Pb-210	Rn-222	1.000E+00	0.000E+00	2.280E-04
Pb-210	Th-230	1.000E+00	0.000E+00	5.888E-07
Pb-210	Th-234	1.000E+00	0.000E+00	2.279E-19
Pb-210	U-234	1.000E+00	0.000E+00	1.107E-12
Pb-210	U-238	9.999E-01	0.000E+00	5.479E-19
Pb-210	∑S(j):		6.100E-01	5.958E-01
Ra-226	Ra-226	1.000E+00	6.100E-01	5.938E-01
Ra-226	Th-230	1.000E+00	0.000E+00	4.702E-05
Ra-226	Th-234	1.000E+00	0.000E+00	2.990E-17
Ra-226	U-234	1.000E+00	0.000E+00	1.336E-10
Ra-226	U-238	9.999E-01	0.000E+00	9.621E-17
Ra-226	∑S(j):		6.100E-01	5.939E-01
Rn-222	Ra-226	1.000E+00	0.000E+00	4.967E-01
Rn-222	Rn-222	1.000E+00	6.100E-01	2.455E-35
Rn-222	Th-230	1.000E+00	0.000E+00	3.882E-05
Rn-222	Th-234	1.000E+00	0.000E+00	2.432E-17
Rn-222	U-234	1.000E+00	0.000E+00	1.090E-10
Rn-222	U-238	9.999E-01	0.000E+00	7.725E-17
Rn-222	∑S(j):		6.100E-01	4.967E-01
Th-230	Th-230	1.000E+00	1.100E-01	1.100E-01
Th-230	Th-234	1.000E+00	0.000E+00	1.513E-13
Th-230	U-234	1.000E+00	0.000E+00	6.186E-07
Th-230	U-238	9.999E-01	0.000E+00	7.227E-13
Th-230	∑S(j):		1.100E-01	1.100E-01

Summary : Road Construction Worker - PG in Road Surface (Center)
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Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00
Th-234	Th-234	1.000E+00	7.000E-02	1.918E-06
Th-234	U-238	9.999E-01	0.000E+00	6.769E-02
Th-234	∑S(j):		7.000E-02	6.770E-02
U-234	Th-234	1.000E+00	0.000E+00	1.827E-08
U-234	U-234	1.000E+00	7.000E-02	6.746E-02
U-234	U-238	9.999E-01	0.000E+00	1.736E-07
U-234	∑S(j):		7.000E-02	6.746E-02
U-238	U-238	5.400E-05	3.780E-06	3.643E-06
U-238	U-238	9.999E-01	7.000E-02	6.746E-02
U-238	∑S(j):		7.000E-02	6.746E-02

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

RESCALC.EXE execution time = 25.33 seconds

RESRAD Modelling Results

Road Construction Worker – Road Surface_Edge

Summary : Road Construction Worker - PG in Road Surface (Edge)
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Part I: Mixture Sums and Single Radionuclide Guidelines

Summary : Road Construction Worker - PG in Road Surface (Edge)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RCW_RS_EDGE_070319.RAD

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	At-218 (Source: ICRP 60)	4.878E-03	4.878E-03	DCF1(1)
A-1	Bi-210 (Source: ICRP 60)	5.476E-03	5.476E-03	DCF1(2)
A-1	Bi-214 (Source: ICRP 60)	9.325E+00	9.325E+00	DCF1(3)
A-1	Pa-234 (Source: ICRP 60)	1.088E+01	1.088E+01	DCF1(4)
A-1	Pa-234m (Source: ICRP 60)	9.867E-02	9.867E-02	DCF1(5)
A-1	Pb-210 (Source: ICRP 60)	1.981E-03	1.981E-03	DCF1(6)
A-1	Pb-214 (Source: ICRP 60)	1.243E+00	1.243E+00	DCF1(7)
A-1	Po-210 (Source: ICRP 60)	4.934E-05	4.934E-05	DCF1(8)
A-1	Po-214 (Source: ICRP 60)	4.840E-04	4.840E-04	DCF1(9)
A-1	Po-218 (Source: ICRP 60)	5.326E-05	5.326E-05	DCF1(10)
A-1	Ra-226 (Source: ICRP 60)	2.915E-02	2.915E-02	DCF1(11)
A-1	Rn-222 (Source: ICRP 60)	2.186E-03	2.186E-03	DCF1(12)
A-1	Th-230 (Source: ICRP 60)	1.071E-03	1.071E-03	DCF1(13)
A-1	Th-234 (Source: ICRP 60)	2.130E-02	2.130E-02	DCF1(14)
A-1	Tl-210 (Source: ICRP 60)	1.661E+01	1.661E+01	DCF1(15)
A-1	U-234 (Source: ICRP 60)	3.439E-04	3.439E-04	DCF1(16)
A-1	U-238 (Source: ICRP 60)	7.961E-05	7.961E-05	DCF1(17)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Bi-210	3.441E-04	3.441E-04	DCF2(1)
B-1	Pb-210	2.072E-02	2.072E-02	DCF2(2)
B-1	Po-210	1.591E-02	1.591E-02	DCF2(3)
B-1	Ra-226	3.515E-02	3.515E-02	DCF2(4)
B-1	Rn-222+D	1.073E-04	0.000E+00	DCF2(5)
B-1	Th-230	3.700E-01	3.700E-01	DCF2(6)
B-1	Th-234+D	2.849E-05	2.849E-05	DCF2(7)
B-1	U-234	3.478E-02	3.478E-02	DCF2(8)
B-1	U-238	2.960E-02	2.960E-02	DCF2(9)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Bi-210	4.810E-06	4.810E-06	DCF3(1)
D-1	Pb-210	2.553E-03	2.553E-03	DCF3(2)
D-1	Po-210	4.440E-03	4.440E-03	DCF3(3)
D-1	Ra-226	1.036E-03	1.036E-03	DCF3(4)
D-1	Rn-222+D	9.249E-07	0.000E+00	DCF3(5)
D-1	Th-230	7.770E-04	7.770E-04	DCF3(6)
D-1	Th-234+D	1.259E-05	1.258E-05	DCF3(7)
D-1	U-234	1.813E-04	1.813E-04	DCF3(8)
D-1	U-238	1.665E-04	1.665E-04	DCF3(9)
D-34	Food transfer factors:			
D-34	Bi-210 , plant/soil concentration ratio, dimensionless	1.000E-01	1.000E-01	RTF(1,1)
D-34	Bi-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(1,2)
D-34	Bi-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-04	5.000E-04	RTF(1,3)
D-34				
D-34	Pb-210 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pb-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(2,2)
D-34	Pb-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(2,3)
D-34				

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Po-210 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(3,1)
D-34	Po-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(3,2)
D-34	Po-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.400E-04	3.400E-04	RTF(3,3)
D-34				
D-34	Ra-226 , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Ra-226 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,2)
D-34	Ra-226 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,3)
D-34				
D-34	Rn-222+D , plant/soil concentration ratio, dimensionless	0.000E+00	0.000E+00	RTF(5,1)
D-34	Rn-222+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	0.000E+00	0.000E+00	RTF(5,2)
D-34	Rn-222+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	0.000E+00	0.000E+00	RTF(5,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(6,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(6,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(6,3)
D-34				
D-34	Th-234+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(7,1)
D-34	Th-234+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(7,2)
D-34	Th-234+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(7,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(8,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(8,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(8,3)
D-34				
D-34	U-238 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(9,1)
D-34	U-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(9,2)
D-34	U-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(9,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Bi-210 , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Bi-210 , crustacea and mollusks	1.000E+01	1.000E+01	BIOFAC(1,2)
D-5				
D-5	Pb-210 , fish	3.000E+02	3.000E+02	BIOFAC(2,1)
D-5	Pb-210 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(2,2)
D-5				
D-5	Po-210 , fish	1.000E+02	1.000E+02	BIOFAC(3,1)
D-5	Po-210 , crustacea and mollusks	2.000E+04	2.000E+04	BIOFAC(3,2)
D-5				
D-5	Ra-226 , fish	5.000E+01	5.000E+01	BIOFAC(4,1)
D-5	Ra-226 , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(4,2)
D-5				
D-5	Rn-222+D , fish	0.000E+00	0.000E+00	BIOFAC(5,1)
D-5	Rn-222+D , crustacea and mollusks	0.000E+00	0.000E+00	BIOFAC(5,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(6,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(6,2)
D-5				
D-5	Th-234+D , fish	1.000E+02	1.000E+02	BIOFAC(7,1)
D-5	Th-234+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(7,2)
D-5				

Summary : Road Construction Worker - PG in Road Surface (Edge)
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Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(8,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(8,2)
D-5				
D-5	U-238 , fish	1.000E+01	1.000E+01	BIOFAC(9,1)
D-5	U-238 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(9,2)

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

Summary : Road Construction Worker - PG in Road Surface (Edge)
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Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.500E+03	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	1.200E-01	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	not used	3.000E+00	---	T(3)
R011	Times for calculations (yr)	not used	1.000E+01	---	T(4)
R011	Times for calculations (yr)	not used	3.000E+01	---	T(5)
R011	Times for calculations (yr)	not used	1.000E+02	---	T(6)
R011	Times for calculations (yr)	not used	3.000E+02	---	T(7)
R011	Times for calculations (yr)	not used	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Bi-210	6.100E-01	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Pb-210	6.100E-01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Po-210	6.100E-01	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Ra-226	6.100E-01	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Rn-222	6.100E-01	0.000E+00	---	S1(5)
R012	Initial principal radionuclide (pCi/g): Th-230	1.100E-01	0.000E+00	---	S1(6)
R012	Initial principal radionuclide (pCi/g): Th-234	7.000E-02	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): U-234	7.000E-02	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): U-238	7.000E-02	0.000E+00	---	S1(9)
R012	Concentration in groundwater (pCi/L): Bi-210	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Po-210	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): Rn-222	not used	0.000E+00	---	W1(5)
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---	W1(6)
R012	Concentration in groundwater (pCi/L): Th-234	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(9)
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)	2.250E+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)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	not used	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	not used	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	not used	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	not used	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	not used	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	not used	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	not used	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	not used	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	not used	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	not used	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	not used	1	---	NS
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	not used	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Bi-210				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	not used	0.000E+00	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	not used	0.000E+00	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.298E+01	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+02	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+02	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.849E-02	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Po-210				
R016	Contaminated zone (cm**3/g)	1.000E+01	1.000E+01	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+01	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+01	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.826E-01	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.640E-02	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for Rn-222				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	not used	0.000E+00	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	not used	0.000E+00	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.298E+01	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.086E-05	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for Th-234				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.086E-05	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.693E-02	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(9)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(9,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.693E-02	ALEACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)
R017	Inhalation rate (m**3/yr)	1.140E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	2.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	1.000E+00	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	0.000E+00	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.300E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	-1.000E+00	1.000E+00	-1 shows non-circular AREA.	FS

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	4.417E+00	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	8.833E+00	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	1.325E+01	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	1.767E+01	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	2.208E+01	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	2.650E+01	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	3.092E+01	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	3.533E+01	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	3.975E+01	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	4.417E+01	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	4.858E+01	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	5.300E+01	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	5.000E-01	1.000E+00	---	FRACA(1)
R017	Ring 2	5.000E-01	2.732E-01	---	FRACA(2)
R017	Ring 3	5.000E-01	0.000E+00	---	FRACA(3)
R017	Ring 4	4.400E-01	0.000E+00	---	FRACA(4)
R017	Ring 5	2.800E-01	0.000E+00	---	FRACA(5)
R017	Ring 6	2.200E-01	0.000E+00	---	FRACA(6)
R017	Ring 7	1.800E-01	0.000E+00	---	FRACA(7)
R017	Ring 8	1.500E-01	0.000E+00	---	FRACA(8)
R017	Ring 9	1.300E-01	0.000E+00	---	FRACA(9)
R017	Ring 10	1.200E-01	0.000E+00	---	FRACA(10)
R017	Ring 11	1.100E-01	0.000E+00	---	FRACA(11)
R017	Ring 12	4.600E-02	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	8.250E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI

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Site-Specific Parameter Summary (continued)

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

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Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

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Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	1500.00 square meters	Bi-210	6.100E-01
Thickness:	0.12 meters	Pb-210	6.100E-01
Cover Depth:	0.00 meters	Po-210	6.100E-01
		Ra-226	6.100E-01
		Rn-222	6.100E-01
		Th-230	1.100E-01
		Th-234	7.000E-02
		U-234	7.000E-02
		U-238	7.000E-02

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

t (years):	0.000E+00	1.000E+00
TDOSE(t):	5.941E-01	5.724E-01
M(t):	2.376E-02	2.290E-02

Maximum TDOSE(t): 5.941E-01 mrem/yr at t = 0.000E+00 years

Summary : Road Construction Worker - PG in Road Surface (Edge)
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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-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	8.101E-06	0.0000	7.153E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.003E-04	0.0008
Pb-210	4.024E-04	0.0007	9.527E-04	0.0016	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.933E-02	0.0662
Po-210	1.284E-06	0.0000	2.439E-04	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.770E-02	0.0298
Ra-226	5.050E-01	0.8500	1.249E-03	0.0021	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.918E-03	0.0167
Rn-222	1.335E-02	0.0225	4.480E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.530E-05	0.0000
Th-230	3.252E-05	0.0001	2.375E-03	0.0040	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.298E-03	0.0022
Th-234	1.055E-04	0.0002	1.113E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.274E-06	0.0000
U-234	2.589E-06	0.0000	1.395E-04	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.891E-04	0.0003
U-238	9.851E-04	0.0017	1.188E-04	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.856E-04	0.0003
Total	5.199E-01	0.8751	5.087E-03	0.0086	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.914E-02	0.1164

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.155E-04	0.0009
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.069E-02	0.0685
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.795E-02	0.0302
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.161E-01	0.8688
Rn-222	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.337E-02	0.0225
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	3.706E-03	0.0062
Th-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	1.067E-04	0.0002
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.312E-04	0.0006
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	1.290E-03	0.0022
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.941E-01	1.0000

*Sum of all water independent and dependent pathways.

Summary : Road Construction Worker - PG in Road Surface (Edge)
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	5.107E-09	0.0000	9.702E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.042E-05	0.0001
Pb-210	3.899E-04	0.0007	1.059E-03	0.0019	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.850E-02	0.0847
Po-210	1.716E-07	0.0000	3.261E-05	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.367E-03	0.0041
Ra-226	5.025E-01	0.8779	1.243E-03	0.0022	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.083E-02	0.0189
Rn-222	1.531E-07	0.0000	4.157E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.903E-05	0.0000
Th-230	7.230E-05	0.0001	2.375E-03	0.0041	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.299E-03	0.0023
Th-234	2.890E-09	0.0000	3.672E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.428E-11	0.0000
U-234	2.496E-06	0.0000	1.345E-04	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.823E-04	0.0003
U-238	1.051E-03	0.0018	1.145E-04	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.801E-04	0.0003
Total	5.040E-01	0.8805	4.960E-03	0.0087	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.344E-02	0.1108

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.140E-05	0.0001
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.995E-02	0.0873
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.399E-03	0.0042
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.146E-01	0.8989
Rn-222	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.960E-05	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	3.746E-03	0.0065
Th-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.011E-09	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.192E-04	0.0006
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	1.346E-03	0.0024
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.724E-01	1.0000

*Sum of all water independent and dependent pathways.

Summary : Road Construction Worker - PG in Road Surface (Edge)
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Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	1.531E-05	4.061E-33
Bi-210	Po-210	1.000E+00	8.298E-04	1.170E-04
Bi-210	∑DSR(j)		8.451E-04	1.170E-04
Pb-210	Pb-210	1.000E+00	3.920E-02	3.730E-02
Pb-210	Bi-210	1.000E+00	5.181E-04	5.046E-04
Pb-210	Po-210	1.000E+00	2.698E-02	4.407E-02
Pb-210	∑DSR(j)		6.670E-02	8.188E-02
Po-210	Po-210	1.000E+00	2.942E-02	3.934E-03
Ra-226	Ra-226	1.000E+00	2.062E-02	2.007E-02
Ra-226	Rn-222+D	1.000E+00	8.248E-01	8.208E-01
Ra-226	Pb-210	1.000E+00	4.966E-04	1.464E-03
Ra-226	Bi-210	1.000E+00	6.503E-06	1.959E-05
Ra-226	Po-210	1.000E+00	2.535E-04	1.231E-03
Ra-226	∑DSR(j)		8.461E-01	8.435E-01
Rn-222+D	Rn-222+D	1.000E+00	2.189E-02	8.809E-37
Rn-222+D	Pb-210	1.000E+00	1.506E-05	1.465E-05
Rn-222+D	Bi-210	1.000E+00	2.026E-07	1.982E-07
Rn-222+D	Po-210	1.000E+00	1.039E-05	1.728E-05
Rn-222+D	∑DSR(j)		2.192E-02	3.213E-05
Th-230	Th-230	1.000E+00	3.350E-02	3.350E-02
Th-230	Ra-226	1.000E+00	4.486E-06	1.330E-05
Th-230	Rn-222+D	1.000E+00	1.789E-04	5.391E-04
Th-230	Pb-210	1.000E+00	7.125E-08	4.986E-07
Th-230	Bi-210	1.000E+00	9.187E-10	6.606E-09
Th-230	Po-210	1.000E+00	2.904E-08	3.362E-07
Th-230	∑DSR(j)		3.369E-02	3.406E-02
Th-234+D	Th-234+D	1.000E+00	1.525E-03	4.178E-08
Th-234+D	U-234	1.000E+00	1.157E-09	1.235E-09
Th-234+D	Th-230	1.000E+00	3.331E-14	1.113E-13
Th-234+D	Ra-226	1.000E+00	2.757E-18	2.199E-17
Th-234+D	Rn-222+D	1.000E+00	1.082E-16	8.838E-16
Th-234+D	Pb-210	1.000E+00	3.014E-20	5.401E-19
Th-234+D	Bi-210	1.000E+00	3.809E-22	7.081E-21
Th-234+D	Po-210	1.000E+00	9.643E-21	3.002E-19
Th-234+D	∑DSR(j)		1.525E-03	4.301E-08

Summary : Road Construction Worker - PG in Road Surface (Edge)
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Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years 0.000E+00	1.000E+00 (mrem/yr)/(pCi/g)
U-234	U-234	1.000E+00	4.732E-03	4.560E-03
U-234	Th-230	1.000E+00	1.490E-07	4.397E-07
U-234	Ra-226	1.000E+00	1.337E-11	9.188E-11
U-234	Rn-222+D	1.000E+00	5.263E-10	3.696E-09
U-234	Pb-210	1.000E+00	1.578E-13	2.373E-12
U-234	Bi-210	1.000E+00	2.004E-15	3.116E-14
U-234	Po-210	1.000E+00	5.350E-14	1.357E-12
U-234	∑DSR(j)		4.732E-03	4.561E-03
U-238	U-238	5.400E-05	2.261E-07	2.179E-07
U-238	U-238	9.999E-01	4.186E-03	4.034E-03
U-238	Th-234+D	9.999E-01	1.424E-02	1.519E-02
U-238	U-234	9.999E-01	5.528E-09	1.818E-08
U-238	Th-230	9.999E-01	1.070E-13	8.506E-13
U-238	Ra-226	9.999E-01	6.699E-18	1.169E-16
U-238	Rn-222+D	9.999E-01	2.596E-16	4.664E-15
U-238	Pb-210	9.999E-01	5.827E-20	2.218E-18
U-238	Bi-210	9.999E-01	7.250E-22	2.883E-20
U-238	Po-210	9.999E-01	1.594E-20	1.076E-18
U-238	∑DSR(j)		1.842E-02	1.923E-02

The DSR includes contributions from associated (half-life ≤ 1 day) daughters.

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

Nuclide (i)	t= 0.000E+00	1.000E+00
Bi-210	2.958E+04	2.136E+05
Pb-210	3.748E+02	3.053E+02
Po-210	8.498E+02	6.356E+03
Ra-226	2.955E+01	2.964E+01
Rn-222	1.141E+03	7.782E+05
Th-230	7.421E+02	7.341E+02
Th-234	1.639E+04	5.812E+08
U-234	5.283E+03	5.482E+03
U-238	1.357E+03	1.300E+03

Summary : Road Construction Worker - PG in Road Surface (Edge)
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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

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Bi-210	6.100E-01	0.000E+00	8.451E-04	2.958E+04	8.451E-04	2.958E+04
Pb-210	6.100E-01	1.000E+00	8.188E-02	3.053E+02	6.670E-02	3.748E+02
Po-210	6.100E-01	0.000E+00	2.942E-02	8.498E+02	2.942E-02	8.498E+02
Ra-226	6.100E-01	0.0706 ± 0.0001	8.627E-01	2.898E+01	8.461E-01	2.955E+01
Rn-222	6.100E-01	0.000E+00	2.192E-02	1.141E+03	2.192E-02	1.141E+03
Th-230	1.100E-01	1.000E+00	3.406E-02	7.341E+02	3.369E-02	7.421E+02
Th-234	7.000E-02	0.000E+00	1.525E-03	1.639E+04	1.525E-03	1.639E+04
U-234	7.000E-02	0.000E+00	4.732E-03	5.283E+03	4.732E-03	5.283E+03
U-238	7.000E-02	0.2864 ± 0.0006	1.967E-02	1.271E+03	1.842E-02	1.357E+03

Summary : Road Construction Worker - PG in Road Surface (Edge)
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Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	9.338E-06	0.000E+00
Bi-210	Pb-210	1.000E+00	3.160E-04	3.078E-04
Bi-210	Ra-226	1.000E+00	3.967E-06	1.195E-05
Bi-210	Rn-222	1.000E+00	1.236E-07	1.209E-07
Bi-210	Th-230	1.000E+00	1.011E-10	7.266E-10
Bi-210	Th-234	1.000E+00	2.667E-23	4.957E-22
Bi-210	U-234	1.000E+00	1.403E-16	2.181E-15
Bi-210	U-238	9.999E-01	5.075E-23	2.018E-21
Bi-210	∑DOSE(j)		3.294E-04	3.199E-04
Po-210	Bi-210	1.000E+00	5.062E-04	7.140E-05
Po-210	Pb-210	1.000E+00	1.646E-02	2.688E-02
Po-210	Po-210	1.000E+00	1.795E-02	2.399E-03
Po-210	Ra-226	1.000E+00	1.546E-04	7.510E-04
Po-210	Rn-222	1.000E+00	6.335E-06	1.054E-05
Po-210	Th-230	1.000E+00	3.194E-09	3.698E-08
Po-210	Th-234	1.000E+00	6.750E-22	2.101E-20
Po-210	U-234	1.000E+00	3.745E-15	9.497E-14
Po-210	U-238	9.999E-01	1.116E-21	7.535E-20
Po-210	∑DOSE(j)		3.507E-02	3.012E-02
Pb-210	Pb-210	1.000E+00	2.391E-02	2.276E-02
Pb-210	Ra-226	1.000E+00	3.029E-04	8.932E-04
Pb-210	Rn-222	1.000E+00	9.184E-06	8.936E-06
Pb-210	Th-230	1.000E+00	7.838E-09	5.485E-08
Pb-210	Th-234	1.000E+00	2.110E-21	3.781E-20
Pb-210	U-234	1.000E+00	1.105E-14	1.661E-13
Pb-210	U-238	9.999E-01	4.079E-21	1.553E-19
Pb-210	∑DOSE(j)		2.422E-02	2.366E-02
Ra-226	Ra-226	1.000E+00	1.258E-02	1.224E-02
Ra-226	Th-230	1.000E+00	4.934E-07	1.463E-06
Ra-226	Th-234	1.000E+00	1.930E-19	1.539E-18
Ra-226	U-234	1.000E+00	9.356E-13	6.431E-12
Ra-226	U-238	9.999E-01	4.689E-19	8.184E-18
Ra-226	∑DOSE(j)		1.258E-02	1.224E-02
Rn-222	Ra-226	1.000E+00	5.031E-01	5.007E-01
Rn-222	Rn-222	1.000E+00	1.335E-02	0.000E+00
Rn-222	Th-230	1.000E+00	1.967E-05	5.930E-05
Rn-222	Th-234	1.000E+00	7.577E-18	6.187E-17
Rn-222	U-234	1.000E+00	3.684E-11	2.587E-10
Rn-222	U-238	9.999E-01	1.817E-17	3.265E-16
Rn-222	∑DOSE(j)		5.165E-01	5.007E-01
Th-230	Th-230	1.000E+00	3.686E-03	3.685E-03
Th-230	Th-234	1.000E+00	2.332E-15	7.791E-15
Th-230	U-234	1.000E+00	1.043E-08	3.078E-08
Th-230	U-238	9.999E-01	7.488E-15	5.954E-14
Th-230	∑DOSE(j)		3.686E-03	3.685E-03

Summary : Road Construction Worker - PG in Road Surface (Edge)
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Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00
Th-234	Th-234	1.000E+00	1.067E-04	2.924E-09
Th-234	U-238	9.999E-01	9.965E-04	1.064E-03
Th-234	∑DOSE(j)		1.103E-03	1.064E-03
U-234	Th-234	1.000E+00	8.100E-11	8.645E-11
U-234	U-234	1.000E+00	3.312E-04	3.192E-04
U-234	U-238	9.999E-01	3.870E-10	1.273E-09
U-234	∑DOSE(j)		3.312E-04	3.192E-04
U-238	U-238	5.400E-05	1.582E-08	1.525E-08
U-238	U-238	9.999E-01	2.930E-04	2.824E-04
U-238	∑DOSE(j)		2.930E-04	2.824E-04

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

Summary : Road Construction Worker - PG in Road Surface (Edge)
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Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	6.100E-01	1.618E-28
Bi-210	Pb-210	1.000E+00	0.000E+00	4.622E-01
Bi-210	Ra-226	1.000E+00	0.000E+00	1.181E-02
Bi-210	Rn-222	1.000E+00	0.000E+00	1.815E-04
Bi-210	Th-230	1.000E+00	0.000E+00	4.539E-07
Bi-210	Th-234	1.000E+00	0.000E+00	1.723E-19
Bi-210	U-234	1.000E+00	0.000E+00	8.404E-13
Bi-210	U-238	9.999E-01	0.000E+00	4.076E-19
Bi-210	∑S(j):		6.100E-01	4.741E-01
Po-210	Bi-210	1.000E+00	0.000E+00	2.427E-03
Po-210	Pb-210	1.000E+00	0.000E+00	3.684E-01
Po-210	Po-210	1.000E+00	6.100E-01	8.156E-02
Po-210	Ra-226	1.000E+00	0.000E+00	6.076E-03
Po-210	Rn-222	1.000E+00	0.000E+00	1.440E-04
Po-210	Th-230	1.000E+00	0.000E+00	1.768E-07
Po-210	Th-234	1.000E+00	0.000E+00	5.159E-20
Po-210	U-234	1.000E+00	0.000E+00	2.657E-13
Po-210	U-238	9.999E-01	0.000E+00	1.032E-19
Po-210	∑S(j):		6.100E-01	4.586E-01
Pb-210	Pb-210	1.000E+00	6.100E-01	5.805E-01
Pb-210	Ra-226	1.000E+00	0.000E+00	1.507E-02
Pb-210	Rn-222	1.000E+00	0.000E+00	2.280E-04
Pb-210	Th-230	1.000E+00	0.000E+00	5.888E-07
Pb-210	Th-234	1.000E+00	0.000E+00	2.279E-19
Pb-210	U-234	1.000E+00	0.000E+00	1.107E-12
Pb-210	U-238	9.999E-01	0.000E+00	5.479E-19
Pb-210	∑S(j):		6.100E-01	5.958E-01
Ra-226	Ra-226	1.000E+00	6.100E-01	5.938E-01
Ra-226	Th-230	1.000E+00	0.000E+00	4.702E-05
Ra-226	Th-234	1.000E+00	0.000E+00	2.990E-17
Ra-226	U-234	1.000E+00	0.000E+00	1.336E-10
Ra-226	U-238	9.999E-01	0.000E+00	9.621E-17
Ra-226	∑S(j):		6.100E-01	5.939E-01
Rn-222	Ra-226	1.000E+00	0.000E+00	4.967E-01
Rn-222	Rn-222	1.000E+00	6.100E-01	2.455E-35
Rn-222	Th-230	1.000E+00	0.000E+00	3.882E-05
Rn-222	Th-234	1.000E+00	0.000E+00	2.432E-17
Rn-222	U-234	1.000E+00	0.000E+00	1.090E-10
Rn-222	U-238	9.999E-01	0.000E+00	7.725E-17
Rn-222	∑S(j):		6.100E-01	4.967E-01
Th-230	Th-230	1.000E+00	1.100E-01	1.100E-01
Th-230	Th-234	1.000E+00	0.000E+00	1.513E-13
Th-230	U-234	1.000E+00	0.000E+00	6.186E-07
Th-230	U-238	9.999E-01	0.000E+00	7.227E-13
Th-230	∑S(j):		1.100E-01	1.100E-01

Summary : Road Construction Worker - PG in Road Surface (Edge)
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Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00
Th-234	Th-234	1.000E+00	7.000E-02	1.918E-06
Th-234	U-238	9.999E-01	0.000E+00	6.769E-02
Th-234	∑S(j):		7.000E-02	6.770E-02
U-234	Th-234	1.000E+00	0.000E+00	1.827E-08
U-234	U-234	1.000E+00	7.000E-02	6.746E-02
U-234	U-238	9.999E-01	0.000E+00	1.736E-07
U-234	∑S(j):		7.000E-02	6.746E-02
U-238	U-238	5.400E-05	3.780E-06	3.643E-06
U-238	U-238	9.999E-01	7.000E-02	6.746E-02
U-238	∑S(j):		7.000E-02	6.746E-02

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

RESCALC.EXE execution time = 30.97 seconds

RESRAD Modelling Results

Nearby Resident

Summary : Nearby Resident - PG in Road Base
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Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	At-218 (Source: ICRP 60)	4.878E-03	4.878E-03	DCF1(1)
A-1	Bi-210 (Source: ICRP 60)	5.476E-03	5.476E-03	DCF1(2)
A-1	Bi-214 (Source: ICRP 60)	9.325E+00	9.325E+00	DCF1(3)
A-1	Pa-234 (Source: ICRP 60)	1.088E+01	1.088E+01	DCF1(4)
A-1	Pa-234m (Source: ICRP 60)	9.867E-02	9.867E-02	DCF1(5)
A-1	Pb-210 (Source: ICRP 60)	1.981E-03	1.981E-03	DCF1(6)
A-1	Pb-214 (Source: ICRP 60)	1.243E+00	1.243E+00	DCF1(7)
A-1	Po-210 (Source: ICRP 60)	4.934E-05	4.934E-05	DCF1(8)
A-1	Po-214 (Source: ICRP 60)	4.840E-04	4.840E-04	DCF1(9)
A-1	Po-218 (Source: ICRP 60)	5.326E-05	5.326E-05	DCF1(10)
A-1	Ra-226 (Source: ICRP 60)	2.915E-02	2.915E-02	DCF1(11)
A-1	Rn-222 (Source: ICRP 60)	2.186E-03	2.186E-03	DCF1(12)
A-1	Th-230 (Source: ICRP 60)	1.071E-03	1.071E-03	DCF1(13)
A-1	Th-234 (Source: ICRP 60)	2.130E-02	2.130E-02	DCF1(14)
A-1	Tl-210 (Source: ICRP 60)	1.661E+01	1.661E+01	DCF1(15)
A-1	U-234 (Source: ICRP 60)	3.439E-04	3.439E-04	DCF1(16)
A-1	U-238 (Source: ICRP 60)	7.961E-05	7.961E-05	DCF1(17)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Bi-210	3.441E-04	3.441E-04	DCF2(1)
B-1	Pb-210	2.072E-02	2.072E-02	DCF2(2)
B-1	Po-210	1.591E-02	1.591E-02	DCF2(3)
B-1	Ra-226	3.515E-02	3.515E-02	DCF2(4)
B-1	Rn-222+D	1.073E-04	0.000E+00	DCF2(5)
B-1	Th-230	3.700E-01	3.700E-01	DCF2(6)
B-1	Th-234+D	2.849E-05	2.849E-05	DCF2(7)
B-1	U-234	3.478E-02	3.478E-02	DCF2(8)
B-1	U-238	2.960E-02	2.960E-02	DCF2(9)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Bi-210	4.810E-06	4.810E-06	DCF3(1)
D-1	Pb-210	2.553E-03	2.553E-03	DCF3(2)
D-1	Po-210	4.440E-03	4.440E-03	DCF3(3)
D-1	Ra-226	1.036E-03	1.036E-03	DCF3(4)
D-1	Rn-222+D	9.249E-07	0.000E+00	DCF3(5)
D-1	Th-230	7.770E-04	7.770E-04	DCF3(6)
D-1	Th-234+D	1.259E-05	1.258E-05	DCF3(7)
D-1	U-234	1.813E-04	1.813E-04	DCF3(8)
D-1	U-238	1.665E-04	1.665E-04	DCF3(9)
D-34	Food transfer factors:			
D-34	Bi-210 , plant/soil concentration ratio, dimensionless	1.000E-01	1.000E-01	RTF(1,1)
D-34	Bi-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(1,2)
D-34	Bi-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-04	5.000E-04	RTF(1,3)
D-34				
D-34	Pb-210 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pb-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(2,2)
D-34	Pb-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(2,3)
D-34				

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Po-210 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(3,1)
D-34	Po-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(3,2)
D-34	Po-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.400E-04	3.400E-04	RTF(3,3)
D-34				
D-34	Ra-226 , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Ra-226 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,2)
D-34	Ra-226 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,3)
D-34				
D-34	Rn-222+D , plant/soil concentration ratio, dimensionless	0.000E+00	0.000E+00	RTF(5,1)
D-34	Rn-222+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	0.000E+00	0.000E+00	RTF(5,2)
D-34	Rn-222+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	0.000E+00	0.000E+00	RTF(5,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(6,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(6,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(6,3)
D-34				
D-34	Th-234+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(7,1)
D-34	Th-234+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(7,2)
D-34	Th-234+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(7,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(8,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(8,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(8,3)
D-34				
D-34	U-238 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(9,1)
D-34	U-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(9,2)
D-34	U-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(9,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Bi-210 , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Bi-210 , crustacea and mollusks	1.000E+01	1.000E+01	BIOFAC(1,2)
D-5				
D-5	Pb-210 , fish	3.000E+02	3.000E+02	BIOFAC(2,1)
D-5	Pb-210 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(2,2)
D-5				
D-5	Po-210 , fish	1.000E+02	1.000E+02	BIOFAC(3,1)
D-5	Po-210 , crustacea and mollusks	2.000E+04	2.000E+04	BIOFAC(3,2)
D-5				
D-5	Ra-226 , fish	5.000E+01	5.000E+01	BIOFAC(4,1)
D-5	Ra-226 , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(4,2)
D-5				
D-5	Rn-222+D , fish	0.000E+00	0.000E+00	BIOFAC(5,1)
D-5	Rn-222+D , crustacea and mollusks	0.000E+00	0.000E+00	BIOFAC(5,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(6,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(6,2)
D-5				
D-5	Th-234+D , fish	1.000E+02	1.000E+02	BIOFAC(7,1)
D-5	Th-234+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(7,2)
D-5				

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(8,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(8,2)
D-5				
D-5	U-238 , fish	1.000E+01	1.000E+01	BIOFAC(9,1)
D-5	U-238 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(9,2)

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

Summary : Nearby Resident - PG in Road Base
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Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.500E+03	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	2.500E-01	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	not used	3.000E+00	---	T(3)
R011	Times for calculations (yr)	not used	1.000E+01	---	T(4)
R011	Times for calculations (yr)	not used	3.000E+01	---	T(5)
R011	Times for calculations (yr)	not used	1.000E+02	---	T(6)
R011	Times for calculations (yr)	not used	3.000E+02	---	T(7)
R011	Times for calculations (yr)	not used	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Bi-210	1.350E+01	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Pb-210	1.350E+01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Po-210	1.350E+01	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Ra-226	1.350E+01	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Rn-222	1.350E+01	0.000E+00	---	S1(5)
R012	Initial principal radionuclide (pCi/g): Th-230	2.500E+00	0.000E+00	---	S1(6)
R012	Initial principal radionuclide (pCi/g): Th-234	1.500E+00	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): U-234	1.600E+00	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): U-238	1.500E+00	0.000E+00	---	S1(9)
R012	Concentration in groundwater (pCi/L): Bi-210	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Po-210	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): Rn-222	not used	0.000E+00	---	W1(5)
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---	W1(6)
R012	Concentration in groundwater (pCi/L): Th-234	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(9)
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)	2.250E+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)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH

Summary : Nearby Resident - PG in Road Base
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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	not used	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	not used	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	not used	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	not used	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	not used	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	not used	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	not used	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	not used	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	not used	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	not used	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	not used	1	---	NS
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	not used	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Bi-210				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	not used	0.000E+00	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	not used	0.000E+00	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.232E+00	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+02	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+02	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.876E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Po-210				
R016	Contaminated zone (cm**3/g)	1.000E+01	1.000E+01	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+01	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+01	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.764E-02	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.267E-02	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for Rn-222				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	not used	0.000E+00	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	not used	0.000E+00	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.232E+00	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.481E-05	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for Th-234				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.481E-05	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.773E-02	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(9)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(9,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.773E-02	ALEACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	1.000E+00	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	not used	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	5.000E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.500E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	not used	1.000E+00	-1 shows non-circular AREA.	FS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	5.167E+00	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	1.033E+01	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	1.550E+01	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	2.067E+01	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	2.583E+01	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	3.100E+01	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	3.617E+01	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	4.133E+01	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	4.650E+01	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	5.167E+01	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	5.683E+01	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	6.200E+01	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	0.000E+00	1.000E+00	---	FRACA(1)
R017	Ring 2	0.000E+00	2.732E-01	---	FRACA(2)
R017	Ring 3	0.000E+00	0.000E+00	---	FRACA(3)
R017	Ring 4	6.500E-03	0.000E+00	---	FRACA(4)
R017	Ring 5	1.600E-01	0.000E+00	---	FRACA(5)
R017	Ring 6	2.500E-01	0.000E+00	---	FRACA(6)
R017	Ring 7	2.800E-01	0.000E+00	---	FRACA(7)
R017	Ring 8	1.900E-01	0.000E+00	---	FRACA(8)
R017	Ring 9	1.400E-01	0.000E+00	---	FRACA(9)
R017	Ring 10	1.200E-01	0.000E+00	---	FRACA(10)
R017	Ring 11	9.200E-02	0.000E+00	---	FRACA(11)
R017	Ring 12	2.300E-02	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI

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Site-Specific Parameter Summary (continued)

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

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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

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Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	1500.00 square meters	Bi-210	1.350E+01
Thickness:	0.25 meters	Pb-210	1.350E+01
Cover Depth:	0.00 meters	Po-210	1.350E+01
		Ra-226	1.350E+01
		Rn-222	1.350E+01
		Th-230	2.500E+00
		Th-234	1.500E+00
		U-234	1.600E+00
		U-238	1.500E+00

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

t (years):	0.000E+00	1.000E+00
TDOSE(t):	2.996E+00	2.870E+00
M(t):	1.198E-01	1.148E-01

Maximum TDOSE(t): 2.996E+00 mrem/yr at t = 0.000E+00 years

Summary : Nearby Resident - PG in Road Base
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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-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	0.000E+00	0.0000	1.646E-04	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.313E-02	0.0077
Pb-210	0.000E+00	0.0000	1.974E-02	0.0066	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.669E+00	0.5570
Po-210	0.000E+00	0.0000	5.025E-03	0.0017	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.300E-01	0.2437
Ra-226	0.000E+00	0.0000	2.511E-02	0.0084	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.011E-01	0.1339
Rn-222	0.000E+00	0.0000	9.942E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.079E-04	0.0002
Th-230	0.000E+00	0.0000	4.864E-02	0.0162	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.319E-02	0.0178
Th-234	0.000E+00	0.0000	2.148E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.925E-05	0.0000
U-234	0.000E+00	0.0000	2.901E-03	0.0010	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.871E-03	0.0026
U-238	0.000E+00	0.0000	2.316E-03	0.0008	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.240E-03	0.0024
Total	0.000E+00	0.0000	1.039E-01	0.0347	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.892E+00	0.9653

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.329E-02	0.0078
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.688E+00	0.5636
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.351E-01	0.2454
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.262E-01	0.1423
Rn-222	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.178E-04	0.0002
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	1.018E-01	0.0340
Th-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	4.946E-05	0.0000
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	1.077E-02	0.0036
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.557E-03	0.0032
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.996E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : Nearby Resident - PG in Road Base
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	0.000E+00	0.0000	2.465E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.582E-03	0.0012
Pb-210	0.000E+00	0.0000	2.263E-02	0.0079	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.136E+00	0.7441
Po-210	0.000E+00	0.0000	7.388E-04	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.073E-01	0.0374
Ra-226	0.000E+00	0.0000	2.540E-02	0.0089	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.517E-01	0.1574
Rn-222	0.000E+00	0.0000	9.708E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.156E-04	0.0003
Th-230	0.000E+00	0.0000	4.864E-02	0.0170	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.322E-02	0.0185
Th-234	0.000E+00	0.0000	7.281E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.309E-09	0.0000
U-234	0.000E+00	0.0000	2.850E-03	0.0010	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.733E-03	0.0027
U-238	0.000E+00	0.0000	2.276E-03	0.0008	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.162E-03	0.0025
Total	0.000E+00	0.0000	1.026E-01	0.0357	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.767E+00	0.9643

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.606E-03	0.0013
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.158E+00	0.7520
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.081E-01	0.0377
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.771E-01	0.1663
Rn-222	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.254E-04	0.0003
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	1.019E-01	0.0355
Th-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	4.037E-09	0.0000
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	1.058E-02	0.0037
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.438E-03	0.0033
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.870E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : Nearby Resident - PG in Road Base
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Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	3.485E-06	7.908E-31
Bi-210	Po-210	1.000E+00	1.722E-03	2.671E-04
Bi-210	∑DSR(j)		1.725E-03	2.671E-04
Pb-210	Pb-210	1.000E+00	6.958E-02	6.685E-02
Pb-210	Bi-210	1.000E+00	1.277E-04	1.257E-04
Pb-210	Po-210	1.000E+00	5.535E-02	9.289E-02
Pb-210	∑DSR(j)		1.251E-01	1.599E-01
Po-210	Po-210	1.000E+00	5.445E-02	8.005E-03
Ra-226	Ra-226	1.000E+00	3.001E-02	2.962E-02
Ra-226	Rn-222+D	1.000E+00	2.750E-05	2.775E-05
Ra-226	Pb-210	1.000E+00	9.640E-04	2.877E-03
Ra-226	Bi-210	1.000E+00	1.748E-06	5.342E-06
Ra-226	Po-210	1.000E+00	5.641E-04	2.811E-03
Ra-226	∑DSR(j)		3.157E-02	3.534E-02
Rn-222+D	Rn-222+D	1.000E+00	6.730E-07	2.317E-38
Rn-222+D	Pb-210	1.000E+00	2.921E-05	2.870E-05
Rn-222+D	Bi-210	1.000E+00	5.449E-08	5.394E-08
Rn-222+D	Po-210	1.000E+00	2.324E-05	3.979E-05
Rn-222+D	∑DSR(j)		5.317E-05	6.854E-05
Th-230	Th-230	1.000E+00	4.073E-02	4.073E-02
Th-230	Ra-226	1.000E+00	6.515E-06	1.943E-05
Th-230	Rn-222+D	1.000E+00	5.938E-09	1.804E-08
Th-230	Pb-210	1.000E+00	1.379E-07	9.735E-07
Th-230	Bi-210	1.000E+00	2.457E-10	1.788E-09
Th-230	Po-210	1.000E+00	6.414E-08	7.589E-07
Th-230	∑DSR(j)		4.073E-02	4.075E-02
Th-234+D	Th-234+D	1.000E+00	3.297E-05	9.033E-10
Th-234+D	U-234	1.000E+00	1.645E-09	1.788E-09
Th-234+D	Th-230	1.000E+00	4.073E-14	1.372E-13
Th-234+D	Ra-226	1.000E+00	4.017E-18	3.233E-17
Th-234+D	Rn-222+D	1.000E+00	3.600E-21	2.972E-20
Th-234+D	Pb-210	1.000E+00	5.838E-20	1.058E-18
Th-234+D	Bi-210	1.000E+00	1.017E-22	1.921E-21
Th-234+D	Po-210	1.000E+00	2.120E-20	6.763E-19
Th-234+D	∑DSR(j)		3.297E-05	2.691E-09

Summary : Nearby Resident - PG in Road Base
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Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years 0.000E+00	1.000E+00
U-234	U-234	1.000E+00	6.732E-03	6.614E-03
U-234	Th-230	1.000E+00	1.822E-07	5.424E-07
U-234	Ra-226	1.000E+00	1.948E-11	1.352E-10
U-234	Rn-222+D	1.000E+00	1.752E-14	1.244E-13
U-234	Pb-210	1.000E+00	3.060E-13	4.653E-12
U-234	Bi-210	1.000E+00	5.359E-16	8.460E-15
U-234	Po-210	1.000E+00	1.179E-13	3.062E-12
U-234	∑DSR(j)		6.732E-03	6.614E-03
U-238	U-238	5.400E-05	3.273E-07	3.215E-07
U-238	U-238	9.999E-01	6.060E-03	5.954E-03
U-238	Th-234+D	9.999E-01	3.105E-04	3.375E-04
U-238	U-234	9.999E-01	7.883E-09	2.635E-08
U-238	Th-230	9.999E-01	1.312E-13	1.054E-12
U-238	Ra-226	9.999E-01	9.780E-18	1.725E-16
U-238	Rn-222+D	9.999E-01	8.641E-21	1.574E-19
U-238	Pb-210	9.999E-01	1.129E-19	4.357E-18
U-238	Bi-210	9.999E-01	1.934E-22	7.831E-21
U-238	Po-210	9.999E-01	3.494E-20	2.423E-18
U-238	∑DSR(j)		6.371E-03	6.291E-03

The DSR includes contributions from associated (half-life ≤ 1 day) daughters.

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

Nuclide (i)	t= 0.000E+00	1.000E+00
Bi-210	1.449E+04	9.359E+04
Pb-210	1.999E+02	1.564E+02
Po-210	4.591E+02	3.123E+03
Ra-226	7.919E+02	7.074E+02
Rn-222	4.702E+05	3.647E+05
Th-230	6.137E+02	6.135E+02
Th-234	7.582E+05	9.289E+09
U-234	3.713E+03	3.780E+03
U-238	3.924E+03	3.973E+03

Summary : Nearby Resident - PG in Road Base
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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

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Bi-210	1.350E+01	0.000E+00	1.725E-03	1.449E+04	1.725E-03	1.449E+04
Pb-210	1.350E+01	1.000E+00	1.599E-01	1.564E+02	1.251E-01	1.999E+02
Po-210	1.350E+01	0.000E+00	5.445E-02	4.591E+02	5.445E-02	4.591E+02
Ra-226	1.350E+01	1.000E+00	3.534E-02	7.074E+02	3.157E-02	7.919E+02
Rn-222	1.350E+01	1.000E+00	6.854E-05	3.647E+05	5.317E-05	4.702E+05
Th-230	2.500E+00	1.000E+00	4.075E-02	6.135E+02	4.073E-02	6.137E+02
Th-234	1.500E+00	0.000E+00	3.297E-05	7.582E+05	3.297E-05	7.582E+05
U-234	1.600E+00	0.000E+00	6.732E-03	3.713E+03	6.732E-03	3.713E+03
U-238	1.500E+00	0.1075 ± 0.0002	6.381E-03	3.918E+03	6.371E-03	3.924E+03

Summary : Nearby Resident - PG in Road Base
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Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	4.705E-05	0.000E+00
Bi-210	Pb-210	1.000E+00	1.724E-03	1.696E-03
Bi-210	Ra-226	1.000E+00	2.359E-05	7.212E-05
Bi-210	Rn-222	1.000E+00	7.357E-07	7.282E-07
Bi-210	Th-230	1.000E+00	6.143E-10	4.469E-09
Bi-210	Th-234	1.000E+00	1.526E-22	2.881E-21
Bi-210	U-234	1.000E+00	8.575E-16	1.354E-14
Bi-210	U-238	9.999E-01	2.900E-22	1.175E-20
Bi-210	∑DOSE(j)		1.795E-03	1.769E-03
Po-210	Bi-210	1.000E+00	2.325E-02	3.606E-03
Po-210	Pb-210	1.000E+00	7.472E-01	1.254E+00
Po-210	Po-210	1.000E+00	7.351E-01	1.081E-01
Po-210	Ra-226	1.000E+00	7.615E-03	3.794E-02
Po-210	Rn-222	1.000E+00	3.137E-04	5.372E-04
Po-210	Th-230	1.000E+00	1.603E-07	1.897E-06
Po-210	Th-234	1.000E+00	3.180E-20	1.015E-18
Po-210	U-234	1.000E+00	1.886E-13	4.899E-12
Po-210	U-238	9.999E-01	5.241E-20	3.635E-18
Po-210	∑DOSE(j)		1.513E+00	1.404E+00
Pb-210	Pb-210	1.000E+00	9.393E-01	9.025E-01
Pb-210	Ra-226	1.000E+00	1.301E-02	3.884E-02
Pb-210	Rn-222	1.000E+00	3.943E-04	3.874E-04
Pb-210	Th-230	1.000E+00	3.448E-07	2.434E-06
Pb-210	Th-234	1.000E+00	8.757E-20	1.587E-18
Pb-210	U-234	1.000E+00	4.896E-13	7.446E-12
Pb-210	U-238	9.999E-01	1.694E-19	6.536E-18
Pb-210	∑DOSE(j)		9.527E-01	9.417E-01
Ra-226	Ra-226	1.000E+00	4.052E-01	3.999E-01
Ra-226	Th-230	1.000E+00	1.629E-05	4.858E-05
Ra-226	Th-234	1.000E+00	6.026E-18	4.849E-17
Ra-226	U-234	1.000E+00	3.117E-11	2.163E-10
Ra-226	U-238	9.999E-01	1.467E-17	2.588E-16
Ra-226	∑DOSE(j)		4.052E-01	3.999E-01
Rn-222	Ra-226	1.000E+00	3.713E-04	3.747E-04
Rn-222	Rn-222	1.000E+00	9.086E-06	0.000E+00
Rn-222	Th-230	1.000E+00	1.485E-08	4.509E-08
Rn-222	Th-234	1.000E+00	5.399E-21	4.458E-20
Rn-222	U-234	1.000E+00	2.803E-14	1.991E-13
Rn-222	U-238	9.999E-01	1.296E-20	2.360E-19
Rn-222	∑DOSE(j)		3.804E-04	3.747E-04
Th-230	Th-230	1.000E+00	1.018E-01	1.018E-01
Th-230	Th-234	1.000E+00	6.109E-14	2.058E-13
Th-230	U-234	1.000E+00	2.916E-07	8.679E-07
Th-230	U-238	9.999E-01	1.968E-13	1.581E-12
Th-230	∑DOSE(j)		1.018E-01	1.018E-01

Summary : Nearby Resident - PG in Road Base
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Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00
Th-234	Th-234	1.000E+00	4.946E-05	1.355E-09
Th-234	U-238	9.999E-01	4.658E-04	5.063E-04
Th-234	∑DOSE(j)		5.153E-04	5.063E-04
U-234	Th-234	1.000E+00	2.467E-09	2.682E-09
U-234	U-234	1.000E+00	1.077E-02	1.058E-02
U-234	U-238	9.999E-01	1.182E-08	3.953E-08
U-234	∑DOSE(j)		1.077E-02	1.058E-02
U-238	U-238	5.400E-05	4.909E-07	4.823E-07
U-238	U-238	9.999E-01	9.090E-03	8.931E-03
U-238	∑DOSE(j)		9.091E-03	8.931E-03

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

Summary : Nearby Resident - PG in Road Base
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Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	1.350E+01	3.063E-24
Bi-210	Pb-210	1.000E+00	0.000E+00	1.155E+01
Bi-210	Ra-226	1.000E+00	0.000E+00	3.223E-01
Bi-210	Rn-222	1.000E+00	0.000E+00	4.960E-03
Bi-210	Th-230	1.000E+00	0.000E+00	1.264E-05
Bi-210	Th-234	1.000E+00	0.000E+00	4.515E-18
Bi-210	U-234	1.000E+00	0.000E+00	2.353E-11
Bi-210	U-238	9.999E-01	0.000E+00	1.067E-17
Bi-210	∑S(j):		1.350E+01	1.188E+01
Po-210	Bi-210	1.000E+00	0.000E+00	6.623E-02
Po-210	Pb-210	1.000E+00	0.000E+00	9.479E+00
Po-210	Po-210	1.000E+00	1.350E+01	1.985E+00
Po-210	Ra-226	1.000E+00	0.000E+00	1.689E-01
Po-210	Rn-222	1.000E+00	0.000E+00	4.049E-03
Po-210	Th-230	1.000E+00	0.000E+00	4.992E-06
Po-210	Th-234	1.000E+00	0.000E+00	1.366E-18
Po-210	U-234	1.000E+00	0.000E+00	7.521E-12
Po-210	U-238	9.999E-01	0.000E+00	2.722E-18
Po-210	∑S(j):		1.350E+01	1.170E+01
Pb-210	Pb-210	1.000E+00	1.350E+01	1.297E+01
Pb-210	Ra-226	1.000E+00	0.000E+00	3.685E-01
Pb-210	Rn-222	1.000E+00	0.000E+00	5.568E-03
Pb-210	Th-230	1.000E+00	0.000E+00	1.471E-05
Pb-210	Th-234	1.000E+00	0.000E+00	5.371E-18
Pb-210	U-234	1.000E+00	0.000E+00	2.786E-11
Pb-210	U-238	9.999E-01	0.000E+00	1.292E-17
Pb-210	∑S(j):		1.350E+01	1.335E+01
Ra-226	Ra-226	1.000E+00	1.350E+01	1.332E+01
Ra-226	Th-230	1.000E+00	0.000E+00	1.076E-03
Ra-226	Th-234	1.000E+00	0.000E+00	6.472E-16
Ra-226	U-234	1.000E+00	0.000E+00	3.088E-09
Ra-226	U-238	9.999E-01	0.000E+00	2.087E-15
Ra-226	∑S(j):		1.350E+01	1.333E+01
Rn-222	Ra-226	1.000E+00	0.000E+00	1.218E+01
Rn-222	Rn-222	1.000E+00	1.350E+01	4.647E-31
Rn-222	Th-230	1.000E+00	0.000E+00	9.699E-04
Rn-222	Th-234	1.000E+00	0.000E+00	5.740E-16
Rn-222	U-234	1.000E+00	0.000E+00	2.746E-09
Rn-222	U-238	9.999E-01	0.000E+00	1.825E-15
Rn-222	∑S(j):		1.350E+01	1.218E+01
Th-230	Th-230	1.000E+00	2.500E+00	2.500E+00
Th-230	Th-234	1.000E+00	0.000E+00	3.270E-12
Th-230	U-234	1.000E+00	0.000E+00	1.428E-05
Th-230	U-238	9.999E-01	0.000E+00	1.567E-11
Th-230	∑S(j):		2.500E+00	2.500E+00

Summary : Nearby Resident - PG in Road Base
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Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00
Th-234	Th-234	1.000E+00	1.500E+00	4.110E-05
Th-234	U-238	9.999E-01	0.000E+00	1.476E+00
Th-234	∑S(j):		1.500E+00	1.476E+00
U-234	Th-234	1.000E+00	0.000E+00	3.983E-07
U-234	U-234	1.000E+00	1.600E+00	1.572E+00
U-234	U-238	9.999E-01	0.000E+00	3.786E-06
U-234	∑S(j):		1.600E+00	1.572E+00
U-238	U-238	5.400E-05	8.100E-05	7.958E-05
U-238	U-238	9.999E-01	1.500E+00	1.474E+00
U-238	∑S(j):		1.500E+00	1.474E+00

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

RESCALC.EXE execution time = 21.37 seconds

RESRAD Modelling Results

Utility Worker

Summary : Utility Worker - PG in Road Base
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Part I: Mixture Sums and Single Radionuclide Guidelines

Summary : Utility Worker - PG in Road Base
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Dose Conversion Factor (and Related) Parameter Summary
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	At-218 (Source: ICRP 60)	4.878E-03	4.878E-03	DCF1(1)
A-1	Bi-210 (Source: ICRP 60)	5.476E-03	5.476E-03	DCF1(2)
A-1	Bi-214 (Source: ICRP 60)	9.325E+00	9.325E+00	DCF1(3)
A-1	Pa-234 (Source: ICRP 60)	1.088E+01	1.088E+01	DCF1(4)
A-1	Pa-234m (Source: ICRP 60)	9.867E-02	9.867E-02	DCF1(5)
A-1	Pb-210 (Source: ICRP 60)	1.981E-03	1.981E-03	DCF1(6)
A-1	Pb-214 (Source: ICRP 60)	1.243E+00	1.243E+00	DCF1(7)
A-1	Po-210 (Source: ICRP 60)	4.934E-05	4.934E-05	DCF1(8)
A-1	Po-214 (Source: ICRP 60)	4.840E-04	4.840E-04	DCF1(9)
A-1	Po-218 (Source: ICRP 60)	5.326E-05	5.326E-05	DCF1(10)
A-1	Ra-226 (Source: ICRP 60)	2.915E-02	2.915E-02	DCF1(11)
A-1	Rn-222 (Source: ICRP 60)	2.186E-03	2.186E-03	DCF1(12)
A-1	Th-230 (Source: ICRP 60)	1.071E-03	1.071E-03	DCF1(13)
A-1	Th-234 (Source: ICRP 60)	2.130E-02	2.130E-02	DCF1(14)
A-1	Tl-210 (Source: ICRP 60)	1.661E+01	1.661E+01	DCF1(15)
A-1	U-234 (Source: ICRP 60)	3.439E-04	3.439E-04	DCF1(16)
A-1	U-238 (Source: ICRP 60)	7.961E-05	7.961E-05	DCF1(17)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Bi-210	3.441E-04	3.441E-04	DCF2(1)
B-1	Pb-210	2.072E-02	2.072E-02	DCF2(2)
B-1	Po-210	1.591E-02	1.591E-02	DCF2(3)
B-1	Ra-226	3.515E-02	3.515E-02	DCF2(4)
B-1	Rn-222+D	1.073E-04	0.000E+00	DCF2(5)
B-1	Th-230	3.700E-01	3.700E-01	DCF2(6)
B-1	Th-234+D	2.849E-05	2.849E-05	DCF2(7)
B-1	U-234	3.478E-02	3.478E-02	DCF2(8)
B-1	U-238	2.960E-02	2.960E-02	DCF2(9)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Bi-210	4.810E-06	4.810E-06	DCF3(1)
D-1	Pb-210	2.553E-03	2.553E-03	DCF3(2)
D-1	Po-210	4.440E-03	4.440E-03	DCF3(3)
D-1	Ra-226	1.036E-03	1.036E-03	DCF3(4)
D-1	Rn-222+D	9.249E-07	0.000E+00	DCF3(5)
D-1	Th-230	7.770E-04	7.770E-04	DCF3(6)
D-1	Th-234+D	1.259E-05	1.258E-05	DCF3(7)
D-1	U-234	1.813E-04	1.813E-04	DCF3(8)
D-1	U-238	1.665E-04	1.665E-04	DCF3(9)
D-34	Food transfer factors:			
D-34	Bi-210 , plant/soil concentration ratio, dimensionless	1.000E-01	1.000E-01	RTF(1,1)
D-34	Bi-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(1,2)
D-34	Bi-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-04	5.000E-04	RTF(1,3)
D-34				
D-34	Pb-210 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pb-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(2,2)
D-34	Pb-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(2,3)
D-34				

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Po-210 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(3,1)
D-34	Po-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(3,2)
D-34	Po-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.400E-04	3.400E-04	RTF(3,3)
D-34				
D-34	Ra-226 , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Ra-226 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,2)
D-34	Ra-226 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,3)
D-34				
D-34	Rn-222+D , plant/soil concentration ratio, dimensionless	0.000E+00	0.000E+00	RTF(5,1)
D-34	Rn-222+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	0.000E+00	0.000E+00	RTF(5,2)
D-34	Rn-222+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	0.000E+00	0.000E+00	RTF(5,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(6,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(6,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(6,3)
D-34				
D-34	Th-234+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(7,1)
D-34	Th-234+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(7,2)
D-34	Th-234+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(7,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(8,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(8,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(8,3)
D-34				
D-34	U-238 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(9,1)
D-34	U-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(9,2)
D-34	U-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(9,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Bi-210 , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Bi-210 , crustacea and mollusks	1.000E+01	1.000E+01	BIOFAC(1,2)
D-5				
D-5	Pb-210 , fish	3.000E+02	3.000E+02	BIOFAC(2,1)
D-5	Pb-210 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(2,2)
D-5				
D-5	Po-210 , fish	1.000E+02	1.000E+02	BIOFAC(3,1)
D-5	Po-210 , crustacea and mollusks	2.000E+04	2.000E+04	BIOFAC(3,2)
D-5				
D-5	Ra-226 , fish	5.000E+01	5.000E+01	BIOFAC(4,1)
D-5	Ra-226 , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(4,2)
D-5				
D-5	Rn-222+D , fish	0.000E+00	0.000E+00	BIOFAC(5,1)
D-5	Rn-222+D , crustacea and mollusks	0.000E+00	0.000E+00	BIOFAC(5,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(6,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(6,2)
D-5				
D-5	Th-234+D , fish	1.000E+02	1.000E+02	BIOFAC(7,1)
D-5	Th-234+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(7,2)
D-5				

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(8,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(8,2)
D-5				
D-5	U-238 , fish	1.000E+01	1.000E+01	BIOFAC(9,1)
D-5	U-238 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(9,2)

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

Summary : Utility Worker - PG in Road Base
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Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.500E+03	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	2.500E-01	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	not used	3.000E+00	---	T(3)
R011	Times for calculations (yr)	not used	1.000E+01	---	T(4)
R011	Times for calculations (yr)	not used	3.000E+01	---	T(5)
R011	Times for calculations (yr)	not used	1.000E+02	---	T(6)
R011	Times for calculations (yr)	not used	3.000E+02	---	T(7)
R011	Times for calculations (yr)	not used	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Bi-210	1.350E+01	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Pb-210	1.350E+01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Po-210	1.350E+01	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Ra-226	1.350E+01	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Rn-222	1.350E+01	0.000E+00	---	S1(5)
R012	Initial principal radionuclide (pCi/g): Th-230	2.500E+00	0.000E+00	---	S1(6)
R012	Initial principal radionuclide (pCi/g): Th-234	1.500E+00	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): U-234	1.600E+00	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): U-238	1.500E+00	0.000E+00	---	S1(9)
R012	Concentration in groundwater (pCi/L): Bi-210	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Po-210	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): Rn-222	not used	0.000E+00	---	W1(5)
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---	W1(6)
R012	Concentration in groundwater (pCi/L): Th-234	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(9)
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)	2.250E+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)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	not used	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	not used	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	not used	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	not used	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	not used	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	not used	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	not used	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	not used	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	not used	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	not used	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	not used	1	---	NS
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	not used	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Bi-210				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	not used	0.000E+00	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	not used	0.000E+00	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.232E+00	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+02	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+02	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.876E-03	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Po-210				
R016	Contaminated zone (cm**3/g)	1.000E+01	1.000E+01	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+01	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+01	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.764E-02	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)

Summary : Utility Worker - PG in Road Base
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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.267E-02	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for Rn-222				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	not used	0.000E+00	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	not used	0.000E+00	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.232E+00	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.481E-05	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for Th-234				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.481E-05	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.773E-02	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(9)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(9,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.773E-02	ALEACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)
R017	Inhalation rate (m**3/yr)	1.140E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	2.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	1.000E+00	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	not used	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	0.000E+00	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	1.800E-02	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	not used	1.000E+00	-1 shows non-circular AREA.	FS

Summary : Utility Worker - PG in Road Base
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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	4.250E+00	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	8.500E+00	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	1.275E+01	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	1.700E+01	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	2.125E+01	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	2.550E+01	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	2.975E+01	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	3.400E+01	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	3.825E+01	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	4.250E+01	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	4.675E+01	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	5.100E+01	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	1.000E+00	1.000E+00	---	FRACA(1)
R017	Ring 2	1.000E+00	2.732E-01	---	FRACA(2)
R017	Ring 3	5.000E-01	0.000E+00	---	FRACA(3)
R017	Ring 4	3.500E-01	0.000E+00	---	FRACA(4)
R017	Ring 5	2.600E-01	0.000E+00	---	FRACA(5)
R017	Ring 6	2.100E-01	0.000E+00	---	FRACA(6)
R017	Ring 7	1.800E-01	0.000E+00	---	FRACA(7)
R017	Ring 8	1.600E-01	0.000E+00	---	FRACA(8)
R017	Ring 9	1.400E-01	0.000E+00	---	FRACA(9)
R017	Ring 10	1.200E-01	0.000E+00	---	FRACA(10)
R017	Ring 11	1.100E-01	0.000E+00	---	FRACA(11)
R017	Ring 12	7.000E-02	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	8.250E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI

Site-Specific Parameter Summary (continued)

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

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

Summary : Utility Worker - PG in Road Base
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Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	1500.00 square meters	Bi-210	1.350E+01
Thickness:	0.25 meters	Pb-210	1.350E+01
Cover Depth:	0.00 meters	Po-210	1.350E+01
		Ra-226	1.350E+01
		Rn-222	1.350E+01
		Th-230	2.500E+00
		Th-234	1.500E+00
		U-234	1.600E+00
		U-238	1.500E+00

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

t (years):	0.000E+00	1.000E+00
TDOSE(t):	1.682E-01	1.612E-01
M(t):	6.726E-03	6.450E-03

Maximum TDOSE(t): 1.682E-01 mrem/yr at t = 0.000E+00 years

Summary : Utility Worker - PG in Road Base
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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-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	0.000E+00	0.0000	1.787E-05	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.255E-03	0.0075
Pb-210	0.000E+00	0.0000	2.143E-03	0.0127	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.051E-02	0.5383
Po-210	0.000E+00	0.0000	5.456E-04	0.0032	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.960E-02	0.2355
Ra-226	0.000E+00	0.0000	2.727E-03	0.0162	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.176E-02	0.1294
Rn-222	0.000E+00	0.0000	1.079E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.840E-05	0.0002
Th-230	0.000E+00	0.0000	5.281E-03	0.0314	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.885E-03	0.0172
Th-234	0.000E+00	0.0000	2.332E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.671E-06	0.0000
U-234	0.000E+00	0.0000	3.149E-04	0.0019	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.270E-04	0.0025
U-238	0.000E+00	0.0000	2.515E-04	0.0015	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.928E-04	0.0023
Total	0.000E+00	0.0000	1.128E-02	0.0671	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.569E-01	0.9329

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.272E-03	0.0076
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.265E-02	0.5510
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.015E-02	0.2388
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.448E-02	0.1456
Rn-222	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.948E-05	0.0002
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	8.167E-03	0.0486
Th-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	2.695E-06	0.0000
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	7.419E-04	0.0044
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.443E-04	0.0038
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	1.682E-01	1.0000

*Sum of all water independent and dependent pathways.

Summary : Utility Worker - PG in Road Base
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	0.000E+00	0.0000	2.677E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.943E-04	0.0012
Pb-210	0.000E+00	0.0000	2.457E-03	0.0152	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.158E-01	0.7184
Po-210	0.000E+00	0.0000	8.022E-05	0.0005	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.822E-03	0.0361
Ra-226	0.000E+00	0.0000	2.758E-03	0.0171	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.450E-02	0.1520
Rn-222	0.000E+00	0.0000	1.054E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.967E-05	0.0003
Th-230	0.000E+00	0.0000	5.281E-03	0.0328	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.887E-03	0.0179
Th-234	0.000E+00	0.0000	7.905E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.795E-10	0.0000
U-234	0.000E+00	0.0000	3.094E-04	0.0019	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.195E-04	0.0026
U-238	0.000E+00	0.0000	2.471E-04	0.0015	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.885E-04	0.0024
Total	0.000E+00	0.0000	1.114E-02	0.0691	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.501E-01	0.9309

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.970E-04	0.0012
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.183E-01	0.7337
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.903E-03	0.0366
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.726E-02	0.1691
Rn-222	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.072E-05	0.0003
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	8.169E-03	0.0507
Th-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	2.586E-10	0.0000
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	7.289E-04	0.0045
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.356E-04	0.0039
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	1.612E-01	1.0000

*Sum of all water independent and dependent pathways.

Summary : Utility Worker - PG in Road Base
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Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years 0.000E+00	1.000E+00 (mrem/yr)/(pCi/g)
Bi-210	Bi-210	1.000E+00	2.119E-07	4.809E-32
Bi-210	Po-210	1.000E+00	9.404E-05	1.459E-05
Bi-210	∑DSR(j)		9.426E-05	1.459E-05
Pb-210	Pb-210	1.000E+00	3.832E-03	3.682E-03
Pb-210	Bi-210	1.000E+00	7.764E-06	7.641E-06
Pb-210	Po-210	1.000E+00	3.023E-03	5.073E-03
Pb-210	∑DSR(j)		6.863E-03	8.763E-03
Po-210	Po-210	1.000E+00	2.974E-03	4.372E-04
Ra-226	Ra-226	1.000E+00	1.728E-03	1.705E-03
Ra-226	Rn-222+D	1.000E+00	1.764E-06	1.780E-06
Ra-226	Pb-210	1.000E+00	5.310E-05	1.585E-04
Ra-226	Bi-210	1.000E+00	1.063E-07	3.249E-07
Ra-226	Po-210	1.000E+00	3.081E-05	1.535E-04
Ra-226	∑DSR(j)		1.814E-03	2.019E-03
Rn-222+D	Rn-222+D	1.000E+00	4.317E-08	1.486E-39
Rn-222+D	Pb-210	1.000E+00	1.609E-06	1.581E-06
Rn-222+D	Bi-210	1.000E+00	3.314E-09	3.280E-09
Rn-222+D	Po-210	1.000E+00	1.269E-06	2.173E-06
Rn-222+D	∑DSR(j)		2.924E-06	3.757E-06
Th-230	Th-230	1.000E+00	3.266E-03	3.266E-03
Th-230	Ra-226	1.000E+00	3.751E-07	1.119E-06
Th-230	Rn-222+D	1.000E+00	3.809E-10	1.157E-09
Th-230	Pb-210	1.000E+00	7.596E-09	5.362E-08
Th-230	Bi-210	1.000E+00	1.494E-11	1.087E-10
Th-230	Po-210	1.000E+00	3.503E-09	4.145E-08
Th-230	∑DSR(j)		3.267E-03	3.267E-03
Th-234+D	Th-234+D	1.000E+00	1.796E-06	4.922E-11
Th-234+D	U-234	1.000E+00	1.133E-10	1.231E-10
Th-234+D	Th-230	1.000E+00	3.266E-15	1.100E-14
Th-234+D	Ra-226	1.000E+00	2.313E-19	1.861E-18
Th-234+D	Rn-222+D	1.000E+00	2.309E-22	1.907E-21
Th-234+D	Pb-210	1.000E+00	3.216E-21	5.829E-20
Th-234+D	Bi-210	1.000E+00	6.185E-24	1.168E-22
Th-234+D	Po-210	1.000E+00	1.158E-21	3.694E-20
Th-234+D	∑DSR(j)		1.797E-06	1.724E-10

Summary : Utility Worker - PG in Road Base
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Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years 0.000E+00	1.000E+00
U-234	U-234	1.000E+00	4.637E-04	4.555E-04
U-234	Th-230	1.000E+00	1.462E-08	4.350E-08
U-234	Ra-226	1.000E+00	1.122E-12	7.783E-12
U-234	Rn-222+D	1.000E+00	1.124E-15	7.982E-15
U-234	Pb-210	1.000E+00	1.685E-14	2.563E-13
U-234	Bi-210	1.000E+00	3.259E-17	5.144E-16
U-234	Po-210	1.000E+00	6.437E-15	1.672E-13
U-234	∑DSR(j)		4.637E-04	4.556E-04
U-238	U-238	5.400E-05	2.228E-08	2.189E-08
U-238	U-238	9.999E-01	4.126E-04	4.053E-04
U-238	Th-234+D	9.999E-01	1.692E-05	1.839E-05
U-238	U-234	9.999E-01	5.429E-10	1.815E-09
U-238	Th-230	9.999E-01	1.052E-14	8.456E-14
U-238	Ra-226	9.999E-01	5.630E-19	9.934E-18
U-238	Rn-222+D	9.999E-01	5.543E-22	1.009E-20
U-238	Pb-210	9.999E-01	6.220E-21	2.400E-19
U-238	Bi-210	9.999E-01	1.176E-23	4.762E-22
U-238	Po-210	9.999E-01	1.908E-21	1.324E-19
U-238	∑DSR(j)		4.295E-04	4.237E-04

The DSR includes contributions from associated (half-life ≤ 1 day) daughters.

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

Nuclide (i)	t= 0.000E+00	1.000E+00
Bi-210	2.652E+05	1.714E+06
Pb-210	3.643E+03	2.853E+03
Po-210	8.406E+03	5.718E+04
Ra-226	1.378E+04	1.238E+04
Rn-222	8.549E+06	6.654E+06
Th-230	7.653E+03	7.651E+03
Th-234	1.392E+07	1.450E+11
U-234	5.391E+04	5.488E+04
U-238	5.821E+04	5.900E+04

Summary : Utility Worker - PG in Road Base
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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

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Bi-210	1.350E+01	0.000E+00	9.426E-05	2.652E+05	9.426E-05	2.652E+05
Pb-210	1.350E+01	1.000E+00	8.763E-03	2.853E+03	6.863E-03	3.643E+03
Po-210	1.350E+01	0.000E+00	2.974E-03	8.406E+03	2.974E-03	8.406E+03
Ra-226	1.350E+01	1.000E+00	2.019E-03	1.238E+04	1.814E-03	1.378E+04
Rn-222	1.350E+01	1.000E+00	3.757E-06	6.654E+06	2.924E-06	8.549E+06
Th-230	2.500E+00	1.000E+00	3.267E-03	7.651E+03	3.267E-03	7.653E+03
Th-234	1.500E+00	0.000E+00	1.797E-06	1.392E+07	1.797E-06	1.392E+07
U-234	1.600E+00	0.000E+00	4.637E-04	5.391E+04	4.637E-04	5.391E+04
U-238	1.500E+00	0.0869 ± 0.0002	4.299E-04	5.815E+04	4.295E-04	5.821E+04

Summary : Utility Worker - PG in Road Base
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Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	2.861E-06	0.000E+00
Bi-210	Pb-210	1.000E+00	1.048E-04	1.032E-04
Bi-210	Ra-226	1.000E+00	1.435E-06	4.386E-06
Bi-210	Rn-222	1.000E+00	4.474E-08	4.428E-08
Bi-210	Th-230	1.000E+00	3.735E-11	2.718E-10
Bi-210	Th-234	1.000E+00	9.278E-24	1.752E-22
Bi-210	U-234	1.000E+00	5.214E-17	8.231E-16
Bi-210	U-238	9.999E-01	1.764E-23	7.143E-22
Bi-210	∑DOSE(j)		1.092E-04	1.076E-04
Po-210	Bi-210	1.000E+00	1.270E-03	1.970E-04
Po-210	Pb-210	1.000E+00	4.081E-02	6.849E-02
Po-210	Po-210	1.000E+00	4.015E-02	5.903E-03
Po-210	Ra-226	1.000E+00	4.159E-04	2.072E-03
Po-210	Rn-222	1.000E+00	1.713E-05	2.934E-05
Po-210	Th-230	1.000E+00	8.757E-09	1.036E-07
Po-210	Th-234	1.000E+00	1.737E-21	5.541E-20
Po-210	U-234	1.000E+00	1.030E-14	2.676E-13
Po-210	U-238	9.999E-01	2.862E-21	1.985E-19
Po-210	∑DOSE(j)		8.266E-02	7.669E-02
Pb-210	Pb-210	1.000E+00	5.174E-02	4.971E-02
Pb-210	Ra-226	1.000E+00	7.169E-04	2.139E-03
Pb-210	Rn-222	1.000E+00	2.172E-05	2.134E-05
Pb-210	Th-230	1.000E+00	1.899E-08	1.340E-07
Pb-210	Th-234	1.000E+00	4.823E-21	8.743E-20
Pb-210	U-234	1.000E+00	2.697E-14	4.101E-13
Pb-210	U-238	9.999E-01	9.330E-21	3.600E-19
Pb-210	∑DOSE(j)		5.248E-02	5.187E-02
Ra-226	Ra-226	1.000E+00	2.333E-02	2.302E-02
Ra-226	Th-230	1.000E+00	9.377E-07	2.797E-06
Ra-226	Th-234	1.000E+00	3.469E-19	2.792E-18
Ra-226	U-234	1.000E+00	1.795E-12	1.245E-11
Ra-226	U-238	9.999E-01	8.446E-19	1.490E-17
Ra-226	∑DOSE(j)		2.333E-02	2.302E-02
Rn-222	Ra-226	1.000E+00	2.382E-05	2.403E-05
Rn-222	Rn-222	1.000E+00	5.828E-07	0.000E+00
Rn-222	Th-230	1.000E+00	9.523E-10	2.892E-09
Rn-222	Th-234	1.000E+00	3.464E-22	2.860E-21
Rn-222	U-234	1.000E+00	1.798E-15	1.277E-14
Rn-222	U-238	9.999E-01	8.315E-22	1.514E-20
Rn-222	∑DOSE(j)		2.440E-05	2.404E-05
Th-230	Th-230	1.000E+00	8.166E-03	8.166E-03
Th-230	Th-234	1.000E+00	4.899E-15	1.650E-14
Th-230	U-234	1.000E+00	2.338E-08	6.960E-08
Th-230	U-238	9.999E-01	1.578E-14	1.268E-13
Th-230	∑DOSE(j)		8.166E-03	8.166E-03

Summary : Utility Worker - PG in Road Base
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Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00
Th-234	Th-234	1.000E+00	2.695E-06	7.382E-11
Th-234	U-238	9.999E-01	2.538E-05	2.758E-05
Th-234	∑DOSE(j)		2.807E-05	2.758E-05
U-234	Th-234	1.000E+00	1.699E-10	1.847E-10
U-234	U-234	1.000E+00	7.419E-04	7.289E-04
U-234	U-238	9.999E-01	8.144E-10	2.723E-09
U-234	∑DOSE(j)		7.419E-04	7.289E-04
U-238	U-238	5.400E-05	3.342E-08	3.283E-08
U-238	U-238	9.999E-01	6.188E-04	6.080E-04
U-238	∑DOSE(j)		6.189E-04	6.080E-04

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

Summary : Utility Worker - PG in Road Base
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Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	1.350E+01	3.063E-24
Bi-210	Pb-210	1.000E+00	0.000E+00	1.155E+01
Bi-210	Ra-226	1.000E+00	0.000E+00	3.223E-01
Bi-210	Rn-222	1.000E+00	0.000E+00	4.960E-03
Bi-210	Th-230	1.000E+00	0.000E+00	1.264E-05
Bi-210	Th-234	1.000E+00	0.000E+00	4.515E-18
Bi-210	U-234	1.000E+00	0.000E+00	2.353E-11
Bi-210	U-238	9.999E-01	0.000E+00	1.067E-17
Bi-210	∑S(j):		1.350E+01	1.188E+01
Po-210	Bi-210	1.000E+00	0.000E+00	6.623E-02
Po-210	Pb-210	1.000E+00	0.000E+00	9.479E+00
Po-210	Po-210	1.000E+00	1.350E+01	1.985E+00
Po-210	Ra-226	1.000E+00	0.000E+00	1.689E-01
Po-210	Rn-222	1.000E+00	0.000E+00	4.049E-03
Po-210	Th-230	1.000E+00	0.000E+00	4.992E-06
Po-210	Th-234	1.000E+00	0.000E+00	1.366E-18
Po-210	U-234	1.000E+00	0.000E+00	7.521E-12
Po-210	U-238	9.999E-01	0.000E+00	2.722E-18
Po-210	∑S(j):		1.350E+01	1.170E+01
Pb-210	Pb-210	1.000E+00	1.350E+01	1.297E+01
Pb-210	Ra-226	1.000E+00	0.000E+00	3.685E-01
Pb-210	Rn-222	1.000E+00	0.000E+00	5.568E-03
Pb-210	Th-230	1.000E+00	0.000E+00	1.471E-05
Pb-210	Th-234	1.000E+00	0.000E+00	5.371E-18
Pb-210	U-234	1.000E+00	0.000E+00	2.786E-11
Pb-210	U-238	9.999E-01	0.000E+00	1.292E-17
Pb-210	∑S(j):		1.350E+01	1.335E+01
Ra-226	Ra-226	1.000E+00	1.350E+01	1.332E+01
Ra-226	Th-230	1.000E+00	0.000E+00	1.076E-03
Ra-226	Th-234	1.000E+00	0.000E+00	6.472E-16
Ra-226	U-234	1.000E+00	0.000E+00	3.088E-09
Ra-226	U-238	9.999E-01	0.000E+00	2.087E-15
Ra-226	∑S(j):		1.350E+01	1.333E+01
Rn-222	Ra-226	1.000E+00	0.000E+00	1.218E+01
Rn-222	Rn-222	1.000E+00	1.350E+01	4.647E-31
Rn-222	Th-230	1.000E+00	0.000E+00	9.699E-04
Rn-222	Th-234	1.000E+00	0.000E+00	5.740E-16
Rn-222	U-234	1.000E+00	0.000E+00	2.746E-09
Rn-222	U-238	9.999E-01	0.000E+00	1.825E-15
Rn-222	∑S(j):		1.350E+01	1.218E+01
Th-230	Th-230	1.000E+00	2.500E+00	2.500E+00
Th-230	Th-234	1.000E+00	0.000E+00	3.270E-12
Th-230	U-234	1.000E+00	0.000E+00	1.428E-05
Th-230	U-238	9.999E-01	0.000E+00	1.567E-11
Th-230	∑S(j):		2.500E+00	2.500E+00

Summary : Utility Worker - PG in Road Base
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Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00
Th-234	Th-234	1.000E+00	1.500E+00	4.110E-05
Th-234	U-238	9.999E-01	0.000E+00	1.476E+00
Th-234	∑S(j):		1.500E+00	1.476E+00
U-234	Th-234	1.000E+00	0.000E+00	3.983E-07
U-234	U-234	1.000E+00	1.600E+00	1.572E+00
U-234	U-238	9.999E-01	0.000E+00	3.786E-06
U-234	∑S(j):		1.600E+00	1.572E+00
U-238	U-238	5.400E-05	8.100E-05	7.958E-05
U-238	U-238	9.999E-01	1.500E+00	1.474E+00
U-238	∑S(j):		1.500E+00	1.474E+00

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

RESCALC.EXE execution time = 18.59 seconds

RESRAD Modelling Results

Reclaimer Resident

Summary : Reclaimer Resident - PG in Road Base (Center)
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Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Summary : Reclaimer Resident - PG in Road Base (Center)
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Dose Conversion Factor (and Related) Parameter Summary
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	At-218 (Source: ICRP 60)	4.878E-03	4.878E-03	DCF1(1)
A-1	Bi-210 (Source: ICRP 60)	5.476E-03	5.476E-03	DCF1(2)
A-1	Bi-214 (Source: ICRP 60)	9.325E+00	9.325E+00	DCF1(3)
A-1	Pa-234 (Source: ICRP 60)	1.088E+01	1.088E+01	DCF1(4)
A-1	Pa-234m (Source: ICRP 60)	9.867E-02	9.867E-02	DCF1(5)
A-1	Pb-210 (Source: ICRP 60)	1.981E-03	1.981E-03	DCF1(6)
A-1	Pb-214 (Source: ICRP 60)	1.243E+00	1.243E+00	DCF1(7)
A-1	Po-210 (Source: ICRP 60)	4.934E-05	4.934E-05	DCF1(8)
A-1	Po-214 (Source: ICRP 60)	4.840E-04	4.840E-04	DCF1(9)
A-1	Po-218 (Source: ICRP 60)	5.326E-05	5.326E-05	DCF1(10)
A-1	Ra-226 (Source: ICRP 60)	2.915E-02	2.915E-02	DCF1(11)
A-1	Rn-222 (Source: ICRP 60)	2.186E-03	2.186E-03	DCF1(12)
A-1	Th-230 (Source: ICRP 60)	1.071E-03	1.071E-03	DCF1(13)
A-1	Th-234 (Source: ICRP 60)	2.130E-02	2.130E-02	DCF1(14)
A-1	Tl-210 (Source: ICRP 60)	1.661E+01	1.661E+01	DCF1(15)
A-1	U-234 (Source: ICRP 60)	3.439E-04	3.439E-04	DCF1(16)
A-1	U-238 (Source: ICRP 60)	7.961E-05	7.961E-05	DCF1(17)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Bi-210	3.441E-04	3.441E-04	DCF2(1)
B-1	Pb-210	2.072E-02	2.072E-02	DCF2(2)
B-1	Po-210	1.591E-02	1.591E-02	DCF2(3)
B-1	Ra-226	3.515E-02	3.515E-02	DCF2(4)
B-1	Rn-222+D	1.073E-04	0.000E+00	DCF2(5)
B-1	Th-230	3.700E-01	3.700E-01	DCF2(6)
B-1	Th-234+D	2.849E-05	2.849E-05	DCF2(7)
B-1	U-234	3.478E-02	3.478E-02	DCF2(8)
B-1	U-238	2.960E-02	2.960E-02	DCF2(9)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Bi-210	4.810E-06	4.810E-06	DCF3(1)
D-1	Pb-210	2.553E-03	2.553E-03	DCF3(2)
D-1	Po-210	4.440E-03	4.440E-03	DCF3(3)
D-1	Ra-226	1.036E-03	1.036E-03	DCF3(4)
D-1	Rn-222+D	9.249E-07	0.000E+00	DCF3(5)
D-1	Th-230	7.770E-04	7.770E-04	DCF3(6)
D-1	Th-234+D	1.259E-05	1.258E-05	DCF3(7)
D-1	U-234	1.813E-04	1.813E-04	DCF3(8)
D-1	U-238	1.665E-04	1.665E-04	DCF3(9)
D-34	Food transfer factors:			
D-34	Bi-210 , plant/soil concentration ratio, dimensionless	1.000E-01	1.000E-01	RTF(1,1)
D-34	Bi-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-03	2.000E-03	RTF(1,2)
D-34	Bi-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-04	5.000E-04	RTF(1,3)
D-34				
D-34	Pb-210 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pb-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(2,2)
D-34	Pb-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(2,3)
D-34				

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Po-210 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(3,1)
D-34	Po-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(3,2)
D-34	Po-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.400E-04	3.400E-04	RTF(3,3)
D-34				
D-34	Ra-226 , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Ra-226 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,2)
D-34	Ra-226 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,3)
D-34				
D-34	Rn-222+D , plant/soil concentration ratio, dimensionless	0.000E+00	0.000E+00	RTF(5,1)
D-34	Rn-222+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	0.000E+00	0.000E+00	RTF(5,2)
D-34	Rn-222+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	0.000E+00	0.000E+00	RTF(5,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(6,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(6,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(6,3)
D-34				
D-34	Th-234+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(7,1)
D-34	Th-234+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(7,2)
D-34	Th-234+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(7,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(8,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(8,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(8,3)
D-34				
D-34	U-238 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(9,1)
D-34	U-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(9,2)
D-34	U-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(9,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Bi-210 , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Bi-210 , crustacea and mollusks	1.000E+01	1.000E+01	BIOFAC(1,2)
D-5				
D-5	Pb-210 , fish	3.000E+02	3.000E+02	BIOFAC(2,1)
D-5	Pb-210 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(2,2)
D-5				
D-5	Po-210 , fish	1.000E+02	1.000E+02	BIOFAC(3,1)
D-5	Po-210 , crustacea and mollusks	2.000E+04	2.000E+04	BIOFAC(3,2)
D-5				
D-5	Ra-226 , fish	5.000E+01	5.000E+01	BIOFAC(4,1)
D-5	Ra-226 , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(4,2)
D-5				
D-5	Rn-222+D , fish	0.000E+00	0.000E+00	BIOFAC(5,1)
D-5	Rn-222+D , crustacea and mollusks	0.000E+00	0.000E+00	BIOFAC(5,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(6,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(6,2)
D-5				
D-5	Th-234+D , fish	1.000E+02	1.000E+02	BIOFAC(7,1)
D-5	Th-234+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(7,2)
D-5				

Summary : Reclaimer Resident - PG in Road Base (Center)
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Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: ICRP 72 (Adult)

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(8,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(8,2)
D-5				
D-5	U-238 , fish	1.000E+01	1.000E+01	BIOFAC(9,1)
D-5	U-238 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(9,2)

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

Summary : Reclaimer Resident - PG in Road Base (Center)
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Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.000E+02	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	1.000E-01	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	not used	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	not used	3.000E+00	---	T(3)
R011	Times for calculations (yr)	not used	1.000E+01	---	T(4)
R011	Times for calculations (yr)	not used	3.000E+01	---	T(5)
R011	Times for calculations (yr)	not used	1.000E+02	---	T(6)
R011	Times for calculations (yr)	not used	3.000E+02	---	T(7)
R011	Times for calculations (yr)	not used	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Bi-210	1.000E+01	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Pb-210	1.000E+01	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Po-210	1.000E+01	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Ra-226	1.000E+01	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Rn-222	1.000E+01	0.000E+00	---	S1(5)
R012	Initial principal radionuclide (pCi/g): Th-230	1.800E+00	0.000E+00	---	S1(6)
R012	Initial principal radionuclide (pCi/g): Th-234	1.100E+00	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): U-234	1.200E+00	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): U-238	1.100E+00	0.000E+00	---	S1(9)
R012	Concentration in groundwater (pCi/L): Bi-210	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Po-210	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): Rn-222	not used	0.000E+00	---	W1(5)
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---	W1(6)
R012	Concentration in groundwater (pCi/L): Th-234	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(9)
R013	Cover depth (m)	2.000E-01	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	2.250E+00	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	0.000E+00	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	2.250E+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)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	not used	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	not used	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	not used	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	not used	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	not used	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	not used	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	not used	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	not used	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	not used	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	not used	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	not used	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	not used	1	---	NS
R015	Unsat. zone 1, thickness (m)	not used	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	not used	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	not used	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	not used	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	not used	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	not used	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	not used	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Bi-210				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	not used	0.000E+00	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	not used	0.000E+00	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.558E+01	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+02	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+02	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.219E-02	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Po-210				
R016	Contaminated zone (cm**3/g)	1.000E+01	1.000E+01	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	not used	1.000E+01	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	not used	1.000E+01	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.191E-01	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	not used	7.000E+01	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	not used	7.000E+01	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.168E-02	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for Rn-222				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	not used	0.000E+00	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	not used	0.000E+00	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.558E+01	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.704E-05	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for Th-234				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	not used	6.000E+04	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	not used	6.000E+04	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.704E-05	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.432E-02	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(9)
R016	Unsaturated zone 1 (cm**3/g)	not used	5.000E+01	---	DCNUCU(9,1)
R016	Saturated zone (cm**3/g)	not used	5.000E+01	---	DCNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.432E-02	ALEACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)
R017	Inhalation rate (m**3/yr)	not used	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	not used	1.000E-04	---	MLINH
R017	Exposure duration	1.000E+00	3.000E+01	---	ED
R017	Shielding factor, inhalation	not used	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	1.000E+00	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	7.500E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	0.000E+00	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	-1.000E+00	1.000E+00	-1 shows non-circular AREA.	FS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	1.167E+00	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	2.333E+00	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	3.500E+00	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	4.667E+00	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	5.833E+00	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	7.000E+00	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	8.167E+00	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	9.333E+00	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	1.050E+01	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	1.167E+01	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	1.283E+01	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	1.400E+01	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	1.000E+00	1.000E+00	---	FRACA(1)
R017	Ring 2	1.000E+00	2.732E-01	---	FRACA(2)
R017	Ring 3	5.000E-01	0.000E+00	---	FRACA(3)
R017	Ring 4	3.200E-01	0.000E+00	---	FRACA(4)
R017	Ring 5	2.400E-01	0.000E+00	---	FRACA(5)
R017	Ring 6	2.000E-01	0.000E+00	---	FRACA(6)
R017	Ring 7	1.600E-01	0.000E+00	---	FRACA(7)
R017	Ring 8	1.400E-01	0.000E+00	---	FRACA(8)
R017	Ring 9	1.200E-01	0.000E+00	---	FRACA(9)
R017	Ring 10	1.100E-01	0.000E+00	---	FRACA(10)
R017	Ring 11	1.000E-01	0.000E+00	---	FRACA(11)
R017	Ring 12	3.700E-02	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	not used	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	not used	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	not used	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI

Summary : Reclaimer Resident - PG in Road Base (Center)
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Site-Specific Parameter Summary (continued)

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

Summary : Reclaimer Resident - PG in Road Base (Center)
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Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	257	---	---	KYMAX

Summary of Pathway Selections

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

Summary : Reclaimer Resident - PG in Road Base (Center)
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Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	100.00 square meters	Bi-210	1.000E+01
Thickness:	0.10 meters	Pb-210	1.000E+01
Cover Depth:	0.20 meters	Po-210	1.000E+01
		Ra-226	1.000E+01
		Rn-222	1.000E+01
		Th-230	1.800E+00
		Th-234	1.100E+00
		U-234	1.200E+00
		U-238	1.100E+00

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

t (years):	0.000E+00	1.000E+00
TDOSE(t):	1.275E+00	1.228E+00
M(t):	5.098E-02	4.913E-02

Maximum TDOSE(t): 1.275E+00 mrem/yr at t = 0.000E+00 years

Summary : Reclaimer Resident - PG in Road Base (Center)
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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-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	1.072E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	3.518E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Po-210	2.293E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	1.239E+00	0.9723	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Rn-222	3.390E-02	0.0266	0.000E+00	0.0000	0.000E+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	4.872E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-234	1.295E-04	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	3.184E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	1.205E-03	0.0009	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.275E+00	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.072E-06	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.518E-05	0.0000
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.293E-06	0.0000
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	1.239E+00	0.9723
Rn-222	0.000E+00	0.0000	0.000E+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-02	0.0266
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	4.872E-05	0.0000
Th-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	1.295E-04	0.0001
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.184E-08	0.0000
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	1.205E-03	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	1.275E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : Reclaimer Resident - PG in Road Base (Center)
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	8.442E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	3.544E-05	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Po-210	2.955E-07	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	1.227E+00	0.9988	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Rn-222	1.347E-08	0.0000	0.000E+00	0.0000	0.000E+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	1.459E-04	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-234	3.549E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	3.104E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	1.277E-03	0.0010	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.228E+00	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Bi-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.442E-09	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.544E-05	0.0000
Po-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.955E-07	0.0000
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	1.227E+00	0.9988
Rn-222	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.347E-08	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	1.459E-04	0.0001
Th-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.549E-09	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.104E-08	0.0000
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	1.277E-03	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	1.228E+00	1.0000

*Sum of all water independent and dependent pathways.

Summary : Reclaimer Resident - PG in Road Base (Center)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RR_RB_CENTER_INDOOR.RAD

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	1.010E-07	1.997E-36
Bi-210	Po-210	1.000E+00	6.207E-09	8.442E-10
Bi-210	∑DSR(j)		1.072E-07	8.442E-10
Pb-210	Pb-210	1.000E+00	8.571E-15	8.126E-15
Pb-210	Bi-210	1.000E+00	3.315E-06	3.216E-06
Pb-210	Po-210	1.000E+00	2.027E-07	3.277E-07
Pb-210	∑DSR(j)		3.518E-06	3.544E-06
Po-210	Po-210	1.000E+00	2.293E-07	2.955E-08
Ra-226	Ra-226	1.000E+00	4.224E-05	4.090E-05
Ra-226	Rn-222+D	1.000E+00	1.239E-01	1.226E-01
Ra-226	Pb-210	1.000E+00	1.051E-16	3.085E-16
Ra-226	Bi-210	1.000E+00	4.032E-08	1.208E-07
Ra-226	Po-210	1.000E+00	1.849E-09	8.893E-09
Ra-226	∑DSR(j)		1.239E-01	1.227E-01
Rn-222+D	Rn-222+D	1.000E+00	3.390E-03	1.017E-38
Rn-222+D	Pb-210	1.000E+00	3.188E-18	3.090E-18
Rn-222+D	Bi-210	1.000E+00	1.256E-09	1.223E-09
Rn-222+D	Po-210	1.000E+00	7.560E-11	1.244E-10
Rn-222+D	∑DSR(j)		3.390E-03	1.347E-09
Th-230	Th-230	1.000E+00	1.503E-07	1.503E-07
Th-230	Ra-226	1.000E+00	9.197E-09	2.720E-08
Th-230	Rn-222+D	1.000E+00	2.691E-05	8.088E-05
Th-230	Pb-210	1.000E+00	1.510E-20	1.053E-19
Th-230	Bi-210	1.000E+00	5.706E-12	4.085E-11
Th-230	Po-210	1.000E+00	2.123E-13	2.439E-12
Th-230	∑DSR(j)		2.707E-05	8.106E-05
Th-234+D	Th-234+D	1.000E+00	1.178E-04	3.226E-09
Th-234+D	U-234	1.000E+00	6.471E-15	6.859E-15
Th-234+D	Th-230	1.000E+00	1.491E-19	4.965E-19
Th-234+D	Ra-226	1.000E+00	5.647E-21	4.488E-20
Th-234+D	Rn-222+D	1.000E+00	1.627E-17	1.323E-16
Th-234+D	Pb-210	1.000E+00	6.384E-33	1.139E-31
Th-234+D	Bi-210	1.000E+00	2.367E-24	4.375E-23
Th-234+D	Po-210	1.000E+00	7.063E-26	2.179E-24
Th-234+D	∑DSR(j)		1.178E-04	3.226E-09

Summary : Reclaimer Resident - PG in Road Base (Center)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RR_RB_CENTER_INDOOR.RAD

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years 0.000E+00	1.000E+00
U-234	U-234	1.000E+00	2.645E-08	2.531E-08
U-234	Th-230	1.000E+00	6.665E-13	1.961E-12
U-234	Ra-226	1.000E+00	2.737E-14	1.874E-13
U-234	Rn-222+D	1.000E+00	7.910E-11	5.532E-10
U-234	Pb-210	1.000E+00	3.342E-26	5.004E-25
U-234	Bi-210	1.000E+00	1.245E-17	1.924E-16
U-234	Po-210	1.000E+00	3.915E-19	9.842E-18
U-234	∑DSR(j)		2.653E-08	2.586E-08
U-238	U-238	5.400E-05	2.454E-19	2.348E-19
U-238	U-238	9.999E-01	4.545E-15	4.348E-15
U-238	Th-234+D	9.999E-01	1.096E-03	1.161E-03
U-238	U-234	9.999E-01	3.088E-14	1.009E-13
U-238	Th-230	9.999E-01	4.781E-19	3.787E-18
U-238	Ra-226	9.999E-01	1.371E-20	2.383E-19
U-238	Rn-222+D	9.999E-01	3.902E-17	6.974E-16
U-238	Pb-210	9.999E-01	1.234E-32	4.674E-31
U-238	Bi-210	9.999E-01	4.507E-24	1.780E-22
U-238	Po-210	9.999E-01	1.168E-25	7.815E-24
U-238	∑DSR(j)		1.096E-03	1.161E-03

The DSR includes contributions from associated (half-life ≤ 1 day) daughters.

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

Nuclide (i)	t= 0.000E+00	1.000E+00
Bi-210	2.331E+08	2.961E+10
Pb-210	7.107E+06	7.054E+06
Po-210	1.091E+08	8.459E+08
Ra-226	2.017E+02	2.038E+02
Rn-222	7.374E+03	1.855E+10
Th-230	9.236E+05	3.084E+05
Th-234	2.123E+05	7.750E+09
U-234	9.422E+08	9.666E+08
U-238	2.282E+04	2.153E+04

Summary : Reclaimer Resident - PG in Road Base (Center)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RR_RB_CENTER_INDOOR.RAD

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

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Bi-210	1.000E+01	0.000E+00	1.072E-07	2.331E+08	1.072E-07	2.331E+08
Pb-210	1.000E+01	0.2600 ± 0.0005	3.611E-06	6.922E+06	3.518E-06	7.107E+06
Po-210	1.000E+01	0.000E+00	2.293E-07	1.091E+08	2.293E-07	1.091E+08
Ra-226	1.000E+01	0.0660 ± 0.0001	1.264E-01	1.979E+02	1.239E-01	2.017E+02
Rn-222	1.000E+01	0.000E+00	3.390E-03	7.374E+03	3.390E-03	7.374E+03
Th-230	1.800E+00	1.000E+00	8.106E-05	3.084E+05	2.707E-05	9.236E+05
Th-234	1.100E+00	0.000E+00	1.178E-04	2.123E+05	1.178E-04	2.123E+05
U-234	1.200E+00	0.000E+00	2.653E-08	9.422E+08	2.653E-08	9.422E+08
U-238	1.100E+00	0.3128 ± 0.0006	1.193E-03	2.096E+04	1.096E-03	2.282E+04

Summary : Reclaimer Resident - PG in Road Base (Center)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RR_RB_CENTER_INDOOR.RAD

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	1.010E-06	0.000E+00
Bi-210	Pb-210	1.000E+00	3.315E-05	3.216E-05
Bi-210	Ra-226	1.000E+00	4.032E-07	1.208E-06
Bi-210	Rn-222	1.000E+00	1.256E-08	1.223E-08
Bi-210	Th-230	1.000E+00	1.027E-11	7.354E-11
Bi-210	Th-234	1.000E+00	2.604E-24	4.813E-23
Bi-210	U-234	1.000E+00	1.494E-17	2.309E-16
Bi-210	U-238	9.999E-01	4.957E-24	1.958E-22
Bi-210	∑DOSE(j)		3.458E-05	3.338E-05
Po-210	Bi-210	1.000E+00	6.207E-08	8.442E-09
Po-210	Pb-210	1.000E+00	2.027E-06	3.277E-06
Po-210	Po-210	1.000E+00	2.293E-06	2.955E-07
Po-210	Ra-226	1.000E+00	1.849E-08	8.893E-08
Po-210	Rn-222	1.000E+00	7.560E-10	1.244E-09
Po-210	Th-230	1.000E+00	3.822E-13	4.390E-12
Po-210	Th-234	1.000E+00	7.769E-26	2.397E-24
Po-210	U-234	1.000E+00	4.698E-19	1.181E-17
Po-210	U-238	9.999E-01	1.285E-25	8.596E-24
Po-210	∑DOSE(j)		4.401E-06	3.672E-06
Pb-210	Pb-210	1.000E+00	8.571E-14	8.126E-14
Pb-210	Ra-226	1.000E+00	1.051E-15	3.085E-15
Pb-210	Rn-222	1.000E+00	3.188E-17	3.090E-17
Pb-210	Th-230	1.000E+00	2.717E-20	1.896E-19
Pb-210	Th-234	1.000E+00	0.000E+00	0.000E+00
Pb-210	U-234	1.000E+00	4.011E-26	6.004E-25
Pb-210	U-238	9.999E-01	0.000E+00	0.000E+00
Pb-210	∑DOSE(j)		8.679E-14	8.438E-14
Ra-226	Ra-226	1.000E+00	4.224E-04	4.090E-04
Ra-226	Th-230	1.000E+00	1.656E-08	4.897E-08
Ra-226	Th-234	1.000E+00	6.212E-21	4.936E-20
Ra-226	U-234	1.000E+00	3.284E-14	2.249E-13
Ra-226	U-238	9.999E-01	1.508E-20	2.621E-19
Ra-226	∑DOSE(j)		4.224E-04	4.091E-04
Rn-222	Ra-226	1.000E+00	1.239E+00	1.226E+00
Rn-222	Rn-222	1.000E+00	3.390E-02	0.000E+00
Rn-222	Th-230	1.000E+00	4.844E-05	1.456E-04
Rn-222	Th-234	1.000E+00	1.790E-17	1.455E-16
Rn-222	U-234	1.000E+00	9.492E-11	6.638E-10
Rn-222	U-238	9.999E-01	4.292E-17	7.672E-16
Rn-222	∑DOSE(j)		1.273E+00	1.226E+00
Th-230	Th-230	1.000E+00	2.705E-07	2.705E-07
Th-230	Th-234	1.000E+00	1.640E-19	5.462E-19
Th-230	U-234	1.000E+00	7.998E-13	2.353E-12
Th-230	U-238	9.999E-01	5.260E-19	4.165E-18
Th-230	∑DOSE(j)		2.705E-07	2.705E-07

Summary : Reclaimer Resident - PG in Road Base (Center)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RR_RB_CENTER_INDOOR.RAD

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00
Th-234	Th-234	1.000E+00	1.295E-04	3.549E-09
Th-234	U-238	9.999E-01	1.205E-03	1.277E-03
Th-234	∑DOSE(j)		1.335E-03	1.277E-03
U-234	Th-234	1.000E+00	7.118E-15	7.544E-15
U-234	U-234	1.000E+00	3.175E-08	3.037E-08
U-234	U-238	9.999E-01	3.397E-14	1.110E-13
U-234	∑DOSE(j)		3.175E-08	3.037E-08
U-238	U-238	5.400E-05	2.700E-19	2.583E-19
U-238	U-238	9.999E-01	5.000E-15	4.783E-15
U-238	∑DOSE(j)		5.000E-15	4.783E-15

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

Summary : Reclaimer Resident - PG in Road Base (Center)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RR_RB_CENTER_INDOOR.RAD

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00
Bi-210	Bi-210	1.000E+00	1.000E+01	1.977E-28
Bi-210	Pb-210	1.000E+00	0.000E+00	7.252E+00
Bi-210	Ra-226	1.000E+00	0.000E+00	1.794E-01
Bi-210	Rn-222	1.000E+00	0.000E+00	2.758E-03
Bi-210	Th-230	1.000E+00	0.000E+00	6.903E-06
Bi-210	Th-234	1.000E+00	0.000E+00	2.518E-18
Bi-210	U-234	1.000E+00	0.000E+00	1.339E-11
Bi-210	U-238	9.999E-01	0.000E+00	5.958E-18
Bi-210	∑S(j):		1.000E+01	7.434E+00
Po-210	Bi-210	1.000E+00	0.000E+00	3.683E-02
Po-210	Pb-210	1.000E+00	0.000E+00	5.717E+00
Po-210	Po-210	1.000E+00	1.000E+01	1.289E+00
Po-210	Ra-226	1.000E+00	0.000E+00	9.171E-02
Po-210	Rn-222	1.000E+00	0.000E+00	2.165E-03
Po-210	Th-230	1.000E+00	0.000E+00	2.674E-06
Po-210	Th-234	1.000E+00	0.000E+00	7.508E-19
Po-210	U-234	1.000E+00	0.000E+00	4.216E-12
Po-210	U-238	9.999E-01	0.000E+00	1.503E-18
Po-210	∑S(j):		1.000E+01	7.137E+00
Pb-210	Pb-210	1.000E+00	1.000E+01	9.481E+00
Pb-210	Ra-226	1.000E+00	0.000E+00	2.383E-01
Pb-210	Rn-222	1.000E+00	0.000E+00	3.605E-03
Pb-210	Th-230	1.000E+00	0.000E+00	9.309E-06
Pb-210	Th-234	1.000E+00	0.000E+00	3.459E-18
Pb-210	U-234	1.000E+00	0.000E+00	1.833E-11
Pb-210	U-238	9.999E-01	0.000E+00	8.314E-18
Pb-210	∑S(j):		1.000E+01	9.723E+00
Ra-226	Ra-226	1.000E+00	1.000E+01	9.684E+00
Ra-226	Th-230	1.000E+00	0.000E+00	7.674E-04
Ra-226	Th-234	1.000E+00	0.000E+00	4.680E-16
Ra-226	U-234	1.000E+00	0.000E+00	2.281E-09
Ra-226	U-238	9.999E-01	0.000E+00	1.505E-15
Ra-226	∑S(j):		1.000E+01	9.685E+00
Rn-222	Ra-226	1.000E+00	0.000E+00	7.842E+00
Rn-222	Rn-222	1.000E+00	1.000E+01	2.999E-35
Rn-222	Th-230	1.000E+00	0.000E+00	6.137E-04
Rn-222	Th-234	1.000E+00	0.000E+00	3.690E-16
Rn-222	U-234	1.000E+00	0.000E+00	1.803E-09
Rn-222	U-238	9.999E-01	0.000E+00	1.172E-15
Rn-222	∑S(j):		1.000E+01	7.843E+00
Th-230	Th-230	1.000E+00	1.800E+00	1.800E+00
Th-230	Th-234	1.000E+00	0.000E+00	2.369E-12
Th-230	U-234	1.000E+00	0.000E+00	1.057E-05
Th-230	U-238	9.999E-01	0.000E+00	1.131E-11
Th-230	∑S(j):		1.800E+00	1.800E+00

Summary : Reclaimer Resident - PG in Road Base (Center)
File : C:\USERS\NEMICKASH\DESKTOP\FERTILIZER INSTITUTE\RESRAD\RR_RB_CENTER_INDOOR.RAD

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00
Th-234	Th-234	1.000E+00	1.100E+00	3.014E-05
Th-234	U-238	9.999E-01	0.000E+00	1.057E+00
Th-234	∑S(j):		1.100E+00	1.057E+00
U-234	Th-234	1.000E+00	0.000E+00	2.852E-07
U-234	U-234	1.000E+00	1.200E+00	1.148E+00
U-234	U-238	9.999E-01	0.000E+00	2.709E-06
U-234	∑S(j):		1.200E+00	1.148E+00
U-238	U-238	5.400E-05	5.940E-05	5.682E-05
U-238	U-238	9.999E-01	1.100E+00	1.052E+00
U-238	∑S(j):		1.100E+00	1.052E+00

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

RESCALC.EXE execution time = 27.94 seconds

APPENDIX D

MicroShield Output

APPENDIX D – MICROSHIELD OUTPUT

The following MicroShield Output files provide detailed documentation of the modelling runs and results shown within the software.

MicroShield Modelling Results

Nearby Resident

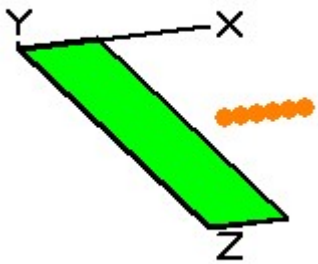
MicroShield 8.03 ARCADIS (8.03-0000)		
Date	**By**	**Checked**

Filename	Run Date	Run Time	Duration
offsite resident no sh dose 125 20 ft step out.msd	October 5, 2019	11:00:28 AM	00:00:12

Project Info	
Case Title	Near Res
Description	Nea Res 10 ft step out
Geometry	13 - Rectangular Volume

Source Dimensions	
Length	1.5e+3 cm (49 ft 2.6 in)
Width	1.0e+4 cm (328 ft 1.0 in)
Height	25.0 cm (9.8 in)

Dose Points			
A	**X**	**Y**	**Z**
#1	2.1e+3 cm (69 ft 2.7 in)	125.0 cm (4 ft 1.2 in)	5.0e+3 cm (164 ft 0.5 in)
#2	2.4e+3 cm (79 ft 10.8 in)	125.0 cm (4 ft 1.2 in)	5.0e+3 cm (164 ft 0.5 in)
#3	2.7e+3 cm (89 ft 10.8 in)	125.0 cm (4 ft 1.2 in)	5.0e+3 cm (164 ft 0.5 in)
#4	3.0e+3 cm (99 ft 10.8 in)	125.0 cm (4 ft 1.2 in)	5.0e+3 cm (164 ft 0.5 in)
#5	3.3e+3 cm (109 ft 10.8 in)	125.0 cm (4 ft 1.2 in)	5.0e+3 cm (164 ft 0.5 in)
#6	3.7e+3 cm (119 ft 10.8 in)	125.0 cm (4 ft 1.2 in)	5.0e+3 cm (164 ft 0.5 in)



Shields			
Shield N	**Dimension**	**Material**	**Density**
Source	1.32e+04 ft³	Concrete	2.25
Air Gap		Air	0.00122
Immersion		Air	0.00122

Source Input: Grouping Method - Standard Indices Number of Groups: 25 Lower Energy Cutoff: 0.015 Photons < 0.015: Included Library: Grove				
Nuclide	**Ci**	**Bq**	**µCi/cm³**	**Bq/cm³**
Bi-210	1.1102e-002	4.1079e+008	2.9606e-005	1.0954e+000
Bi-214	1.0950e-002	4.0516e+008	2.9200e-005	1.0804e+000
Pb-210	1.1102e-002	4.1079e+008	2.9606e-005	1.0954e+000

Pb-214	1.0950e-002	4.0516e+008	2.9200e-005	1.0804e+000
Po-210	1.1105e-002	4.1089e+008	2.9613e-005	1.0957e+000
Po-214	1.0948e-002	4.0507e+008	2.9194e-005	1.0802e+000
Po-218	1.0952e-002	4.0524e+008	2.9206e-005	1.0806e+000
Ra-226	1.0952e-002	4.0523e+008	2.9206e-005	1.0806e+000
Rn-222	1.0952e-002	4.0524e+008	2.9206e-005	1.0806e+000

Buildup: The material reference is Source Integration Parameters	
X Direction	20
Y Direction	40
Z Direction	40

Results - Dose Point # 1 - (6.92e+01,4.10e+00,1.64e+02) ft					
Energy (MeV)	**Activity (Photons/sec)**	**Fluence Rate MeV/cm²/sec No Buildup**	**Fluence Rate MeV/cm²/sec With Buildup**	**Exposure Rate mR/hr No Buildup**	**Exposure Rate mR/hr With Buildup**
0.015	1.600e+08	1.859e-07	1.963e-07	1.595e-08	1.684e-08
0.05	2.112e+07	4.531e-05	8.584e-05	1.207e-07	2.287e-07
0.08	9.341e+07	6.902e-04	2.207e-03	1.092e-06	3.492e-06
0.1	5.500e+05	6.289e-06	2.295e-05	9.621e-09	3.511e-08
0.2	4.364e+07	1.506e-03	5.649e-03	2.658e-06	9.970e-06
0.3	8.361e+07	5.283e-03	1.775e-02	1.002e-05	3.367e-05
0.4	1.550e+08	1.507e-02	4.597e-02	2.937e-05	8.957e-05
0.5	7.238e+06	9.852e-04	2.783e-03	1.934e-06	5.463e-06
0.6	1.953e+08	3.507e-02	9.276e-02	6.845e-05	1.811e-04
0.8	3.829e+07	1.068e-02	2.565e-02	2.031e-05	4.878e-05
1.0	1.269e+08	4.997e-02	1.120e-01	9.210e-05	2.065e-04
1.5	7.713e+07	5.726e-02	1.144e-01	9.633e-05	1.924e-04
2.0	1.084e+08	1.260e-01	2.356e-01	1.949e-04	3.643e-04
Totals	**1.111e+09**	**3.026e-01**	**6.548e-01**	**5.173e-04**	**1.135e-03**

Results - Dose Point # 2 - (79.9,4.10e+00,1.64e+02) ft					
Energy (MeV)	**Activity (Photons/sec)**	**Fluence Rate MeV/cm²/sec No Buildup**	**Fluence Rate MeV/cm²/sec With Buildup**	**Exposure Rate mR/hr No Buildup**	**Exposure Rate mR/hr With Buildup**
0.015	1.600e+08	1.672e-08	1.781e-08	1.434e-09	1.528e-09
0.05	2.112e+07	2.288e-05	4.501e-05	6.094e-08	1.199e-07
0.08	9.341e+07	3.636e-04	1.228e-03	5.754e-07	1.943e-06
0.1	5.500e+05	3.352e-06	1.295e-05	5.128e-09	1.982e-08
0.2	4.364e+07	8.221e-04	3.240e-03	1.451e-06	5.718e-06
0.3	8.361e+07	2.917e-03	1.021e-02	5.533e-06	1.937e-05
0.4	1.550e+08	8.382e-03	2.648e-02	1.633e-05	5.159e-05
0.5	7.238e+06	5.509e-04	1.605e-03	1.081e-06	3.149e-06
0.6	1.953e+08	1.969e-02	5.351e-02	3.843e-05	1.045e-04
0.8	3.829e+07	6.031e-03	1.481e-02	1.147e-05	2.818e-05
1.0	1.269e+08	2.834e-02	6.476e-02	5.225e-05	1.194e-04

1.5	7.713e+07	3.271e-02	6.626e-02	5.503e-05	1.115e-04
2.0	1.084e+08	7.231e-02	1.367e-01	1.118e-04	2.114e-04
Totals	**1.111e+09**	**1.721e-01**	**3.789e-01**	**2.940e-04**	**6.569e-04**

Results - Dose Point # 3 - (89.9,4.10e+00,1.64e+02) ft					
Energy (MeV)	**Activity (Photons/sec)**	**Fluence Rate MeV/cm²/sec No Buildup**	**Fluence Rate MeV/cm²/sec With Buildup**	**Exposure Rate mR/hr No Buildup**	**Exposure Rate mR/hr With Buildup**
0.015	1.600e+08	1.970e-09	2.113e-09	1.689e-10	1.813e-10
0.05	2.112e+07	1.384e-05	2.803e-05	3.686e-08	7.468e-08
0.08	9.341e+07	2.280e-04	8.056e-04	3.609e-07	1.275e-06
0.1	5.500e+05	2.124e-06	8.601e-06	3.249e-09	1.316e-08
0.2	4.364e+07	5.315e-04	2.182e-03	9.381e-07	3.852e-06
0.3	8.361e+07	1.904e-03	6.896e-03	3.612e-06	1.308e-05
0.4	1.550e+08	5.506e-03	1.791e-02	1.073e-05	3.489e-05
0.5	7.238e+06	3.635e-04	1.086e-03	7.135e-07	2.131e-06
0.6	1.953e+08	1.304e-02	3.623e-02	2.545e-05	7.071e-05
0.8	3.829e+07	4.014e-03	1.004e-02	7.634e-06	1.909e-05
1.0	1.269e+08	1.893e-02	4.390e-02	3.489e-05	8.093e-05
1.5	7.713e+07	2.196e-02	4.498e-02	3.695e-05	7.568e-05
2.0	1.084e+08	4.871e-02	9.292e-02	7.533e-05	1.437e-04
Totals	**1.111e+09**	**1.152e-01**	**2.570e-01**	**1.966e-04**	**4.454e-04**

Results - Dose Point # 4 - (99.9,4.10e+00,1.64e+02) ft					
Energy (MeV)	**Activity (Photons/sec)**	**Fluence Rate MeV/cm²/sec No Buildup**	**Fluence Rate MeV/cm²/sec With Buildup**	**Exposure Rate mR/hr No Buildup**	**Exposure Rate mR/hr With Buildup**
0.015	1.600e+08	2.484e-10	2.686e-10	2.131e-11	2.304e-11
0.05	2.112e+07	9.036e-06	1.881e-05	2.407e-08	5.010e-08
0.08	9.341e+07	1.542e-04	5.668e-04	2.440e-07	8.969e-07
0.1	5.500e+05	1.450e-06	6.126e-06	2.218e-09	9.372e-09
0.2	4.364e+07	3.698e-04	1.577e-03	6.527e-07	2.783e-06
0.3	8.361e+07	1.337e-03	4.994e-03	2.536e-06	9.474e-06
0.4	1.550e+08	3.888e-03	1.298e-02	7.575e-06	2.529e-05
0.5	7.238e+06	2.578e-04	7.874e-04	5.060e-07	1.546e-06
0.6	1.953e+08	9.274e-03	2.628e-02	1.810e-05	5.130e-05
0.8	3.829e+07	2.868e-03	7.287e-03	5.455e-06	1.386e-05
1.0	1.269e+08	1.357e-02	3.189e-02	2.501e-05	5.879e-05
1.5	7.713e+07	1.582e-02	3.272e-02	2.662e-05	5.505e-05
2.0	1.084e+08	3.520e-02	6.765e-02	5.443e-05	1.046e-04
Totals	**1.111e+09**	**8.274e-02**	**1.868e-01**	**1.411e-04**	**3.237e-04**

Results - Dose Point # 5 - (109.9,4.10e+00,1.64e+02) ft					
Energy (MeV)	**Activity (Photons/sec)**	**Fluence Rate MeV/cm²/sec No Buildup**	**Fluence Rate MeV/cm²/sec With Buildup**	**Exposure Rate mR/hr No Buildup**	**Exposure Rate mR/hr With Buildup**
0.015	1.600e+08	3.281e-11	3.567e-11	2.814e-12	3.060e-12

0.05	2.112e+07	6.211e-06	1.326e-05	1.655e-08	3.533e-08
0.08	9.341e+07	1.097e-04	4.178e-04	1.735e-07	6.611e-07
0.1	5.500e+05	1.040e-06	4.569e-06	1.591e-09	6.990e-09
0.2	4.364e+07	2.702e-04	1.192e-03	4.768e-07	2.104e-06
0.3	8.361e+07	9.849e-04	3.786e-03	1.868e-06	7.182e-06
0.4	1.550e+08	2.880e-03	9.848e-03	5.612e-06	1.919e-05
0.5	7.238e+06	1.917e-04	5.977e-04	3.763e-07	1.173e-06
0.6	1.953e+08	6.916e-03	1.996e-02	1.350e-05	3.896e-05
0.8	3.829e+07	2.148e-03	5.537e-03	4.085e-06	1.053e-05
1.0	1.269e+08	1.019e-02	2.425e-02	1.878e-05	4.470e-05
1.5	7.713e+07	1.194e-02	2.491e-02	2.008e-05	4.191e-05
2.0	1.084e+08	2.663e-02	5.156e-02	4.118e-05	7.972e-05
Totals	**1.111e+09**	**6.226e-02**	**1.421e-01**	**1.062e-04**	**2.462e-04**

Results - Dose Point # 6 - (119.9,4.10e+00,1.64e+02) ft					
Energy (MeV)	**Activity (Photons/sec)**	**Fluence Rate MeV/cm²/sec No Buildup**	**Fluence Rate MeV/cm²/sec With Buildup**	**Exposure Rate mR/hr No Buildup**	**Exposure Rate mR/hr With Buildup**
0.015	1.600e+08	4.477e-12	4.878e-12	3.840e-13	4.184e-13
0.05	2.112e+07	4.431e-06	9.697e-06	1.180e-08	2.583e-08
0.08	9.341e+07	8.090e-05	3.188e-04	1.280e-07	5.045e-07
0.1	5.500e+05	7.741e-07	3.523e-06	1.184e-09	5.390e-09
0.2	4.364e+07	2.045e-04	9.315e-04	3.610e-07	1.644e-06
0.3	8.361e+07	7.515e-04	2.965e-03	1.425e-06	5.624e-06
0.4	1.550e+08	2.209e-03	7.718e-03	4.303e-06	1.504e-05
0.5	7.238e+06	1.475e-04	4.686e-04	2.896e-07	9.199e-07
0.6	1.953e+08	5.337e-03	1.566e-02	1.042e-05	3.056e-05
0.8	3.829e+07	1.664e-03	4.345e-03	3.164e-06	8.265e-06
1.0	1.269e+08	7.914e-03	1.904e-02	1.459e-05	3.510e-05
1.5	7.713e+07	9.310e-03	1.959e-02	1.566e-05	3.296e-05
2.0	1.084e+08	2.082e-02	4.058e-02	3.220e-05	6.276e-05
Totals	**1.111e+09**	**4.844e-02**	**1.116e-01**	**8.255e-05**	**1.934e-04**

MicroShield Modelling Results

Truck Driver

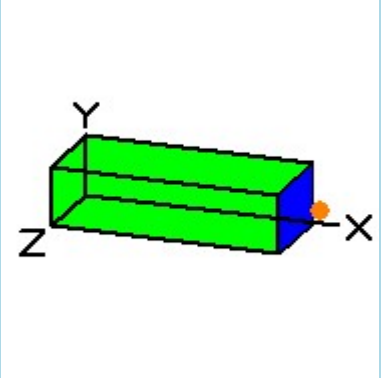
MicroShield 8.03
ARCADIS (8.03-0000)

Date	By	Checked

Filename	Run Date	Run Time	Duration
trucker.msd	June 13, 2019	2:53:24 PM	00:00:02

Project Info	
Case Title	Trucker Shield
Description	Trucker isotopes
Geometry	13 - Rectangular Volume

Source Dimensions	
Length	518.16 cm (17 ft)
Width	213.36 cm (7 ft 0.0 in)
Height	137.16 cm (4 ft 6.0 in)



Dose Points			
A	**X**	**Y**	**Z**
#1	579.12 cm (19 ft)	68.58 cm (2 ft 3.0 in)	106.68 cm (3 ft 6.0 in)

Shields			
Shield N	**Dimension**	**Material**	**Density**
Source	1.52e+07 cm³	Phosphogypsum	1.12
Shield 1	1.0 cm	Iron	1
Air Gap		Air	0.00122

Source Input: Grouping Method - Standard Indices
Number of Groups: 25
Lower Energy Cutoff: 0.015
Photons < 0.015: Included
Library: Grove

Nuclide	Ci	Bq	µCi/cm³	Bq/cm³
Bi-210	4.6308e-004	1.7134e+007	3.0539e-005	1.1299e+000
Bi-214	4.5673e-004	1.6899e+007	3.0120e-005	1.1144e+000
Pb-210	4.6308e-004	1.7134e+007	3.0539e-005	1.1299e+000
Pb-214	4.5673e-004	1.6899e+007	3.0120e-005	1.1144e+000
Po-210	4.6319e-004	1.7138e+007	3.0546e-005	1.1302e+000
Po-214	4.5664e-004	1.6896e+007	3.0114e-005	1.1142e+000
Po-218	4.5682e-004	1.6902e+007	3.0126e-005	1.1147e+000
Ra-226	4.5682e-004	1.6902e+007	3.0126e-005	1.1147e+000
Rn-222	4.5682e-004	1.6902e+007	3.0126e-005	1.1147e+000

Buildup: The material reference is Source
Integration Parameters

X Direction	30
Y Direction	40

Z Direction	40

Results					
Energy (MeV)	**Activity (Photons/sec)**	**Fluence Rate MeV/cm²/sec No Buildup**	**Fluence Rate MeV/cm²/sec With Buildup**	**Exposure Rate mR/hr No Buildup**	**Exposure Rate mR/hr With Buildup**
0.015	6.674e+06	1.465e-32	1.756e-27	1.256e-33	1.507e-28
0.05	8.807e+05	1.356e-04	6.019e-04	3.612e-07	1.603e-06
0.08	3.896e+06	9.139e-03	4.703e-02	1.446e-05	7.443e-05
0.1	2.294e+04	1.037e-04	5.040e-04	1.587e-07	7.710e-07
0.2	1.820e+06	2.914e-02	1.090e-01	5.143e-05	1.923e-04
0.3	3.487e+06	1.010e-01	3.231e-01	1.917e-04	6.128e-04
0.4	6.467e+06	2.835e-01	8.134e-01	5.523e-04	1.585e-03
0.5	3.019e+05	1.825e-02	4.822e-02	3.582e-05	9.465e-05
0.6	8.148e+06	6.413e-01	1.587e+00	1.252e-03	3.098e-03
0.8	1.597e+06	1.912e-01	4.293e-01	3.638e-04	8.165e-04
1.0	5.291e+06	8.801e-01	1.842e+00	1.622e-03	3.394e-03
1.5	3.217e+06	9.767e-01	1.819e+00	1.643e-03	3.060e-03
2.0	4.522e+06	2.098e+00	3.649e+00	3.244e-03	5.643e-03
Totals	**4.633e+07**	**5.228e+00**	**1.067e+01**	**8.971e-03**	**1.857e-02**

MicroShield Modelling Results

Utility Worker

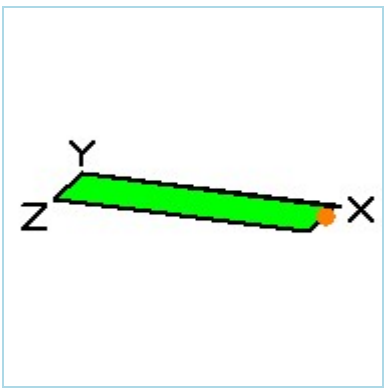
MicroShield 8.03
ARCADIS (8.03-0000)

Date	By	Checked

Filename	Run Date	Run Time	Duration
Case2	May 16, 2019	10:26:48 AM	00:00:01

Project Info	
Case Title	Case 2
Description	Case 2
Geometry	13 - Rectangular Volume

Source Dimensions	
Length	5.0e+3 cm (164 ft 0.5 in)
Width	1.5e+3 cm (49 ft 2.6 in)
Height	25.0 cm (9.8 in)



Dose Points			
A	**X**	**Y**	**Z**
#1	5.1e+3 cm (167 ft 3.9 in)	25.0 cm (9.8 in)	750.0 cm (24 ft 7.3 in)

Shields			
Shield N	**Dimension**	**Material**	**Density**
Source	187.5 m³	Concrete	2.25
Air Gap		Air	0.00122

Source Input: Grouping Method - Standard Indices
Number of Groups: 25
Lower Energy Cutoff: 0.015
Photons < 0.015: Included
Library: Grove

Nuclide	Ci	Bq	µCi/cm³	Bq/cm³
Bi-210	5.7634e-003	2.1324e+008	3.0738e-005	1.1373e+000
Bi-214	5.6843e-003	2.1032e+008	3.0316e-005	1.1217e+000
Pb-210	5.7633e-003	2.1324e+008	3.0738e-005	1.1373e+000
Pb-214	5.6843e-003	2.1032e+008	3.0316e-005	1.1217e+000
Po-210	5.7647e-003	2.1329e+008	3.0745e-005	1.1376e+000
Po-214	5.6831e-003	2.1028e+008	3.0310e-005	1.1215e+000
Po-218	5.6855e-003	2.1036e+008	3.0322e-005	1.1219e+000
Ra-226	5.6854e-003	2.1036e+008	3.0322e-005	1.1219e+000
Rn-222	5.6855e-003	2.1036e+008	3.0322e-005	1.1219e+000

Buildup: The material reference is Air Gap
Integration Parameters

X Direction	30
Y Direction	30
Z Direction	20

Results					
Energy (MeV)	**Activity (Photons/sec)**	**Fluence Rate MeV/cm²/sec No Buildup**	**Fluence Rate MeV/cm²/sec With Buildup**	**Exposure Rate mR/hr No Buildup**	**Exposure Rate mR/hr With Buildup**
0.015	8.306e+07	1.233e-65	1.355e-27	1.058e-66	1.162e-28
0.05	1.096e+07	1.523e-06	6.656e-05	4.056e-09	1.773e-07
0.08	4.849e+07	2.526e-04	9.497e-03	3.998e-07	1.503e-05
0.1	2.855e+05	3.355e-06	9.744e-05	5.133e-09	1.491e-07
0.2	2.266e+07	1.330e-03	1.592e-02	2.347e-06	2.810e-05
0.3	4.340e+07	5.516e-03	4.181e-02	1.046e-05	7.932e-05
0.4	8.048e+07	1.737e-02	9.876e-02	3.385e-05	1.924e-04
0.5	3.757e+06	1.215e-03	5.650e-03	2.384e-06	1.109e-05
0.6	1.014e+08	4.537e-02	1.816e-01	8.856e-05	3.544e-04
0.8	1.988e+07	1.474e-02	4.763e-02	2.804e-05	9.059e-05
1.0	6.585e+07	7.183e-02	2.017e-01	1.324e-04	3.718e-04
1.5	4.004e+07	8.670e-02	1.963e-01	1.459e-04	3.303e-04
2.0	5.629e+07	1.949e-01	3.929e-01	3.013e-04	6.076e-04
Totals	**5.765e+08**	**4.392e-01**	**1.192e+00**	**7.456e-04**	**2.081e-03**

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