



Department of Energy
Washington, DC 20585

February 13, 2017

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Deputy Director
Mail Stop T8-F5
Washington, DC 20555-0001

Subject: U.S. Department of Energy Office of Legacy Management Response to U.S. Nuclear
Regulatory Commission's January 12, 2017 Request for Additional Information

To Whom It May Concern:

In reference to the U.S. Nuclear Regulatory Commission's (NRC) email transmitted
January 12, 2017, concerning the subject "Follow up to call on January 11, 2017, regarding
Durango Evaporation Pond removal project," the U.S. Department of Energy Office of Legacy
Management (DOE-LM) is providing the following information in response to NRC's request.

Please contact me at (970) 248-6016 if you have any questions. Please address any correspondence
to:

U.S. Department of Energy
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Sincerely,

Jalena Dayvault
Site Manager

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NM5520

**APPLICATION OF US NUCLEAR REGULATORY COMMISSION
RADIUM BENCHMARK DOSE APPROACH FOR THE REMOVAL
OF THE DURANGO EVAPORATION POND - Revision 1**

**Prepared for Navarro Research and Engineering
Grand Junction, Colorado
February 3, 2017**

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APPLICATION OF US NUCLEAR REGULATORY COMMISSION RADIUM BENCHMARK DOSE APPROACH FOR THE REMOVAL OF THE DURANGO EVAPORATION POND

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EXECUTIVE SUMMARY

DOE is planning to remove the evaporation pond at the Durango, CO Title I disposal site and has proposed applying the 5 and 15 pCi/g cleanup criteria for ^{226}Ra per US Nuclear Regulatory Commission regulations in 10 CFR 40. The NRC has requested that DOE follow NRC's guidance for radionuclides other than radium in soil (using the unity rule as presented in the Radium Benchmark Dose approach {RBD}) for determining cleanup criteria for other radionuclides in soils beneath the evaporation pond. The RBD approach is described in Appendix H of NUREG 1620, *Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act of 1978*. For sites at which the radiological contaminants of concern are due to naturally occurring radionuclides of the Uranium series, the additional radionuclides typically evaluated by the NRC's RBD approach are Natural uranium and ^{230}Th , which are the focus of this analysis.

The language in 10 CFR Part 40, Appendix A, Criterion 6(6) invokes the requirement to reduce residual radioactivity in soil (and buildings) to levels based on the potential dose that would result from the radium standard (5/15 pCi/g above background in surface/subsurface soil) at the site, i.e., the RBD approach. Because this site will be covered with material that will be maintained, the 15 pCi/g subsurface scenario was applied to the calculations.

The RBD has been required by NRC of their uranium recovery facility licensees (and license applicants) in establishing decommissioning criteria at sites where soil has been potentially contaminated with natural uranium and / or uranium byproduct material (e.g. ^{226}Ra) above background. Demonstration of compliance with this approach is a criteria NRC uses for license termination and release of the site for unrestricted use. The environmental transport and dose assessment modeling that is typically used with the RBD approach is the RESRAD family of computer codes developed by the Argonne National Laboratory which was used in this analysis.

The area to be remediated is within DOE controlled property under institutional control for the foreseeable future and will not be released for public access. The area will be backfilled and covered with 5.6 - 8.8 feet of clay, silt, sand, and gravel. The most likely future exposure to humans will be to DOE workers conducting annual inspections. Accordingly, the "exposure pathways" that need to be considered that can contribute dose to this receptor are limited, since any extended public occupancy / residency of the site is not credible.

The exposure scenario considered here involves a DOE and/or DOE contractor employee performing an annual inspection of the site during which the onsite exposure time would be a few hours (maximum of one work day of 8 hours was used). In this general case scenario, it was assumed that the contaminated zone is initially 15 pCi/g ^{226}Ra with no mobilization of radium out of this contaminated area (no migration over entire time period of interest). It was also assumed that the only credible exposure pathways are inhalation of re-suspended soil and radon / progeny, incidental soil ingestion, and external gamma exposure. Since there is no residency, or any form of extended occupancy associated with this exposure scenario, traditional exposure



pathways involving ingestion of locally obtained foodstuffs or water are not considered relevant. Accordingly, it was assumed that the inspector is on site "exposed" for one 8 hour day per year.

The general approach to establishing decommissioning criteria using the concept of the RBD to apply the unity rule for clean-up criteria is a multiple step process and was executed for this report as follows:

- 1) Determine the Radium Standard Doses: RESRAD was applied to the site exposure scenario to estimate the dose that would result from the ^{226}Ra reclamation criteria above background i.e., 5 pCi/g ^{226}Ra in surface soil (top 15 cm but not applicable for this case) and 15 pCi/g ^{226}Ra in subsurface soil (15 cm layer with 15 cm clean soil cover). This defines the "Radium Benchmark Dose".
- 2) Calculation of Dose from natural uranium (or ^{230}Th) in Soil: An arbitrary soil concentration (e.g., 100 pCi/g) was entered into the RESRAD model to compute a dose as a result of this arithmetically convenient default level of natural uranium or ^{230}Th . Note that RESRAD includes the uranium series progeny decay chain in its dose assessment.
- 3) Scaling of the RBD to Uranium or ^{230}Th Concentrations: The dose resultant from 100 pCi/g natural uranium or ^{230}Th in soil was then scaled to the RBD to determine the concentration of uranium or ^{230}Th in soil that will result in achieving the RBD, i.e., the same dose as that from 15 pCi per gram ^{226}Ra in 15 cm horizons of soil covered by 15 cm of clean cover.
- 4) Applying the Unity Rule to Measured Soil Concentrations: As the total dose should not exceed the RBD for the soil concentration of ^{226}Ra plus natural uranium plus ^{230}Th , the measured soil concentrations of each would need to be considered. The resultant dose from the combination of all three nuclides in soil will need to be determined and compared to the RBD.

The results of this analysis are as follows:

1. The Total Effective Dose Equivalent (TEDE) the inspector receives from 15 pCi/g ^{226}Ra in 15 cm soil horizon under 15 cm of clean fill = 20.6 mrem. This is the "Radium Benchmark Dose".
2. The equivalent natural uranium concentration, i.e., the concentration of uranium in the 15 cm soil horizon under 15 cm of clean fill that results in the "Radium Benchmark Dose" (i.e., same dose as from the 15 pCi / g ^{226}Ra) = 2395 pCi/g and similarly the ^{230}Th equivalent concentration = 42.9 pCi/g.



3. The Radium Benchmark dose for this site represents an annual dose of $1.9\text{E-}02$ mrem to a site inspector, standing on the remediated pond area for 8 hours per year.

1.0 INTRODUCTION AND BACKGROUND

DOE is planning to remove the evaporation pond at the Durango, CO Title I disposal site and has proposed applying the 15 pCi/g cleanup criteria for subsurface ^{226}Ra per US Nuclear Regulatory Commission regulations in 10 CFR 40 (US NRC 1992). The NRC has requested that DOE follow NRC's guidance for radionuclides other than radium in soil (Radium Benchmark Dose approach - RBD) in determining cleanup criteria for other radionuclides in soils beneath the evaporation pond (The RBD approach is described in US NRC 2003). For sites at which the radiological contaminants of concern are due to naturally occurring radionuclides of the uranium series, the additional radionuclides typically evaluated by the NRC's RBD approach are natural uranium and ^{230}Th , which are the focus of this analysis.

2.0 OBJECTIVE - SCOPE OF WORK

This technical report describes the methods developed and results for proposed, concentration based, soil cleanup criteria for radionuclides other than radium, based on NRC guidance developed for UMTRCA Title II sites (RBD approach). Included in this paper are the assumptions and dose modeling input parameters that were used in developing the cleanup criteria. It is understood that the area to be remediated is within DOE controlled property under institutional control for the foreseeable future and will not be released for public access. The area will be backfilled and covered with 5.6 - 8.8 ft. (1.7-2.7 m) of soil composed of a mixture of silt, sand, clay, and gravel following remediation. The most likely future exposure to humans will be to DOE workers conducting annual inspections. Accordingly, the exposure pathways that can contribute dose to this receptor are limited, since any extended public occupancy / residency of the site is not credible. The pathway analysis applied to this scenario is discussed in Section 4.0.

The RBD has been required by NRC of their uranium recovery facility licensees (and license applicants) in establishing decommissioning criteria at sites where soil has been potentially contaminated with natural and / or uranium byproduct material (e.g. ^{226}Ra) above background. Demonstration of compliance with this approach is a criteria NRC uses for license termination and release of the site for unrestricted use. The environmental transport and dose assessment modeling that is typically used with the RBD approach is the RESRAD family of computer codes developed by the Argonne National Laboratory. The major features and attributes of the RBD approach and the RESRAD model as applied in this analysis are described in Section 3.0 immediately following.



3.0 DESCRIPTION OF THE RADIUM BENCHMARK DOSE (RBD) APPROACH AND THE RESRAD COMPUTER CODE

The RBD approach was developed as a means of establishing soil clean up criteria at uranium recovery sites. The requirements are referenced in USNRC 1992 (10 CFR Part 40 - Domestic Licensing of Source Material), which encompasses federal regulations and authority over the licensing, operation, and reclamation of uranium recovery sites, including conventional uranium mills, in-situ recovery facilities, heap leach facilities and ion-exchange facilities used for recovery of uranium and / or radium. The regulations include a reclamation criteria for ^{226}Ra above background of 5 pCi/g in the first 15 cm of surface soil and 15 pCi/g in 15 cm thick layers of soil more than 15 cm below the surface ⁽¹⁾. The final rulemaking (effective June, 1999), titled "Radiological Criteria for License Termination of Uranium Recovery Facilities", includes the addition of the following paragraph to 10 CFR 40 Appendix A Criterion 6(6) in reference to the Radium Benchmark Dose (see 64 FR 17506):

Byproduct material containing concentrations of radionuclides other than radium in soil, and surface activity on remaining structures, must not result in a total effective dose equivalent exceeding the dose from cleanup of radium contaminated soil to the above standard (benchmark dose) [5/15 pCi/g Ra-226 standard], and must be at levels which are as low as is reasonable achievable. If more than one residual radionuclide is present in the same 100-square meter area, the sum of the ratios for each radionuclide, of concentration present to the concentration limit, will not exceed 1 (unity). A calculation of the peak potential annual total effective dose equivalent within 1,000 years to the average member of the critical group that would result from applying the radium standard (not including radon) on the site, must be submitted for approval. The use of decommissioning plans with benchmark doses that exceed 100 mrem/yr, before application of as low as is reasonably achievable, requires the approval of the Commission after consideration of the recommendation of the staff ⁽²⁾.

The language in 10 CFR Part 40, Appendix A, Criterion 6(6) invokes the requirement to reduce residual radioactivity in soil (and buildings) to levels based on the potential dose that would result from the radium standard (5/15 pCi/g above background in surface/subsurface soil) at the site. This is termed the Radium Benchmark Dose Approach.

⁽¹⁾ Note that US EPA 1983 (40 CFR 192) also establishes the 5 / 15 pCi gram ^{226}Ra criteria in surface / subsurface soil as a residual criteria for inactive uranium processing sites.

⁽²⁾ The 100 mrem annual public exposure criteria was superseded by an annual public exposure criteria of 25 mrem Total Effective Dose Equivalent for decommissioning and license termination in USNRC 1997 and USNRC 2006



Argonne National Laboratories developed the RESRAD family of codes for the modeling of dose as a result of residual radioactivity. The approach defined in this report utilizes the main RESRAD code, Version 7.2 (2016 – see ANL 2001). RESRAD is used by the Department of Energy (DOE), Environmental Protection Agency (EPA), Army Corps of Engineers and Nuclear Regulatory Commission (NRC) for various applications involving the assessment of dose from residual radioactivity. Default dose conversion factors in the RESRAD code are derived from the US EPA's Federal Guidance Report (FGR) Number 11 (EPA 1988). The RESRAD code calculates effective dose equivalents from external radiation (e.g., ground and plume shine) and committed effective dose equivalents (CEDE) from internal exposures (e.g., via inhalation, food and water ingestion) providing a total effective dose equivalent (TEDE). In July, 2016, the release of RESRAD-ONSITE version 7.2 provided support for use of the ICRP 107 radionuclide decay database, paired with support for ICRP 60/72 based dose coefficients. This is the current default dose conversion factor library used by RESRAD 7.2 and thus the more modern dose coefficient library, DCFPAK 3.02 was used in this analysis.

The RESRAD code is accepted by the US NRC for application of the RBD approach as described in *Guidance to the US Nuclear Regulatory Commission Staff on the Radium Benchmark Dose Approach*, a document included in NUREG 1620⁽³⁾ as Appendix H (NRC 2003a) This Appendix was provided as an Acceptance Criteria document for NRC staff approval of the development of decommissioning criteria for license termination at uranium recovery facilities and at UMTRA uranium mill tailings sites. Appendix H of NUREG 1620 was applied to the approach described in this report

The general approach to establishing decommissioning criteria using the concept of a RBD is a multiple step process and was executed for this report as follows:

- 1) Determine the Radium Standard Doses: RESRAD was applied to the site exposure scenario to estimate the dose that would result from the ²²⁶Ra reclamation criteria above background i.e., 5 pCi/g ²²⁶Ra in surface soil (top 15 cm but not applicable for this case) and 15 pCi/g ²²⁶Ra in subsurface soil (15 cm layer with 15 cm clean soil cover). This is referred to as the "Radium Benchmark Dose".
- 2) Calculation of Dose from uranium (or ²³Th) in Soil: An arbitrary soil concentration (e.g., 100 pCi/g) was entered into the RESRAD model to compute a dose as a result of this arithmetically convenient default level of uranium or ²³⁰Th. Note that RESRAD includes the Uranium series progeny decay chain in its dose assessment.

⁽³⁾ The RBD approach is also described in NUREG 1569 (NRC 2003b), Appendix E, which is identical to Appendix H of NUREG 1620



- 3) Scaling of the RBD to uranium or ^{230}Th Concentrations: The dose resultant from 100 pCi/g uranium or ^{230}Th in soil was then scaled to the RBD to determine the concentration of uranium or ^{230}Th in soil that will result in achieving the RBD, i.e., the same dose as that from 15 pCi per gram ^{226}Ra in 15 cm horizons of soil covered by 15 cm of a clean soil cover.
- 4) Applying the Unity Rule to Current Soil Concentrations: As the total dose should not exceed the RBD, the individual soil concentrations associated with ^{226}Ra , natural uranium, and ^{230}Th would need to be considered. The resultant dose from the combination of all three nuclides in soil will need to be determined and compared to the RBD.

The application of each of these RBD process steps to the Durango evaporation pond closure and removal are presented in the remainder of this paper.

4.0 INPUTS TO THE RESRAD MODEL

The exposure scenario considered here involves a DOE and/or DOE contractor employee performing an annual inspection of the site during which the onsite exposure time would be a few hours (maximum of one work day of 8 hours is used). In this general case scenario, it was assumed that the contaminated zone is initially set at 15 pCi/g ^{226}Ra with no mobilization of radium out of this contaminated area (no migration over entire time period of interest). However, the ^{226}Ra concentration was allowed to increase as a function of time due to ingrowth from ^{230}Th (See Section 7.0). It was also assumed that the only credible exposure pathways are inhalation of re-suspended soil and radon / progeny, incidental soil ingestion and external gamma exposure. Since there is no residency, or any form of extended occupancy associated with this scenario, traditional exposure pathways involving ingestion of locally obtained foodstuffs or water are not considered relevant. Table 1 presents the parameters that were altered from default values; all other values can be assumed to be the default values used by RESRAD Version 7.2 for these pathways of interest.

In an attempt to model a scenario where the nuclides are immobile in the environment to represent the maximum possible dose considering ingrowth (from ^{230}Th) over the 1000 year period recommended in the RBD guidance, transport factors were reduced as much as possible to minimize mobility. This included changing the Contaminated Zone Hydraulic Conductivity to the minimum possible value, as well as changing all distribution coefficients in the source transport menu to the highest possible value, which mathematically should minimize movement of nuclides in the soil to the extent possible in RESRAD.

The RESRAD model included input of site specific values for the area of the contaminated zone per the engineering design criteria. Also included were site specific values for local meteorology (annual precipitation and wind speed) based on average values reported from the Durango Weather Station. The model considered a 1000 year period of time per USNRC guidance on the



RBD analysis, and irrigation and cover erosion rates were set to 0 as the site will be maintained by the DOE to retain the cover and will not be irrigated.

Table 1 RESRAD SCENARIO SPECIFIC INPUTS

| Input | Value | Justification |
|--|-----------------------|---|
| Contaminated Zone Thickness | 0.15 m | Value from USNRC Radium Benchmark Dose Analysis |
| Cover Depth | 0.15 m | Value from USNRC Radium Benchmark Dose Analysis |
| Area of Contaminated Zone | 868.36 m ² | Actual area of pond per engineering design criteria |
| Cover Erosion Rate | 0 | The cap will be maintained as part of DOE oversight |
| Contaminated Zone Hydraulic Conductivity | 0.001 m/yr | Minimum value allowed |
| Contaminated Zone b Parameter | 0 | Stop migration of nuclides |
| Wind Speed | 2.68 m/s | Durango Weather Station |
| Precipitation | 0.41 m/yr | Durango Weather Station |
| Irrigation | 0 | No Irrigation at the site |
| Indoor Time Fraction | 0 | It is assumed that there are no structures on the impacted area |
| Outdoor Time Fraction | 1 | Inspector is outdoors at all times during inspections |

5.0 RADIUM BENCHMARK DOSE ANALYSIS RESULTS – DOSE FROM 15 pCi/GRAM ²²⁶Ra IN SUBSURFACE SOIL

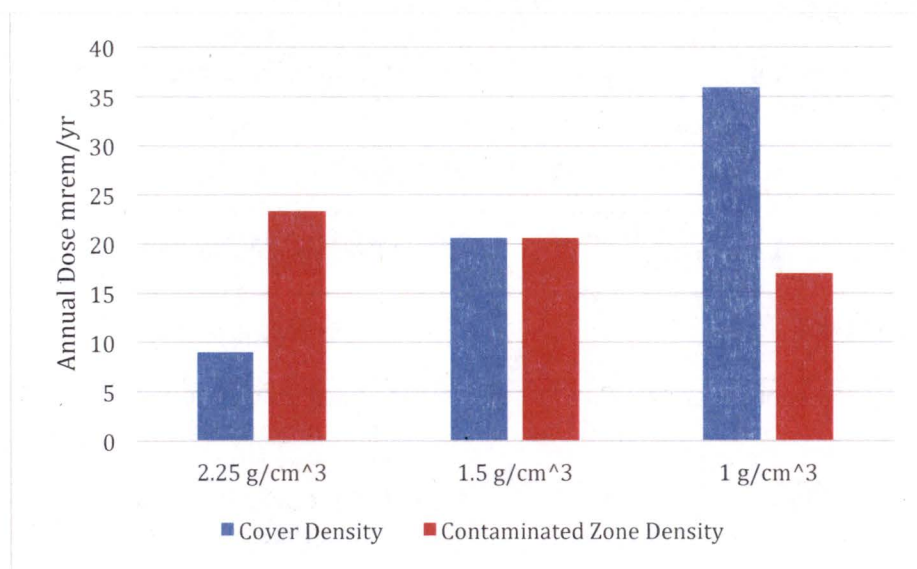
The results of the RESRAD analysis for a concentration of 15 pCi/g ²²⁶Ra in a 15 cm horizon of soil with 15 cm of clean cover indicated an annual dose of 20.6 mrem/yr for a receptor that is located outdoors full time for an entire year of 8760 hrs. This dose is almost exclusively the result of external gamma exposure, however there is a small component from inhalation of re-suspended dust (the RESRAD model assumes some mixing of soils to 0.15 m, so a small portion of the contaminated soil is assumed to have mixed to the top layer for inhalation availability). Modeled results for doses from radon and its progeny as well as doses resulting



from soil ingestion were reported as 0. This RBD corresponds to $2.4\text{E-}3$ mrem/hr or $1.9\text{E-}2$ mrem for an 8 hour work day (i.e., **0.019 mrem per year to the inspector**).

There were some default parameters used in the assessment of this exposure scenario that are potentially variable and could impact the dose. Because the dose is almost exclusively the result of direct gamma exposure, the soil densities of the cover and contaminated zone may have an impact on dose as more dense materials will include more ^{226}Ra per unit volume but will also more efficiently shield the receptor from the gamma exposure. The default value of 1.5 g/cm^3 is a reasonable value for a standard soil (US DOA 1992), however a sensitivity analysis was conducted on the density values to demonstrate that variation of soil classifications would not have a significant impact on the dose calculation. Results of this analysis are presented in Figure 1. As the cover is designed as a mixture of silt, clay, sand, and gravel, the density of the cover may not be consistent across the site and this sensitivity analysis accounts for variation in cover materials.

Figure 1: Sensitivity Analysis – Soil Density of Cover and Contaminated Zone



As would be expected, a higher density in the contaminated zone results in a higher dose rate as there is a greater mass of soil present per unit volume (more ^{226}Ra per unit volume). Also expected is a lower dose rate corresponding to the highest cover density as a result of a denser soil cover providing greater shielding. The largest difference in dose rate relative to the default value used is the result of a soil cover with a density of 1 g/cm^3 where the annual dose calculated to a receptor is about 35 mrem per year. On a daily basis, however, this only represents a fraction of a millirem (an annual dose of 0.031 mrem vs. 0.019 mrem to the inspector) which is within the range of uncertainty of RESRAD's calculations indicating that the potential impact on dose from variation in cover and contaminated zone soil density is small and can be ignored for this case ⁽⁴⁾.

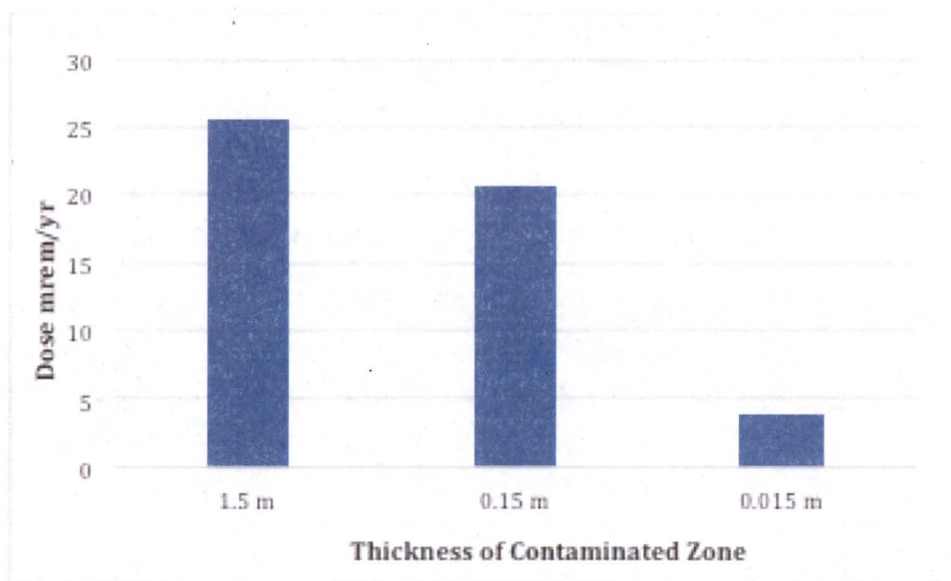
⁽⁴⁾ Also quite small relative to an annual exposure limit of 25 mrem TEDE per year (10 CFR 20 Subpart E)



Although in a general sense, these two factors (soil density of cover and soil density in contaminated zone) would have offsetting effects, it is assumed here that the soil cover and contaminated soil are not necessarily the same soil types and therefore not at the same density. In any event, the impact of the stated potential variation in soil density is small.

Another area of potential variability is the thickness of the contaminated zone. As the approach used in this technical report was derived from the RBD approach, 0.15 m was utilized. However, it is likely that this contaminated zone is thicker than 0.15 m. A sensitivity analysis with a factor of 10 was added to the RESRAD analysis to consider the impact of a deeper contamination zone. At the maximum calculated thickness of 1.5 m, the annual predicted dose is still only 5 mrem/yr. more than the dose from a thickness smaller by factor of 10. This difference corresponds to dose to the 8-hour worker of less than 0.01 mrem, so the effect of contaminated zone thickness on the receptor can be considered negligible. The projected doses as a result of varied contaminated zone thickness are provided in Table 2.

Figure 2: Sensitivity Analysis of Contaminated Zone Thickness



Another important feature of this analysis is recognition that the cover material over the impacted soils will be significantly thicker than the assumed 0.15 m per the RBD approach. Although for consistency with the RBD approach we used this relatively thin cover, a dose resultant from ^{226}Ra , with a contaminated zone thickness of 1.5 m (the maximum previously assumed) and a cover of 1.7 m (the minimum cover projected at the site per the engineering design criteria), yields an annual dose of $1.1\text{E-}03$ mrem/yr., or approximately $1\text{E-}06$ mrem to the inspector for an 8 hour / year exposure.



6.0 ANALYSIS TO ESTABLISH THE NATURAL URANIUM EQUIVALENT CONCENTRATION

To develop a RBD equivalent for natural uranium, RESRAD is first used to calculate the dose rate as a result of a unit concentration of natural uranium (relative activity of 48.6% ^{238}U , 49.2% ^{234}U and 2.2% ^{235}U ; US PHS 1999; US DOE 2009). The unit concentration is arbitrary, as it will be scaled to the dose from ^{226}Ra .

For this analysis, a concentration of 100 pCi/g natural uranium was used. The dose rate to the receptor calculated for a 100 pCi/g concentration was 0.86 mrem per year using the exposure scenario, site model and assumptions described for ^{226}Ra above. The dose from this default concentration of natural uranium is scaled to the RBD by the relationship shown in Equation 1:

Equation 1:

$$\frac{100 \frac{\text{pCi}}{\text{g}} U_{\text{nat}}}{0.86 \text{ mrem/yr}} = \frac{x \frac{\text{pCi}}{\text{g}} U_{\text{nat}}}{20.6 \text{ mrem/yr}}$$

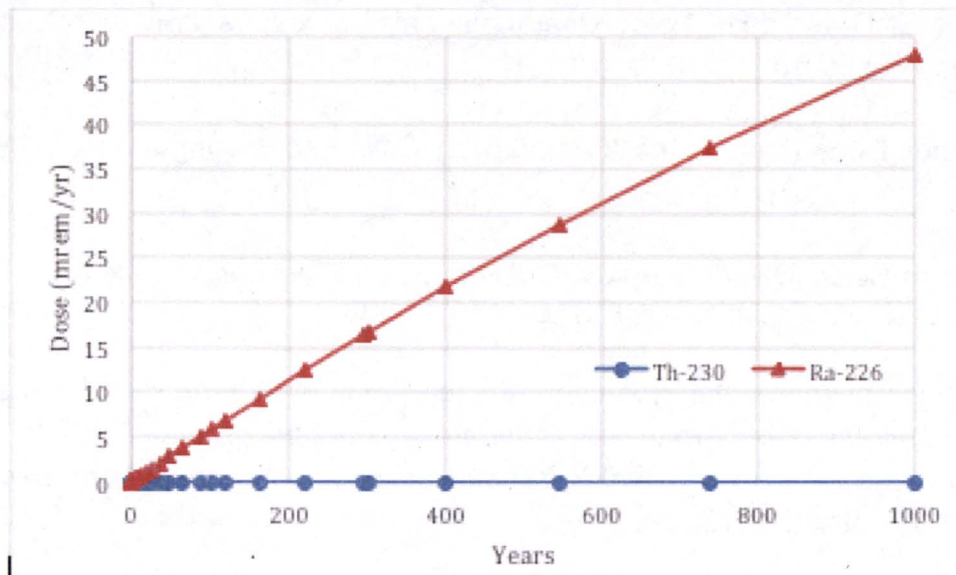
The result of this calculation is that 2395 pCi/g natural uranium would be the concentration that produces the same dose as 15 pCi/g ^{226}Ra relevant to the RBD of 20.6 mrem per year (full time exposure) or in the estimated dose of 0.019 mrem to the inspector for a one work day per year exposure.

7.0 ANALYSIS TO ESTABLISH THE THORIUM 230 EQUIVALENT CONCENTRATION

A unit concentration of ^{230}Th was also applied to the RESRAD model. The annual contribution to dose as a result of 100 pCi/g of ^{230}Th with 0.15 m of cover is 48.0 mrem per year including the dose from the ingrowth of ^{226}Ra . A concentration of 42.9 pCi/g ^{230}Th corresponds to the RBD of 20.6 mrem per year (0.019 mrem for one 8 hour day) when the same relationship used for natural uranium is applied as in Section 6.0 above. It is important to note that the dose which is a direct result of the ^{230}Th itself is well below 1 mrem/yr. for the entire 1000 year period modeled. However the dose to a receptor increases over time as a result of the ingrowth of ^{226}Ra from the ^{230}Th . The 48.0 mrem/yr. dose is the maximum dose at $T = 1000$ years and is almost exclusively the result of ^{226}Ra . The increase in annual dose as a function of time over the 1000 year period is depicted in Figure 3.



FIGURE 3: INCREASE IN ANNUAL DOSE AS A FUNCTION OF TIME



8.0 APPLICATION OF THE RBD APPROACH IN THE FIELD – USE OF THE UNITY RULE ⁽⁵⁾

As the RBD must consider the dose from all 3 radioactive substances considered individually, the unity rule is then typically applied to the concentration of the contaminated soil in order to not exceed 0.019 mrem per day when all 3 radioactive materials are present. The application of the unity rule is presented in Equation 2.

Equation 2:

$$\frac{x \frac{pCi}{g} {}^{226}Ra}{15 \frac{pCi}{g} {}^{226}Ra} + \frac{y \frac{pCi}{g} Unat}{2395 \frac{pCi}{g} Unat} + \frac{z \frac{pCi}{g} {}^{230}Th}{42.9 \frac{pCi}{g} {}^{230}Th} \leq 1$$

Conformance to this relationship ensures that regardless of the relative concentrations of the three nuclides, compliance with the RBD is achieved.

⁽⁵⁾ Sometimes referred to as "Sum of Fractions" or "Sum of Ratios"



9.0 REFERENCES

ANL 2001. Argonne National Laboratory Environmental Assessment Division. *User's Manual for RESRAD Version 6*. ANL/EAD-4. 2001 (Note: Users manuals for subsequent versions of RESRAD have not yet been published).

US DOA 1992. United States Department of the Army. *Military Soils Engineering Manual*. FM 5-410

US DOE 2009. United States Department of Energy. *Guide of Good Practices for Occupational Radiological Protection in Uranium Facilities*. DOE STD 1136 – 2009

US EPA 1983. United States Environmental Protection Agency. Code of Federal Regulations 40 CFR 192 - *Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings, Subpart A - Standards for the Control of Residual Radioactive Materials from Inactive Uranium Processing Sites - Section 192.12*

US EPA 1988. United States Environmental Protection Agency. Federal Guidance Report No.11, *Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion and Ingestion*. EPA 520/1-88-020.

US NRC 1992. United States Nuclear Regulatory Commission. Code of Federal Regulations 10 CFR 40 Appendix A - *Criteria Relating to the Operation of Uranium Mills and the Disposition of Tailings or Wastes Produced by the Extraction or Concentration of Source Material From Ores Processed Primarily for Their Source Material Content*; Criteria 6(6)

US NRC 1997. United States Nuclear Regulatory Commission. Code of Federal Regulations 10 CFR 20, Subpart E - *Radiological Criteria for License Termination* ("License Termination Rule" – FR 62 FR 39058)

USNRC 2003a. United States Nuclear Regulatory Commission. *Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act of 1978*. NUREG 1620, Appendix H - *Guidance to the U.S. Nuclear Regulatory Commission Staff on the Radium Benchmark Dose Approach*

USNRC 2003b. *Standard Review Plan for In Situ Leach Uranium Extraction License Applications*, NUREG 1569, Appendix E - *Guidance to the U.S. Nuclear Regulatory Commission Staff on the Radium Benchmark Dose Approach*

US NRC 2006. United States Nuclear Regulatory Commission. *Consolidated Decommissioning Guidance – Decommissioning Guidance for Material Licensees*. NUREG 1757.



US PHS 1999. U.S. Public Health Service, Agency for Toxic Substances and Disease Registry.
Toxicological Profile for Uranium.



RESRAD DATA FILES

RESRAD Input/Output File Key

Scenarios:

15 pCi/g Ra-226 with 15 cm clean cover

Input - 2262FEB15.rad

Output - 15Ra226.txt

1.5 m Ra-226 15 pCi/g with 1.7 m cover

Input - 2262FebREALTHICKNESS.rad

Output - 226RaActualcover.txt

100 pCi/g natural uranium with 15 cm clean cover

Input - UNATFEB.rad

Output - Unat.txt

100 pCi/g Th-230 with 15 cm clean cover

Input - 230FEB.rad

Output - Thorium.txt

Input - 2262FEB15.rad

```
&DB
CODENAME = 'RESRAD-ONSITE',
ICRPTRANS = 'ICRP107',
HAFTIM = '180 days',
EXTERNAL_DCF= 'DCFPAK3.02',
DFFILE = 'DOE STD-1196-2011 (Reference Person)',
RISKLIB= 'DCFPAK3.02 Morbidity',
DOSELIB= 'DOE STD-1196-2011 (Reference Person)',
NANUC = 2,
NIY = 6,
NPD = 2,
NPTS = 32,
NS = 1,
NPDS = 3,
U_activity = 'pci',
U_dose_unit = 'mrem',
nDAll = 2,
nUniqueNuc = 14,
&END
&INDATA
TITLE = 'Ra-226 15 pCi/g ',
DIRECTORY_NAME = 'C:\USERS\BRIAN\DESKTOP\LISA OTHER WORK\SEPT RESRAD ANALYSIS
2016\ ',
NPTS = 32,
TDISK = ' ', VERS = '7.2',
XSPACE = 'LOG',
FINDPEAK = 0,
LYMAX = 17,
KYMAY = 1,
COVER0 = .15,
DENSCV = 1.5,
VCV = 0,
DENSCH = 1.5,
VCZ = .001,
TPCZ = .4,
FCCZ = .2,
HCCZ = .001,
BCZ = 0,
HUMID = 8,
EVAPTR = .5,
PRECIP = .41,
RI = 0,
IDITCH = 0,
RUNOFF = .2,
WAREA = 1000000,
EPS = .001,
NS = 1,
TI = 0,
DENSEAQ = 1.5,
TPSZ = .4,
EPSZ = .2,
FCSZ = .2,
HCSZ = 100,
HGWT = .02,
BSZ = 5.3,
VWT = .001,
DWIBWT = 10,
MODEL = 0,
UW = 250,
AREA = 868.36,
THICK0 = .15,
SUBMFRACT = 0,
LCZPAQ = 100,
```

BRDL = 25,
T(1) = 0,
T(2) = .2,
T(3) = 10,
T(4) = 100,
T(5) = 300,
T(6) = 1000,
T(7) = 0,
T(8) = 0,
T(9) = 0,
T(10) = 0,
INHALR = 8400,
MLINH = .0001,
ED = 30,
SHF1 = .7,
SHF3 = .4,
FIND = 0,
FOTD = 1,
FS = 1,
RAD_SHAPE(1) = 50,
RAD_SHAPE(2) = 70.71068,
RAD_SHAPE(3) = 0,
RAD_SHAPE(4) = 0,
RAD_SHAPE(5) = 0,
RAD_SHAPE(6) = 0,
RAD_SHAPE(7) = 0,
RAD_SHAPE(8) = 0,
RAD_SHAPE(9) = 0,
RAD_SHAPE(10) = 0,
RAD_SHAPE(11) = 0,
RAD_SHAPE(12) = 0,
FRACA(1) = 1,
FRACA(2) = .2732395,
FRACA(3) = 0,
FRACA(4) = 0,
FRACA(5) = 0,
FRACA(6) = 0,
FRACA(7) = 0,
FRACA(8) = 0,
FRACA(9) = 0,
FRACA(10) = 0,
FRACA(11) = 0,
FRACA(12) = 0,
DIET(1) = 160,
DIET(2) = 14,
DIET(3) = 92,
DIET(4) = 63,
DIET(5) = 5.4,
DIET(6) = .9,
SOIL = 36.5,
DWI = 510,
FDW = 1,
FHHW = 1,
FLW = 1,
FIRW = 1,
FR9 = .5,
FPLANT = -1,
FMEAT = -1,
FMILK = -1,
LFI5 = 68,
LFI6 = 55,
LWI5 = 50,
LWI6 = 160,

LSI = .5,
MLFD = .0001,
DM = .15,
DROOT = .9,
FGWDW = 1,
FGWHH = 1,
FGWLW = 1,
FGWIR = 1,
STOR_T(1) = 14,
STOR_T(2) = 1,
STOR_T(3) = 1,
STOR_T(4) = 20,
STOR_T(5) = 7,
STOR_T(6) = 7,
STOR_T(7) = 1,
STOR_T(8) = 1,
STOR_T(9) = 45,
FLOOR1 = .15,
DENSFL = 2.4,
TPCV = .4,
TPFL = .1,
PH2OCV = .05,
PH2OFL = .03,
DIFCV = .000002,
DIFFL = .0000003,
DIFCZ = .000002,
HMX = 2,
WIND = 2.68,
REXG = .5,
HRM = 2.5,
FAI = 0,
DMFL = -1,
EMANA(1) = .25,
EMANA(2) = .15,
C12WTR = .00002,
C12CZ = .03,
CSOIL = .02,
CAIR = .98,
DMC = .3,
EVSN = .0000007,
REVSN = 1E-10,
AVFG4 = .8,
AVFG5 = .2,
H(1) = 4,
H(2) = 4,
H(3) = 4,
H(4) = 4,
H(5) = 4,
DENSUZ(1) = 1.5,
DENSUZ(2) = 1.5,
DENSUZ(3) = 1.5,
DENSUZ(4) = 1.5,
DENSUZ(5) = 1.5,
TPUZ(1) = .4,
TPUZ(2) = .4,
TPUZ(3) = .4,
TPUZ(4) = .4,
TPUZ(5) = .4,
EPUZ(1) = .2,
EPUZ(2) = .2,
EPUZ(3) = .2,
EPUZ(4) = .2,
EPUZ(5) = .2,

FCUZ(1) = .2,
FCUZ(2) = .2,
FCUZ(3) = .2,
FCUZ(4) = .2,
FCUZ(5) = .2,
BUZ(1) = 5.3,
BUZ(2) = 5.3,
BUZ(3) = 5.3,
BUZ(4) = 5.3,
BUZ(5) = 5.3,
HCUZ(1) = 10,
HCUZ(2) = 10,
HCUZ(3) = 10,
HCUZ(4) = 10,
HCUZ(5) = 10,
INDPOPFLAG = 0,
OFFDISTANCE(1) = 250,
NUMDISTANCES = 0,
AMBIENTTEMP = 10,
LIDHEIGHT = 1000,
SOURCEHEIGHT = 10,
AGVEG(1) = 0,
AGVEG(2) = .5,
AGVEG(3) = .5,
AGMILK(1) = 0,
AGMILK(2) = .5,
AGMILK(3) = .5,
AGMEAT(1) = 0,
AGMEAT(2) = .5,
AGMEAT(3) = .5,
BEEFDENSITY = .164,
MILKEDENSITY = .0207,
VEGLANDFRACTION = .0185,
YV(1) = .7,
YV(2) = 1.5,
YV(3) = 1.1,
TE(1) = .17,
TE(2) = .25,
TE(3) = .08,
TIV(1) = .1,
TIV(2) = 1,
TIV(3) = 1,
WLAM = 20,
RWET(1) = .25,
RWET(2) = .25,
RWET(3) = .25,
RDRY(1) = .25,
RDRY(2) = .25,
RDRY(3) = .25,
NUCNAM = 'Pb-210+D', 'Ra-226+D', 'LAST',
S = 0, 15,
W = 2*0,
DCACTC = 100, 1E+34,
DCACTU1 = 100, 1E+34,
DCACTS = 100, 1E+34,
RLEACH = 2*0,
SOLUBK0 = 2*0,
SDENSCV = 1.5,
SDENSCZ = 1.5,
STHICK0 = 10,
NSENA = 3,
NUM_SAMPS = 300, NUMVAR = 1,
UNCPPD = 1,

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```
UNCPND = 1,  
SELPATH = 387,  
&END  
&DCF  
T_DCF2= .0401672, 3.823283E-02,  
T_DCF3= 1.025566E-02, 1.677388E-03,  
BIOFAC2= 100, 250,  
BIOFAC1= 300, 50,  
RTF2= .0008, .001,  
RTF3= .0003, .001,  
RTF1= .01, .04,  
SLPF1= 4.295087E-09, 8.36718E-06,  
SLPF2= 3.0825E-08, 2.822095E-08,  
SLPF3= 3.44202E-09, 5.149498E-10,  
SLPF4= 2.669116E-09, 3.853363E-10,  
SLPF5= 3.44202E-09, 5.149498E-10,  
T_SLPFRN= 1.8E-12, 1.9E-13, 3.7E-12, 3E-15, 6.2E-12, 3.9E-11,  
1.5E-11, 3.7E-11,  
T_KFACTR= 388, 188, 388, 188,  
&END
```

Output - 15Ra226.txt

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| | | | | | |
|-----------|---|--|---|-----------|---|
| A-1 | 3 | Rn-218 (Source: DCFPAK3.02) | 3 | 4.259E-03 | 3 |
| 4.259E-03 | 3 | DCF1(11) | | | |
| A-1 | 3 | Rn-222 (Source: DCFPAK3.02) | 3 | 2.130E-03 | 3 |
| 2.130E-03 | 3 | DCF1(12) | | | |
| A-1 | 3 | Tl-206 (Source: DCFPAK3.02) | 3 | 1.278E-02 | 3 |
| 1.278E-02 | 3 | DCF1(13) | | | |
| A-1 | 3 | Tl-210 (Source: DCFPAK3.02) | 3 | 1.677E+01 | 3 |
| 1.677E+01 | 3 | DCF1(14) | | | |
| | 3 | | | | |
| B-1 | 3 | Dose conversion factors for inhalation, mrem/pCi: | | | |
| | 3 | | | | |
| B-1 | 3 | Pb-210+D | 3 | 4.017E-02 | 3 |
| 2.231E-02 | 3 | DCF2(1) | | | |
| B-1 | 3 | Ra-226+D | 3 | 3.823E-02 | 3 |
| 3.811E-02 | 3 | DCF2(2) | | | |
| | 3 | | | | |
| D-1 | 3 | Dose conversion factors for ingestion, mrem/pCi: | | | |
| | 3 | | | | |
| D-1 | 3 | Pb-210+D | 3 | 1.026E-02 | 3 |
| 3.774E-03 | 3 | DCF3(1) | | | |
| D-1 | 3 | Ra-226+D | 3 | 1.677E-03 | 3 |
| 1.676E-03 | 3 | DCF3(2) | | | |
| | 3 | | | | |
| D-34 | 3 | Food transfer factors: | | | |
| | 3 | | | | |
| D-34 | 3 | Pb-210+D , plant/soil concentration ratio, dimensionless | 3 | 1.000E-02 | 3 |
| 1.000E-02 | 3 | RTF(1,1) | | | |
| D-34 | 3 | Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d) | 3 | 8.000E-04 | 3 |
| 8.000E-04 | 3 | RTF(1,2) | | | |
| D-34 | 3 | Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d) | 3 | 3.000E-04 | 3 |
| 3.000E-04 | 3 | RTF(1,3) | | | |
| D-34 | 3 | | | | |
| | 3 | | | | |
| D-34 | 3 | Ra-226+D , plant/soil concentration ratio, dimensionless | 3 | 4.000E-02 | 3 |
| 4.000E-02 | 3 | RTF(2,1) | | | |
| D-34 | 3 | Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d) | 3 | 1.000E-03 | 3 |
| 1.000E-03 | 3 | RTF(2,2) | | | |
| D-34 | 3 | Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d) | 3 | 1.000E-03 | 3 |
| 1.000E-03 | 3 | RTF(2,3) | | | |
| | 3 | | | | |
| D-5 | 3 | Bioaccumulation factors, fresh water, L/kg: | | | |
| | 3 | | | | |
| D-5 | 3 | Pb-210+D , fish | 3 | 3.000E+02 | 3 |
| 3.000E+02 | 3 | BIOFAC(1,1) | | | |
| D-5 | 3 | Pb-210+D , crustacea and mollusks | 3 | 1.000E+02 | 3 |
| 1.000E+02 | 3 | BIOFAC(1,2) | | | |
| D-5 | 3 | | | | |
| | 3 | | | | |
| D-5 | 3 | Ra-226+D , fish | 3 | 5.000E+01 | 3 |
| 5.000E+01 | 3 | BIOFAC(2,1) | | | |
| D-5 | 3 | Ra-226+D , crustacea and mollusks | 3 | 2.500E+02 | 3 |
| 2.500E+02 | 3 | BIOFAC(2,2) | | | |

#####

#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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Summary : Ra-226 15 pCi/g

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Site-Specific Parameter Summary

| 0 | Used by RESRAD | Parameter | User | Input | Default |
|--|--|-----------|------|-----------|-----------|
| Menu | Parameter | Name | | | |
| (If different from user input) | | | | | |
| AA | | | | | |
| R011 | Area of contaminated zone (m**2) | AREA | | 8.684E+02 | 1.000E+04 |
| R011 | Thickness of contaminated zone (m) | THICK0 | | 1.500E-01 | 2.000E+00 |
| R011 | Fraction of contamination that is submerged | SUBMFRACT | | 0.000E+00 | 0.000E+00 |
| R011 | Length parallel to aquifer flow (m) | LCZPAQ | | 1.000E+02 | 1.000E+02 |
| R011 | Basic radiation dose limit (mrem/yr) | BRDL | | 2.500E+01 | 3.000E+01 |
| R011 | Time since placement of material (yr) | TI | | 0.000E+00 | 0.000E+00 |
| R011 | Times for calculations (yr) | T(2) | | 2.000E-01 | 1.000E+00 |
| R011 | Times for calculations (yr) | T(3) | | 1.000E+01 | 3.000E+00 |
| R011 | Times for calculations (yr) | T(4) | | 1.000E+02 | 1.000E+01 |
| R011 | Times for calculations (yr) | T(5) | | 3.000E+02 | 3.000E+01 |
| R011 | Times for calculations (yr) | T(6) | | 1.000E+03 | 1.000E+02 |
| R011 | Times for calculations (yr) | T(7) | | not used | 3.000E+02 |
| R011 | Times for calculations (yr) | T(8) | | not used | 1.000E+03 |
| R011 | Times for calculations (yr) | T(9) | | not used | 0.000E+00 |
| R011 | Times for calculations (yr) | T(10) | | not used | 0.000E+00 |
| R012 | Initial principal radionuclide (pCi/g): Ra-226 | SI(2) | | 1.500E+01 | 0.000E+00 |
| R012 | Concentration in groundwater (pCi/L): Ra-226 | W1(2) | | not used | 0.000E+00 |
| R013 | Cover depth (m) | COVER0 | | 1.500E-01 | 0.000E+00 |
| R013 | Density of cover material (g/cm**3) | DENSCV | | 1.500E+00 | 1.500E+00 |
| R013 | Cover depth erosion rate (m/yr) | VCV | | 0.000E+00 | 1.000E-03 |
| R013 | Density of contaminated zone (g/cm**3) | DENSCZ | | 1.500E+00 | 1.500E+00 |
| R013 | Contaminated zone erosion rate (m/yr) | VCZ | | 1.000E-03 | 1.000E-03 |
| R013 | Contaminated zone total porosity | TPCZ | | 4.000E-01 | 4.000E-01 |

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| | | | |
|------|---|-----------|-----------|
| R013 | Contaminated zone field capacity | 2.000E-01 | 2.000E-01 |
| | --- FCCZ | | |
| R013 | Contaminated zone hydraulic conductivity (m/yr) | 1.000E-03 | 1.000E+01 |
| | --- HCCZ | | |
| R013 | Contaminated zone b parameter | 0.000E+00 | 5.300E+00 |
| | --- BCZ | | |
| R013 | Average annual wind speed (m/sec) | 2.680E+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) | 4.100E-01 | 1.000E+00 |
| | --- PRECIP | | |
| R013 | Irrigation (m/yr) | 0.000E+00 | 2.000E-01 |
| | --- RI | | |
| R013 | Irrigation mode | overhead | overhead |
| | --- IDITCH | | |
| R013 | Runoff coefficient | 2.000E-01 | 2.000E-01 |
| | --- RUNOFF | | |
| R013 | Watershed area for nearby stream or pond (m**2) | 1.000E+06 | 1.000E+06 |
| | --- WAREA | | |
| R013 | Accuracy for water/soil computations | 1.000E-03 | 1.000E-03 |
| | --- EPS | | |
| | | | |
| R014 | Density of saturated zone (g/cm**3) | 1.500E+00 | 1.500E+00 |
| | --- DENSAQ | | |
| R014 | Saturated zone total porosity | 4.000E-01 | 4.000E-01 |
| | --- TPSZ | | |
| R014 | Saturated zone effective porosity | 2.000E-01 | 2.000E-01 |
| | --- EPSZ | | |
| R014 | Saturated zone field capacity | 2.000E-01 | 2.000E-01 |
| | --- FCSZ | | |
| R014 | Saturated zone hydraulic conductivity (m/yr) | 1.000E+02 | 1.000E+02 |
| | --- HCSZ | | |
| R014 | Saturated zone hydraulic gradient | 2.000E-02 | 2.000E-02 |
| | --- HGWT | | |
| R014 | Saturated zone b parameter | 5.300E+00 | 5.300E+00 |
| | --- BSZ | | |
| R014 | Water table drop rate (m/yr) | 1.000E-03 | 1.000E-03 |
| | --- VWT | | |
| R014 | Well pump intake depth (m below water table) | 1.000E+01 | 1.000E+01 |
| | --- DWIBWT | | |
| R014 | Model: Nondispersion (ND) or Mass-Balance (MB) | ND | ND |
| | --- MODEL | | |
| R014 | Well pumping rate (m**3/yr) | 2.500E+02 | 2.500E+02 |
| | --- UW | | |

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T« Limit = 180 days

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Summary : Ra-226 15 pCi/g

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Site-Specific Parameter Summary

(continued)

| | Parameter | User | Default |
|--------------------------------|----------------|-------|---------|
| 0 | Used by RESRAD | | |
| Menu | Parameter | Input | Default |
| (If different from user input) | Name | | |

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| | | | | |
|------|----------------------|--------------------------------|----------|-----------|
| R017 | Outer annular radius | (m), ring 1: RAD_SHAPE(1) | not used | 5.000E+01 |
| R017 | Outer annular radius | (m), ring 2: RAD_SHAPE(2) | not used | 7.071E+01 |
| R017 | Outer annular radius | (m), ring 3: RAD_SHAPE(3) | not used | 0.000E+00 |
| R017 | Outer annular radius | (m), ring 4: RAD_SHAPE(4) | not used | 0.000E+00 |
| R017 | Outer annular radius | (m), ring 5: RAD_SHAPE(5) | not used | 0.000E+00 |
| R017 | Outer annular radius | (m), ring 6: RAD_SHAPE(6) | not used | 0.000E+00 |
| R017 | Outer annular radius | (m), ring 7: RAD_SHAPE(7) | not used | 0.000E+00 |
| R017 | Outer annular radius | (m), ring 8: RAD_SHAPE(8) | not used | 0.000E+00 |
| R017 | Outer annular radius | (m), ring 9: RAD_SHAPE(9) | not used | 0.000E+00 |
| R017 | Outer annular radius | (m), ring 10: RAD_SHAPE(10) | not used | 0.000E+00 |
| R017 | Outer annular radius | (m), ring 11: RAD_SHAPE(11) | not used | 0.000E+00 |
| R017 | Outer annular radius | (m), ring 12: RAD_SHAPE(12) | not used | 0.000E+00 |

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(continued).

| Menu | Used by RESRAD | Parameter | User | Input | Default |
|--------------------------------|----------------|-----------|------|-------|---------|
| (If different from user input) | | Name | | | |

[illegible]

| Ring | FRACA() | not used | value |
|--------|-----------|----------|-----------|
| Ring 1 | FRACA(1) | not used | 1.000E+00 |
| Ring 2 | FRACA(2) | not used | 2.732E-01 |
| Ring 3 | FRACA(3) | not used | 0.000E+00 |
| Ring 4 | FRACA(4) | not used | 0.000E+00 |
| Ring 5 | FRACA(5) | not used | 0.000E+00 |
| Ring 6 | FRACA(6) | not used | 0.000E+00 |
| Ring 7 | FRACA(7) | not used | 0.000E+00 |
| Ring 8 | FRACA(8) | not used | 0.000E+00 |
| Ring 9 | | not used | 0.000E+00 |

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| | | | | |
|------|--|-----------|-----------|-----------|
| R017 | Ring 10 | FRACA(9) | not used | 0.000E+00 |
| R017 | Ring 11 | FRACA(10) | not used | 0.000E+00 |
| R017 | Ring 12 | FRACA(11) | not used | 0.000E+00 |
| | | FRACA(12) | | |
| R018 | Fruits, vegetables and grain consumption (kg/yr) | DIET(1) | not used | 1.600E+02 |
| R018 | Leafy vegetable consumption (kg/yr) | DIET(2) | not used | 1.400E+01 |
| R018 | Milk consumption (L/yr) | DIET(3) | not used | 9.200E+01 |
| R018 | Meat and poultry consumption (kg/yr) | DIET(4) | not used | 6.300E+01 |
| R018 | Fish consumption (kg/yr) | DIET(5) | not used | 5.400E+00 |
| R018 | Other seafood consumption (kg/yr) | DIET(6) | not used | 9.000E-01 |
| R018 | Soil ingestion rate (g/yr) | SOIL | 3.650E+01 | 3.650E+01 |
| R018 | Drinking water intake (L/yr) | DWI | not used | 5.100E+02 |
| R018 | Contamination fraction of drinking water | FDW | not used | 1.000E+00 |
| R018 | Contamination fraction of household water | FHHW | 1.000E+00 | 1.000E+00 |
| R018 | Contamination fraction of livestock water | FLW | not used | 1.000E+00 |
| R018 | Contamination fraction of irrigation water | FIRW | not used | 1.000E+00 |
| R018 | Contamination fraction of aquatic food | FR9 | not used | 5.000E-01 |
| R018 | Contamination fraction of plant food | FPLANT | not used | -1 |
| R018 | Contamination fraction of meat | FMEAT | not used | -1 |
| R018 | Contamination fraction of milk | FMILK | not used | -1 |
| R019 | Livestock fodder intake for meat (kg/day) | LFI5 | not used | 6.800E+01 |
| R019 | Livestock fodder intake for milk (kg/day) | LFI6 | not used | 5.500E+01 |
| R019 | Livestock water intake for meat (L/day) | LWI5 | not used | 5.000E+01 |
| R019 | Livestock water intake for milk (L/day) | LWI6 | not used | 1.600E+02 |
| R019 | Livestock soil intake (kg/day) | LSI | not used | 5.000E-01 |
| R019 | Mass loading for foliar deposition (g/m**3) | MLFD | not used | 1.000E-04 |
| R019 | Depth of soil mixing layer (m) | DM | 1.500E-01 | 1.500E-01 |
| R019 | Depth of roots (m) | DROOT | not used | 9.000E-01 |
| R019 | Drinking water fraction from ground water | FGWDW | not used | 1.000E+00 |
| R019 | Household water fraction from ground water | FGWHH | 1.000E+00 | 1.000E+00 |

| | | | | | | | |
|------|---|---|---|----------|---|-----------|---|
| R019 | 3 | Livestock water fraction from ground water | 3 | not used | 3 | 1.000E+00 | 3 |
| | | 3 FGWLW | | | | | |
| R019 | 3 | Irrigation fraction from ground water | 3 | not used | 3 | 1.000E+00 | 3 |
| | | 3 FGWIR | | | | | |
| | 3 | | | | | | |
| R19B | 3 | Wet weight crop yield for Non-Leafy (kg/m**2) | 3 | not used | 3 | 7.000E-01 | 3 |
| | | 3 YV(1) | | | | | |
| R19B | 3 | Wet weight crop yield for Leafy (kg/m**2) | 3 | not used | 3 | 1.500E+00 | 3 |
| | | 3 YV(2) | | | | | |
| R19B | 3 | Wet weight crop yield for Fodder (kg/m**2) | 3 | not used | 3 | 1.100E+00 | 3 |
| | | 3 YV(3) | | | | | |
| R19B | 3 | Growing Season for Non-Leafy (years) | 3 | not used | 3 | 1.700E-01 | 3 |
| | | 3 TE(1) | | | | | |
| R19B | 3 | Growing Season for Leafy (years) | 3 | not used | 3 | 2.500E-01 | 3 |
| | | 3 TE(2) | | | | | |
| R19B | 3 | Growing Season for Fodder (years) | 3 | not used | 3 | 8.000E-02 | 3 |
| | | 3 TE(3) | | | | | |

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Summary : Ra-226 15 pCi/g

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Site-Specific Parameter Summary

(continued)

| | | | | | | | |
|--------------------------------|---|----------------|---|-----------|---|---------|---|
| 0 | 3 | | 3 | User | 3 | | 3 |
| | | Used by RESRAD | 3 | Parameter | | | |
| Menu | 3 | Parameter | 3 | Input | 3 | Default | 3 |
| (If different from user input) | 3 | Name | | | | | |

AA
 AA

| | | | | | | | |
|------|---|--|---|----------|---|-----------|---|
| R19B | 3 | Translocation Factor for Non-Leafy | 3 | not used | 3 | 1.000E-01 | 3 |
| | | 3 TIV(1) | | | | | |
| R19B | 3 | Translocation Factor for Leafy | 3 | not used | 3 | 1.000E+00 | 3 |
| | | 3 TIV(2) | | | | | |
| R19B | 3 | Translocation Factor for Fodder | 3 | not used | 3 | 1.000E+00 | 3 |
| | | 3 TIV(3) | | | | | |
| R19B | 3 | Dry Foliar Interception Fraction for Non-Leafy | 3 | not used | 3 | 2.500E-01 | 3 |
| | | 3 RDRY(1) | | | | | |
| R19B | 3 | Dry Foliar Interception Fraction for Leafy | 3 | not used | 3 | 2.500E-01 | 3 |
| | | 3 RDRY(2) | | | | | |
| R19B | 3 | Dry Foliar Interception Fraction for Fodder | 3 | not used | 3 | 2.500E-01 | 3 |
| | | 3 RDRY(3) | | | | | |
| R19B | 3 | Wet Foliar Interception Fraction for Non-Leafy | 3 | not used | 3 | 2.500E-01 | 3 |
| | | 3 RWET(1) | | | | | |
| R19B | 3 | Wet Foliar Interception Fraction for Leafy | 3 | not used | 3 | 2.500E-01 | 3 |
| | | 3 RWET(2) | | | | | |
| R19B | 3 | Wet Foliar Interception Fraction for Fodder | 3 | not used | 3 | 2.500E-01 | 3 |
| | | 3 RWET(3) | | | | | |
| R19B | 3 | Weathering Removal Constant for Vegetation | 3 | not used | 3 | 2.000E+01 | 3 |
| | | 3 WLAM | | | | | |
| | 3 | | | | | | |
| | | | | | | | |
| C14 | 3 | C-12 concentration in water (g/cm**3) | 3 | not used | 3 | 2.000E-05 | 3 |
| | | 3 C12WTR | | | | | |
| C14 | 3 | C-12 concentration in contaminated soil (g/g) | 3 | not used | 3 | 3.000E-02 | 3 |
| | | 3 C12CZ | | | | | |
| C14 | 3 | Fraction of vegetation carbon from soil | 3 | not used | 3 | 2.000E-02 | 3 |
| | | 3 CSOIL | | | | | |
| C14 | 3 | Fraction of vegetation carbon from air | 3 | not used | 3 | 9.800E-01 | 3 |
| | | 3 CAIR | | | | | |

| | | | | |
|------|--|-----------|-----------|------------|
| C14 | C-14 evasion layer thickness in soil (m) | DMC | not used | 3.000E-01 |
| C14 | C-14 evasion flux rate from soil (1/sec) | EVS | not used | 7.000E-07 |
| C14 | C-12 evasion flux rate from soil (1/sec) | REVS | not used | 1.000E-10 |
| C14 | Fraction of grain in beef cattle feed | AVFG4 | not used | 8.000E-01 |
| C14 | Fraction of grain in milk cow feed | AVFG5 | not used | 2.000E-01 |
| STOR | Storage times of contaminated foodstuffs (days): | | | |
| STOR | Fruits, non-leafy vegetables, and grain | STOR_T(1) | 1.400E+01 | 1.400E+01 |
| STOR | Leafy vegetables | STOR_T(2) | 1.000E+00 | 1.000E+00 |
| STOR | Milk | STOR_T(3) | 1.000E+00 | 1.000E+00 |
| STOR | Meat and poultry | STOR_T(4) | 2.000E+01 | 2.000E+01 |
| STOR | Fish | STOR_T(5) | 7.000E+00 | 7.000E+00 |
| STOR | Crustacea and mollusks | STOR_T(6) | 7.000E+00 | 7.000E+00 |
| STOR | well water | STOR_T(7) | 1.000E+00 | 1.000E+00 |
| STOR | Surface water | STOR_T(8) | 1.000E+00 | 1.000E+00 |
| STOR | Livestock fodder | STOR_T(9) | 4.500E+01 | 4.500E+01 |
| R021 | Thickness of building foundation (m) | FLOOR1 | not used | 1.500E-01 |
| R021 | Bulk density of building foundation (g/cm**3) | DENSFL | not used | 2.400E+00 |
| R021 | Total porosity of the cover material | TPCV | 4.000E-01 | 4.000E-01 |
| R021 | Total porosity of the building foundation | TPFL | not used | 1.000E-01 |
| R021 | volumetric water content of the cover material | PH2OCV | 5.000E-02 | 5.000E-02 |
| R021 | volumetric water content of the foundation | PH2OFL | not used | 3.000E-02 |
| R021 | Diffusion coefficient for radon gas (m/sec): | | | |
| R021 | in cover material | DIFCV | 2.000E-06 | 2.000E-06 |
| R021 | in foundation material | DIFFL | not used | 3.000E-07 |
| R021 | in contaminated zone soil | DIFCZ | 2.000E-06 | 2.000E-06 |
| R021 | Radon vertical dimension of mixing (m) | HMIX | 2.000E+00 | 2.000E+00 |
| R021 | Average building air exchange rate (1/hr) | REXG | not used | 5.000E-01 |
| R021 | Height of the building (room) (m) | HRM | not used | 2.500E+00 |
| R021 | Building interior area factor | FAI | not used | 0.000E+00 |
| R021 | Building depth below ground surface (m) | | not used | -1.000E+00 |

```

code computed (time dependent) 3 DMFL
R021 3 Emanating power of Rn-222 gas 3 2.500E-01 3 2.500E-01 3
    --- 3 EMANA(1)
R021 3 Emanating power of Rn-220 gas 3 not used 3 1.500E-01 3
    --- 3 EMANA(2)
    3 3 3
    3
TITL 3 Number of graphical time points 3 32 3 --- 3
    --- 3 NPTS
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```

(continued)

```

0      Used by RESRAD      3      Parameter      3      User      3
Menu      3      Parameter      3      Input      3      Default      3
(If different from user input)      3      Name
*****
*****
TITL 3 Maximum number of integration points for dose      3      17      3      ---      3
      ---      3      LYMAX
TITL 3 Maximum number of integration points for risk      3      1      3      ---      3
      ---      3      KYMAX

```

[illegible]

| 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 | active |
| Find peak pathway doses | active |

```

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```

| | | | |
|------------------------------|----------------------|------------------------------------|-----------|
| Contaminated Zone Dimensions | | Initial Soil Concentrations, pCi/g | |
| AAAAAAAAAAAAAAAAAAAAAAAAAAAA | | AAAAAAAAAAAAAAAAAAAAAAAAAAAA | |
| Area: | 868.36 square meters | Ra-226 | 1.500E+01 |
| Thickness: | 0.15 meters | | |
| Over Depth: | 0.15 meters | | |

Total Dose TDOSE(t), mrem/yr.

Basic Radiation Dose Limit = 2.500E+01 mrem/yr

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

AA

t (years): 0.000E+00 2.000E-01 1.000E+01 1.000E+02 3.000E+02 1.000E+03
 TDOSE(t): 2.057E+01 2.056E+01 2.048E+01 1.970E+01 1.806E+01 1.334E+01
 M(t): 8.227E-01 8.226E-01 8.191E-01 7.878E-01 7.225E-01 5.335E-01
 0Maximum TDOSE(t): 2.057E+01 mrem/yr at t = 0.000E+00 years
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 Summary : Ra-226 15 pCi/g
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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

0 Water Independent Pathways (Inhalation
 excludes radon)

| | Ground | Milk | Inhalation | Soil | Radon | Plant |
|-----------|------------------|------------------|------------------|------------------|------------------|------------------|
| Meat | | | | | | |
| Radio- | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |
| AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA |
| AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA |
| Ra-226 | 2.057E+01 | 1.0000 | 0.000E+00 | 0.0000 | 9.838E-04 | 0.0000 |
| 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.0000 |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| Total | 2.057E+01 | 1.0000 | 0.000E+00 | 0.0000 | 9.838E-04 | 0.0000 |
| 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.0000 |

0 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

0 Water Dependent Pathways
 0 Water Milk Fish Radon Plant

| | Water | Milk | Fish | All Pathways* | Radon | Plant |
|-----------|------------------|------------------|------------------|------------------|------------------|------------------|
| Meat | | | | | | |
| Radio- | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |
| AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA |
| AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA |
| 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 | 2.057E+01 | 1.0000 | 0.0000 |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| 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 | 2.057E+01 | 1.0000 | 0.0000 |

0*Sum of all water independent and dependent pathways.
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Total Dose Contributions TDOSE(i,p,t) for Individual
Radionuclides (i) and Pathways (p) As mrem/yr and Fraction of Total Dose At t =

2.000E-01 years

0 Water Independent Pathways (Inhalation
excludes radon)

| | Ground | | Inhalation | | Radon | | Plant | |
|-----------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| | Meat | Milk | Soil | | | | | |
| Radio- | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |
| AAAAAAAA | AAAAAAAA | AAAAAA | AAAAAAAA | AAAAAA | AAAAAAAA | AAAAAA | AAAAAAAA | AAAAAA |
| AAAAAAAA | AAAAAA | AAAAAAAA | AAAAAA | AAAAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA |
| Ra-226 | 2.056E+01 | 1.0000 | 0.000E+00 | 0.0000 | 9.837E-04 | 0.0000 | 0.000E+00 | 0.0000 |
| 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.0000 | | |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| Total | 2.056E+01 | 1.0000 | 0.000E+00 | 0.0000 | 9.837E-04 | 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 =

2.000E-01 years

0 Water Dependent Pathways
0

| | Water | | Fish | | Radon | | Plant | |
|-----------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| | Meat | Milk | All Pathways* | | | | | |
| Radio- | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |
| AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA |
| AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA |
| 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 | 2.056E+01 | 1.0000 | | | |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| 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 | 2.056E+01 | 1.0000 | | | |

0*Sum of all water independent and dependent pathways.

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

1.000E+01 years

0 Water Independent Pathways (Inhalation
excludes radon)

| | Ground | | Inhalation | | Radon | | Plant | |
|---------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| | Meat | Milk | Soil | | | | | |
| Radio- | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |
| AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA |
| AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA |
| Ra-226 | 2.048E+01 | 1.0000 | 0.000E+00 | 0.0000 | 9.795E-04 | 0.0000 | 0.000E+00 | 0.0000 |

15RA226.txt.REP

0.000E+00 0.0000 0.000E+00 0.0000 0.000E+00 0.0000
 fffffff fffffff fffffff fffffff fffffff fffffff fffffff fffffff
 fffffff fffffff fffffff fffffff fffffff fffffff fffffff fffffff
 Total 2.048E+01 1.0000 0.000E+00 0.0000 9.795E-04 0.0000 0.000E+00 0.0000
 0.000E+00 0.0000 0.000E+00 0.0000 0.000E+00 0.0000
 0

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

1.000E+01 years

0
 0 Water Fish Radon Water Dependent Pathways
 Plant
 Meat Milk All Pathways*
 Radio- AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA
 AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA
 Nuclide mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract.
 mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract.
 AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA
 AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA
 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 2.048E+01 1.0000
 fffffff fffffff fffffff fffffff fffffff fffffff fffffff fffffff
 fffffff fffffff fffffff fffffff fffffff fffffff fffffff fffffff
 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 2.048E+01 1.0000
 0*Sum of all water independent and dependent pathways.

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

1.000E+02 years

0
 0 Water Independent Pathways (Inhalation
 excludes radon)

0 Ground Inhalation Soil Radon Plant
 Meat Milk Soil
 Radio- AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA
 AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA
 Nuclide mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract.
 mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract.
 AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA
 AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA
 Ra-226 1.970E+01 1.0000 0.000E+00 0.0000 0.000E+00 0.0000 9.421E-04 0.0000
 0.000E+00 0.0000 0.000E+00 0.0000 0.000E+00 0.0000
 fffffff fffffff fffffff fffffff fffffff fffffff fffffff fffffff
 fffffff fffffff fffffff fffffff fffffff fffffff fffffff fffffff
 Total 1.970E+01 1.0000 0.000E+00 0.0000 9.421E-04 0.0000 0.000E+00 0.0000
 0.000E+00 0.0000 0.000E+00 0.0000 0.000E+00 0.0000
 0

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

1.000E+02 years

0
 0 Water Fish Radon Water Dependent Pathways
 Plant

Meat Milk All Pathways*
 Radio- AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA
 AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA
 Nuclide mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract.

15RA226.txt.REP

```

mrem/yr  fract.  mrem/yr  fract.  mrem/yr  fract.
AAAAAAA AAAAAAAA AAAAAA AAAAAAAA AAAAAA AAAAAAAA AAAAAA AAAAAAAA AAAAAA
AAAAAAA AAAAAA AAAAAAAA AAAAAA AAAAAAAA AAAAAA
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 1.970E+01 1.0000
iiiiiii iiiiiiiiii iiiiii iiiiiiiiii iiiiii iiiiiiiiii iiiiii iiiiiiiiii iiiiii
iiiiiiiiiii iiiiii iiiiiiiiii iiiiii iiiiiiiiii iiiiii
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 1.970E+01 1.0000
0*Sum of all water independent and dependent pathways.
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Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

3.000E+02 years As mrem/yr and Fraction of Total Dose At t =

0.00000022 years
excludes radon) Water Independent Pathways (Inhalation

| 0 | Ground | | Inhalation | | Radon | | Plant | |
|-----------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Meat | Milk | | Soil | | | | | |
| Radio- | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |
| AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA |
| AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA |
| Ra-226 | 1.806E+01 | 1.0000 | 0.000E+00 | 0.0000 | 8.639E-04 | 0.0000 | 0.000E+00 | 0.0000 |
| 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | | | |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| Total | 1.806E+01 | 1.0000 | 0.000E+00 | 0.0000 | 8.639E-04 | 0.0000 | 0.000E+00 | 0.0000 |
| 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | | | |

0 Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p) As mrem/yr and Fraction of Total Dose At t =

| 3.000E+02 years | Water | Fish | Radon | Water Dependent Pathways | Plant |
|-----------------|-------|------|-------|--------------------------|-------|
| 0 | | | | | |
| 0 | | | | | |

| | Meat | | Milk | | Fish | | All Pathways* | | Radon | | Plant | |
|--|-----------|---------|-----------|---------|-----------|---------|---------------|---------|-----------|---------|-----------|---------|
| Radio- | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |
| AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA |
| AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA | AAAAAA |
| Ra-226 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 1.806E+01 | 1.0000 | | | | | | |
| | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| Total | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 1.806E+01 | 1.0000 | | | | | | |
| 0*Sum of all water independent and dependent pathways. | | | | | | | | | | | | |
| 1RESRAD-ONSITE, Version 7.2 T« Limit = 180 days 02/02/2017 16:02 | | | | | | | | | | | | |

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Summary : Ra-226 15 pCi/g

File : C:\USER
2016\2262EFB15.RAD

Total Dose Contributions TDOSE(i,p,t) for Individual
Radionuclides (i) and Pathways (p)

1.000E+03 years

As mrem/yr and Fraction of Total Dose At t =

0
excludes radon)

Water Independent Pathways (Inhalation

| | Ground | Milk | Inhalation | Soil | Radon | Plant |
|-----------|-----------|-----------|------------|-----------|-----------|---------|
| Meat | | | | | | |
| Radio- | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| Ra-226 | 1.334E+01 | 1.0000 | 0.000E+00 | 0.0000 | 6.379E-04 | 0.0000 |
| 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| Total | 1.334E+01 | 1.0000 | 0.000E+00 | 0.0000 | 6.379E-04 | 0.0000 |
| 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | |

Total Dose Contributions TDOSE(i,p,t) for Individual
Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t =

1.000E+03 years

0

Water Dependent Pathways

| | Water | Milk | Fish | All Pathways* | Radon | Plant |
|-----------|-----------|-----------|-----------|---------------|-----------|---------|
| Meat | | | | | | |
| Radio- | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| 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 | 1.334E+01 | 1.0000 | |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| 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 | 1.334E+01 | 1.0000 | |

0*Sum of all water independent and dependent pathways.

1RESRAD-ONSITE, Version 7.2

T« Limit = 180 days

02/02/2017 16:02 Page

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Summary : Ra-226 15 pCi/g

File : C:\USERS\BRIAN\DESKTOP\LISA OTHER WORK\SEPT RESRAD ANALYSIS

2016\2262FEB15.RAD

Dose/Source Ratios Summed Over All Pathways

Parent and Progeny Principal Radionuclide Contributions Indicated

| Parent (mrem/yr)/(pCi/g) | Product (j) | Thread Fraction | DSR(j,t) At Time in Years | | | | |
|-----------------------------|----------------|--------------------|---------------------------|-----------|-----------|-----------|-----------|
| 1.000E+03 | | | 0.000E+00 | 2.000E-01 | 1.000E+01 | 1.000E+02 | 3.000E+02 |
| AAAAA | | | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| Ra-226+D | Ra-226+D | 1.000E+00 | 1.371E+00 | 1.371E+00 | 1.365E+00 | 1.313E+00 | 1.204E+00 |
| 8.891E-01 | | | | | | | |
| Ra-226+D | Pb-210+D | 1.000E+00 | 1.868E-06 | 2.608E-06 | 3.261E-05 | 9.315E-05 | 8.732E-05 |
| 6.448E-05 | | | | | | | |
| Ra-226+D | äDSR(j) | | 1.371E+00 | 1.371E+00 | 1.365E+00 | 1.313E+00 | 1.204E+00 |
| 8.891E-01 | | | | | | | |

0

Basic Radiation Dose Limit = 2.500E+01 mrem/yr

| | | | | | | | |
|----------|----|-----------|-----------|-----------|-----------|-----------|-----------|
| ONuclide | t= | 0.000E+00 | 2.000E-01 | 1.000E+01 | 1.000E+02 | 3.000E+02 | 1.000E+03 |
| (i) | | | | | | | |
| AAAAAAA | | AAAAAAAAA | AAAAAAAAA | AAAAAAAAA | AAAAAAAAA | AAAAAAAAA | AAAAAAAAA |
| Ra-226 | | 1.823E+01 | 1.824E+01 | 1.831E+01 | 1.904E+01 | 2.076E+01 | 2.812E+01 |
| iiiiiii | | iiiiiiiii | iiiiiiiii | iiiiiiiii | iiiiiiiii | iiiiiiiii | iiiiiiiii |

0

| ONuclide (i) | Initial (pCi/g) | tmin (years) | DSR(i,tmin) | G(i,tmin) (pCi/g) | DSR(i,tmax) | G(i,tmax) (pCi/g) |
|-----------------|--------------------|----------------------|-------------|----------------------|-------------|----------------------|
| AAAAAAA | AAAAAAAAA | AAAAAAAAAAAAAAAAAAAA | AAAAAAAAA | AAAAAAAAA | AAAAAAAAA | AAAAAAAAA |
| Ra-226 | 1.500E+01 | 0.000E+00 | 1.371E+00 | 1.823E+01 | 1.371E+00 | 1.823E+01 |
| TTTTTTT | TTTTTTT | TTTTTTTTTTTTTTTTTTTT | TTTTTTTTT | TTTTTTTTT | TTTTTTTTT | TTTTTTTTT |

1RESRAD-ONSITE, Version 7.2 T_{1/2} Limit = 180 days 02/02/2017 16:02 Page 16

Summary : Ra-226 15 pCi/g
File : C:\USERS\BRIAN\DESKTOP\LISA OTHER WORK\SEPT RESRAD ANALYSIS
2016\2262FEB15.RAD

| ONuclide (j) | Parent (i) | THF(i) | DOSE(j,t), mrem/yr | | | | |
|-----------------|---------------|------------|--------------------|------------|------------|------------|------------|
| | | | t= 0.000E+00 | 2.000E-01 | 1.000E+01 | 1.000E+02 | 3.000E+02 |
| 1.000E+03 | | | | | | | |
| AAAAAAA | AAAAAAA | AAAAAAAAA | AAAAAAAAA | AAAAAAAAA | AAAAAAAAA | AAAAAAAAA | AAAAAAAAA |
| AAAAAAA | | | | | | | |
| Ra-226 | Ra-226 | 1.000E+00 | 2.057E+01 | 2.056E+01 | 2.048E+01 | 1.969E+01 | 1.806E+01 |
| 1.334E+01 | | | | | | | |
| OPb-210 | Ra-226 | 1.000E+00 | 2.803E-05 | 3.912E-05 | 4.892E-04 | 1.397E-03 | 1.310E-03 |
| 9.672E-04 | | | | | | | |
| iiiiiii | iiiiiii | iiiiiiiiii | iiiiiiiiii | iiiiiiiiii | iiiiiiiiii | iiiiiiiiii | iiiiiiiiii |
| iiiiiiiiii | | | | | | | |

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

| ONuclide (j) | Parent (i) | THF(i) | s(j,t), pCi/g | | | | |
|-----------------|---------------|-----------|---------------|-----------|-----------|-----------|-----------|
| | | | t= 0.000E+00 | 2.000E-01 | 1.000E+01 | 1.000E+02 | 3.000E+02 |
| 1.000E+03 | | | | | | | |
| AAAAAAA | AAAAAAA | AAAAAAAAA | AAAAAAAAA | AAAAAAAAA | AAAAAAAAA | AAAAAAAAA | AAAAAAAAA |
| AAAAAAA | | | | | | | |
| Ra-226 | Ra-226 | 1.000E+00 | 1.500E+01 | 1.500E+01 | 1.494E+01 | 1.436E+01 | 1.317E+01 |
| 9.726E+00 | | | | | | | |
| OPb-210 | Ra-226 | 1.000E+00 | 0.000E+00 | 9.330E-02 | 3.878E+00 | 1.152E+01 | 1.081E+01 |
| 7.979E+00 | | | | | | | |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| iiiiiii | | | | | | | |

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

15RA226.txt.REP
ORESCALC.EXE execution time = 6.06 seconds

Input - 2262FebREALTHICKNESS.rad

2262FEBREALTHICKNESS.RAD

```
&DB
CODENAME = 'RESRAD-ONSITE',
ICRPTRANS = 'ICRP107',
HAFTIM = '180 days',
EXTERNAL_DCF= 'DCFPAK3.02',
OFFFILE = 'DOE STD-1196-2011 (Reference Person)',
RISKLIB= 'DCFPAK3.02 Morbidity',
DOSELIB= 'DOE STD-1196-2011 (Reference Person)',
NANUC = 2,
NIY = 6,
NPD = 2,
NPTS = 32,
NS = 1,
NPDS = 3,
U_activity = 'pci',
U_dose_unit = 'mrem',
nDall = 2,
nUniqueNuc = 14,
&END
&INDATA
TITLE = 'Ra-226 15 pCi/g with Actual Cover Scenario',
DIRECTORY_NAME = 'C:\USERS\BRIAN\DESKTOP\LISA OTHER WORK\SEPT RESRAD ANALYSIS
2016\ ',
NPTS = 32,
TDISK = ' ', VERS = '7.2',
XSPACE = 'LOG',
FINDPEAK = 0,
LYMAX = 17,
KYMAY = 1,
COVER0 = 1.7,
DENSECV = 1.5,
VCV = 0,
DENSECZ = 1.5,
VCZ = .001,
TPCZ = .4,
FCCZ = .2,
HCCZ = .001,
BCZ = 0,
HUMID = 8,
EVAPTR = .5,
PRECIP = .41,
RI = 0,
IDITCH = 0,
RUNOFF = .2,
WAREA = 1000000,
EPS = .001,
NS = 1,
TI = 0,
DENSEAQ = 1.5,
TPSZ = .4,
EPSZ = .2,
FCSZ = .2,
HCSZ = 100,
HGWT = .02,
BSZ = 5.3,
VWT = .001,
DWIBWT = 10,
MODEL = 0,
UW = 250,
AREA = 868.36,
THICK0 = 1.5,
SUBMFRACT = 0,
LCZPAQ = 100,
```

2262FEBREALTHICKNESS.RAD

BRDL = 25,
T(1) = 0,
T(2) = .2,
T(3) = 10,
T(4) = 100,
T(5) = 300,
T(6) = 1000,
T(7) = 0,
T(8) = 0,
T(9) = 0,
T(10) = 0,
INHALR = 8400,
MLINH = .0001,
ED = 30,
SHF1 = .7,
SHF3 = .4,
FIND = 0,
FOTD = 1,
FS = 1,
RAD_SHAPE(1) = 50,
RAD_SHAPE(2) = 70.71068,
RAD_SHAPE(3) = 0,
RAD_SHAPE(4) = 0,
RAD_SHAPE(5) = 0,
RAD_SHAPE(6) = 0,
RAD_SHAPE(7) = 0,
RAD_SHAPE(8) = 0,
RAD_SHAPE(9) = 0,
RAD_SHAPE(10) = 0,
RAD_SHAPE(11) = 0,
RAD_SHAPE(12) = 0,
FRACA(1) = 1,
FRACA(2) = .2732395,
FRACA(3) = 0,
FRACA(4) = 0,
FRACA(5) = 0,
FRACA(6) = 0,
FRACA(7) = 0,
FRACA(8) = 0,
FRACA(9) = 0,
FRACA(10) = 0,
FRACA(11) = 0,
FRACA(12) = 0,
DIET(1) = 160,
DIET(2) = 14,
DIET(3) = 92,
DIET(4) = 63,
DIET(5) = 5.4,
DIET(6) = .9,
SOIL = 36.5,
DWI = 510,
FDW = 1,
FHHW = 1,
FLW = 1,
FIRW = 1,
FR9 = .5,
FPLANT = -1,
FMEAT = -1,
FMILK = -1,
LFI5 = 68,
LFI6 = 55,
LWI5 = 50,
LWI6 = 160,

2262FEBREALTHICKNESS.RAD

LSI = .5,
 MLFD = .0001,
 DM = .15,
 DROOT = .9,
 FGWDW = 1,
 FGWHH = 1,
 FGWLW = 1,
 FGWIR = 1,
 STOR_T(1) = 14,
 STOR_T(2) = 1,
 STOR_T(3) = 1,
 STOR_T(4) = 20,
 STOR_T(5) = 7,
 STOR_T(6) = 7,
 STOR_T(7) = 1,
 STOR_T(8) = 1,
 STOR_T(9) = 45,
 FLOOR1 = .15,
 DENSFL = 2.4,
 TPCV = .4,
 TPFL = .1,
 PH2OCV = .05,
 PH2OFL = .03,
 DIFCV = .000002,
 DIFFL = .0000003,
 DIFCZ = .000002,
 HMX = 2,
 WIND = 2.68,
 REXG = .5,
 HRM = 2.5,
 FAI = 0,
 DMFL = -1,
 EMANA(1) = .25,
 EMANA(2) = .15,
 C12WTR = .00002,
 C12CZ = .03,
 CSOIL = .02,
 CAIR = .98,
 DMC = .3,
 EVSN = .0000007,
 REVS = 1E-10,
 AVFG4 = .8,
 AVFG5 = .2,
 H(1) = 4,
 H(2) = 4,
 H(3) = 4,
 H(4) = 4,
 H(5) = 4,
 DENSUZ(1) = 1.5,
 DENSUZ(2) = 1.5,
 DENSUZ(3) = 1.5,
 DENSUZ(4) = 1.5,
 DENSUZ(5) = 1.5,
 TPUZ(1) = .4,
 TPUZ(2) = .4,
 TPUZ(3) = .4,
 TPUZ(4) = .4,
 TPUZ(5) = .4,
 EPUZ(1) = .2,
 EPUZ(2) = .2,
 EPUZ(3) = .2,
 EPUZ(4) = .2,
 EPUZ(5) = .2,

2262FEBREALTHICKNESS.RAD

FCUZ(1) = .2,
 FCUZ(2) = .2,
 FCUZ(3) = .2,
 FCUZ(4) = .2,
 FCUZ(5) = .2,
 BUZ(1) = 5.3,
 BUZ(2) = 5.3,
 BUZ(3) = 5.3,
 BUZ(4) = 5.3,
 BUZ(5) = 5.3,
 HCUZ(1) = 10,
 HCUZ(2) = 10,
 HCUZ(3) = 10,
 HCUZ(4) = 10,
 HCUZ(5) = 10,
 INDPFLAG = 0,
 OFFDISTANCE(1) = 250,
 NUMDISTANCES = 0,
 AMBIENTTEMP = 10,
 LIDHEIGHT = 1000,
 SOURCEHEIGHT = 10,
 AGVEG(1) = 0,
 AGVEG(2) = .5,
 AGVEG(3) = .5,
 AGMILK(1) = 0,
 AGMILK(2) = .5,
 AGMILK(3) = .5,
 AGMEAT(1) = 0,
 AGMEAT(2) = .5,
 AGMEAT(3) = .5,
 BEEFDENSITY = .164,
 MILKDENSITY = .0207,
 VEGLANDFRACTION = .0185,
 YV(1) = .7,
 YV(2) = 1.5,
 YV(3) = 1.1,
 TE(1) = .17,
 TE(2) = .25,
 TE(3) = .08,
 TIV(1) = .1,
 TIV(2) = 1,
 TIV(3) = 1,
 WLAM = 20,
 RWET(1) = .25,
 RWET(2) = .25,
 RWET(3) = .25,
 RDRY(1) = .25,
 RDRY(2) = .25,
 RDRY(3) = .25,
 NUCNAM = 'Pb-210+D', 'Ra-226+D', 'LAST',
 S = 0, 15,
 W = 2*0,
 DCACTC = 100, 1E+34,
 DCACTU1 = 100, 1E+34,
 DCACTS = 100, 1E+34,
 RLEACH = 2*0,
 SOLUBK0 = 2*0,
 SDENSCV = 1.5,
 SDENSCZ = 1.5,
 STHICK0 = 10,
 NSENA = 3,
 NUM_SAMPS = 300, NUMVAR = 1,
 UNCPPD = 1,

2262FEBREALTHICKNESS.RAD

```

UNCPND = 1 ,
SELPATH = 387,
&END
&DCF
T_DCF2= .0401672, 3.823283E-02,
T_DCF3= 1.025566E-02, 1.677388E-03,
BIOFAC2= 100, 250,
BIOFAC1= 300, 50,
RTF2= .0008, .001,
RTF3= .0003, .001,
RTF1= .01, .04,
SLPF1= 4.295087E-09, 8.36718E-06,
SLPF2= 3.0825E-08, 2.822095E-08,
SLPF3= 3.44202E-09, 5.149498E-10,
SLPF4= 2.669116E-09, 3.853363E-10,
SLPF5= 3.44202E-09, 5.149498E-10,
T_SLPRN= 1.8E-12, 1.9E-13, 3.7E-12, 3E-15, 6.2E-12, 3.9E-11,
1.5E-11, 3.7E-11,
T_KFACTR= 388, 188, 388, 188,
&END

```

Output - 226RaActualcover.txt

Page 1

226RaActualCover.txt.REP

A-1 ³ Rn-218 (Source: DCFPAK3.02) ³ 4.259E-03 ³
 4.259E-03 ³ DCF1(11)
 A-1 ³ Rn-222 (Source: DCFPAK3.02) ³ 2.130E-03 ³
 2.130E-03 ³ DCF1(12)
 A-1 ³ Tl-206 (Source: DCFPAK3.02) ³ 1.278E-02 ³
 1.278E-02 ³ DCF1(13)
 A-1 ³ Tl-210 (Source: DCFPAK3.02) ³ 1.677E+01 ³
 1.677E+01 ³ DCF1(14)

B-1 ³ Dose conversion factors for inhalation, mrem/pCi:

B-1 ³ Pb-210+D ³ 4.017E-02 ³
 2.231E-02 ³ DCF2(1)
 B-1 ³ Ra-226+D ³ 3.823E-02 ³
 3.811E-02 ³ DCF2(2)

D-1 ³ Dose conversion factors for ingestion, mrem/pCi:

D-1 ³ Pb-210+D ³ 1.026E-02 ³
 3.774E-03 ³ DCF3(1)
 D-1 ³ Ra-226+D ³ 1.677E-03 ³
 1.676E-03 ³ DCF3(2)

D-34 ³ Food transfer factors:

D-34 ³ Pb-210+D , plant/soil concentration ratio, dimensionless ³ 1.000E-02 ³
 1.000E-02 ³ RTF(1,1)
 D-34 ³ Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d) ³ 8.000E-04 ³
 8.000E-04 ³ RTF(1,2)
 D-34 ³ Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d) ³ 3.000E-04 ³
 3.000E-04 ³ RTF(1,3)
 D-34 ³ Ra-226+D , plant/soil concentration ratio, dimensionless ³ 4.000E-02 ³
 4.000E-02 ³ RTF(2,1)
 D-34 ³ Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d) ³ 1.000E-03 ³
 1.000E-03 ³ RTF(2,2)
 D-34 ³ Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d) ³ 1.000E-03 ³
 1.000E-03 ³ RTF(2,3)

D-5 ³ Bioaccumulation factors, fresh water, L/kg:

D-5 ³ Pb-210+D , fish ³ 3.000E+02 ³
 3.000E+02 ³ BIOFAC(1,1)
 D-5 ³ Pb-210+D , crustacea and mollusks ³ 1.000E+02 ³
 1.000E+02 ³ BIOFAC(1,2)
 D-5 ³ Ra-226+D , fish ³ 5.000E+01 ³
 5.000E+01 ³ BIOFAC(2,1)
 D-5 ³ Ra-226+D , crustacea and mollusks ³ 2.500E+02 ³
 2.500E+02 ³ BIOFAC(2,2)

 #####

#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.

226RaActualCover.txt.REP

3
Summary : Ra-226 15 pCi/g With Actual Cover Scenario
File : C:\USERS\BRIAN\DESKTOP\LISA OTHER WORK\SEPT RESRAD ANALYSIS
2016\2262FEBREALTHICKNESS.RAD

Site-Specific Parameter Summary

| Menu | Used by RESRAD (If different from user input) | Parameter Parameter Name | User Input | Default |
|--|--|-----------------------------|------------|-----------|
| AA | | | | |
| R011 | Area of contaminated zone (m**2) | AREA | 8.684E+02 | 1.000E+04 |
| R011 | Thickness of contaminated zone (m) | THICK0 | 1.500E+00 | 2.000E+00 |
| R011 | Fraction of contamination that is submerged | SUBMFRACT | 0.000E+00 | 0.000E+00 |
| R011 | Length parallel to aquifer flow (m) | LCZPAQ | 1.000E+02 | 1.000E+02 |
| R011 | Basic radiation dose limit (mrem/yr) | BRDL | 2.500E+01 | 3.000E+01 |
| R011 | Time since placement of material (yr) | TI | 0.000E+00 | 0.000E+00 |
| R011 | Times for calculations (yr) | T(2) | 2.000E-01 | 1.000E+00 |
| R011 | Times for calculations (yr) | T(3) | 1.000E+01 | 3.000E+00 |
| R011 | Times for calculations (yr) | T(4) | 1.000E+02 | 1.000E+01 |
| R011 | Times for calculations (yr) | T(5) | 3.000E+02 | 3.000E+01 |
| R011 | Times for calculations (yr) | T(6) | 1.000E+03 | 1.000E+02 |
| R011 | Times for calculations (yr) | T(7) | not used | 3.000E+02 |
| R011 | Times for calculations (yr) | T(8) | not used | 1.000E+03 |
| R011 | Times for calculations (yr) | T(9) | not used | 0.000E+00 |
| R011 | Times for calculations (yr) | T(10) | not used | 0.000E+00 |
| R012 | Initial principal radionuclide (pCi/g): Ra-226 | SI(2) | 1.500E+01 | 0.000E+00 |
| R012 | Concentration in groundwater (pCi/L): Ra-226 | WI(2) | not used | 0.000E+00 |
| R013 | Cover depth (m) | COVER0 | 1.700E+00 | 0.000E+00 |
| R013 | Density of cover material (g/cm**3) | DENSCV | 1.500E+00 | 1.500E+00 |
| R013 | Cover depth erosion rate (m/yr) | VCV | 0.000E+00 | 1.000E-03 |
| R013 | Density of contaminated zone (g/cm**3) | DENSCZ | 1.500E+00 | 1.500E+00 |
| R013 | Contaminated zone erosion rate (m/yr) | VCZ | 1.000E-03 | 1.000E-03 |
| R013 | Contaminated zone total porosity | TPCZ | 4.000E-01 | 4.000E-01 |

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| | | | | |
|------|---|--------|-----------|-----------|
| R013 | Contaminated zone field capacity | FCCZ | 2.000E-01 | 2.000E-01 |
| R013 | Contaminated zone hydraulic conductivity (m/yr) | HCCZ | 1.000E-03 | 1.000E+01 |
| R013 | Contaminated zone b parameter | BCZ | 0.000E+00 | 5.300E+00 |
| R013 | Average annual wind speed (m/sec) | WIND | 2.680E+00 | 2.000E+00 |
| R013 | Humidity in air (g/m**3) | HUMID | not used | 8.000E+00 |
| R013 | Evapotranspiration coefficient | EVAPTR | 5.000E-01 | 5.000E-01 |
| R013 | Precipitation (m/yr) | PRECIP | 4.100E-01 | 1.000E+00 |
| R013 | Irrigation (m/yr) | RI | 0.000E+00 | 2.000E-01 |
| R013 | Irrigation mode | IDITCH | overhead | overhead |
| R013 | Runoff coefficient | RUNOFF | 2.000E-01 | 2.000E-01 |
| R013 | Watershed area for nearby stream or pond (m**2) | WAREA | 1.000E+06 | 1.000E+06 |
| R013 | Accuracy for water/soil computations | EPS | 1.000E-03 | 1.000E-03 |
| R014 | Density of saturated zone (g/cm**3) | DENSAQ | 1.500E+00 | 1.500E+00 |
| R014 | Saturated zone total porosity | TPSZ | 4.000E-01 | 4.000E-01 |
| R014 | Saturated zone effective porosity | EPSZ | 2.000E-01 | 2.000E-01 |
| R014 | Saturated zone field capacity | FCSZ | 2.000E-01 | 2.000E-01 |
| R014 | Saturated zone hydraulic conductivity (m/yr) | HCSZ | 1.000E+02 | 1.000E+02 |
| R014 | Saturated zone hydraulic gradient | HGWT | 2.000E-02 | 2.000E-02 |
| R014 | Saturated zone b parameter | BSZ | 5.300E+00 | 5.300E+00 |
| R014 | Water table drop rate (m/yr) | VWT | 1.000E-03 | 1.000E-03 |
| R014 | Well pump intake depth (m below water table) | DWIBWT | 1.000E+01 | 1.000E+01 |
| R014 | Model: Nondispersion (ND) or Mass-Balance (MB) | MODEL | ND | ND |
| R014 | Well pumping rate (m**3/yr) | UW | 2.500E+02 | 2.500E+02 |

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Summary : Ra-226 15 pCi/g With Actual Cover Scenario
 File : C:\USERS\BRIAN\DESKTOP\LISA OTHER WORK\SEPT RESRAD ANALYSIS
 2016\2262FEBREALTHICKNESS.RAD

Site-Specific Parameter Summary

(continued)

| 0 | Used by RESRAD | Parameter | User | Default |
|--------------------------------|----------------|-----------|-------|---------|
| Menu | Parameter | Name | Input | |
| (If different from user input) | | | | |

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AA
 AA

| | | | | |
|------|---|--------------|-----------|-----------|
| R015 | Number of unsaturated zone strata | NS | 1 | 1 |
| R015 | Unsat. zone 1, thickness (m) | H(1) | 4.000E+00 | 4.000E+00 |
| R015 | Unsat. zone 1, soil density (g/cm**3) | DENSUZ(1) | 1.500E+00 | 1.500E+00 |
| R015 | Unsat. zone 1, total porosity | TPUZ(1) | 4.000E-01 | 4.000E-01 |
| R015 | Unsat. zone 1, effective porosity | EPUZ(1) | 2.000E-01 | 2.000E-01 |
| R015 | Unsat. zone 1, field capacity | FCUZ(1) | 2.000E-01 | 2.000E-01 |
| R015 | Unsat. zone 1, soil-specific b parameter | BUZ(1) | 5.300E+00 | 5.300E+00 |
| R015 | Unsat. zone 1, hydraulic conductivity (m/yr) | HCUZ(1) | 1.000E+01 | 1.000E+01 |
| R016 | Distribution coefficients for Ra-226 | | | |
| R016 | Contaminated zone (cm**3/g) | DCNUCC(2) | 1.000E+34 | 7.000E+01 |
| R016 | Unsat. zone 1 (cm**3/g) | DCNUCU(2,1) | 1.000E+34 | 7.000E+01 |
| R016 | Saturated zone (cm**3/g) | DCNUCS(2) | 1.000E+34 | 7.000E+01 |
| R016 | Leach rate (/yr) | ALEACH(2) | 0.000E+00 | 0.000E+00 |
| R016 | 7.289E-36 Solubility constant not used | SOLUBK(2) | 0.000E+00 | 0.000E+00 |
| R016 | Distribution coefficients for daughter Pb-210 | | | |
| R016 | Contaminated zone (cm**3/g) | DCNUCC(1) | 1.000E+02 | 1.000E+02 |
| R016 | Unsat. zone 1 (cm**3/g) | DCNUCU(1,1) | 1.000E+02 | 1.000E+02 |
| R016 | Saturated zone (cm**3/g) | DCNUCS(1) | 1.000E+02 | 1.000E+02 |
| R016 | Leach rate (/yr) | ALEACH(1) | 0.000E+00 | 0.000E+00 |
| R016 | 7.270E-04 Solubility constant not used | SOLUBK(1) | 0.000E+00 | 0.000E+00 |
| R017 | Inhalation rate (m**3/yr) | INHALR | 8.400E+03 | 8.400E+03 |
| R017 | Mass loading for inhalation (g/m**3) | MLINH | 1.000E-04 | 1.000E-04 |
| R017 | Exposure duration | ED | 3.000E+01 | 3.000E+01 |
| R017 | Shielding factor, inhalation | SHF3 | 4.000E-01 | 4.000E-01 |
| R017 | Shielding factor, external gamma | SHF1 | 7.000E-01 | 7.000E-01 |
| R017 | Fraction of time spent indoors | FIND | 0.000E+00 | 5.000E-01 |
| R017 | Fraction of time spent outdoors (on site) | FOTD | 1.000E+00 | 2.500E-01 |
| R017 | Shape factor flag, external gamma | | 1.000E+00 | 1.000E+00 |

| Code | Parameter | Unit | Value | Unit |
|------|--|------|-----------|-----------|
| R017 | Ring 10 | | not used | 0.000E+00 |
| R017 | Ring 11 | | not used | 0.000E+00 |
| R017 | Ring 12 | | not used | 0.000E+00 |
| | Fruits, vegetables and grain consumption (kg/yr) | | not used | 1.600E+02 |
| | Leafy vegetable consumption (kg/yr) | | not used | 1.400E+01 |
| | Milk consumption (L/yr) | | not used | 9.200E+01 |
| | Meat and poultry consumption (kg/yr) | | not used | 6.300E+01 |
| | Fish consumption (kg/yr) | | not used | 5.400E+00 |
| | Other seafood consumption (kg/yr) | | not used | 9.000E-01 |
| | Soil ingestion rate (g/yr) | | 3.650E+01 | 3.650E+01 |
| | Drinking water intake (L/yr) | | not used | 5.100E+02 |
| | Contamination fraction of drinking water | | not used | 1.000E+00 |
| | Contamination fraction of household water | | 1.000E+00 | 1.000E+00 |
| | Contamination fraction of livestock water | | not used | 1.000E+00 |
| | Contamination fraction of irrigation water | | not used | 1.000E+00 |
| | Contamination fraction of aquatic food | | not used | 5.000E-01 |
| | Contamination fraction of plant food | | not used | -1 |
| | Contamination fraction of meat | | not used | -1 |
| | Contamination fraction of milk | | not used | -1 |
| R019 | Livestock fodder intake for meat (kg/day) | | not used | 6.800E+01 |
| R019 | Livestock fodder intake for milk (kg/day) | | not used | 5.500E+01 |
| R019 | Livestock water intake for meat (L/day) | | not used | 5.000E+01 |
| R019 | Livestock water intake for milk (L/day) | | not used | 1.600E+02 |
| R019 | Livestock soil intake (kg/day) | | not used | 5.000E-01 |
| R019 | Mass loading for foliar deposition (g/m**3) | | not used | 1.000E-04 |
| R019 | Depth of soil mixing layer (m) | | 1.500E-01 | 1.500E-01 |
| R019 | Depth of roots (m) | | not used | 9.000E-01 |
| R019 | Drinking water fraction from ground water | | not used | 1.000E+00 |
| R019 | Household water fraction from ground water | | 1.000E+00 | 1.000E+00 |

| | | | | | | | |
|------|-----|---|---|----------|---|-----------|---|
| R019 | 3 | Livestock water fraction from ground water | 3 | not used | 3 | 1.000E+00 | 3 |
| | --- | 3 FGWLW | | | | | |
| R019 | 3 | Irrigation fraction from ground water | 3 | not used | 3 | 1.000E+00 | 3 |
| | --- | 3 FGWIR | | | | | |
| | 3 | | | | | | |
| R19B | 3 | Wet weight crop yield for Non-Leafy (kg/m**2) | 3 | not used | 3 | 7.000E-01 | 3 |
| | --- | 3 YV(1) | | | | | |
| R19B | 3 | Wet weight crop yield for Leafy (kg/m**2) | 3 | not used | 3 | 1.500E+00 | 3 |
| | --- | 3 YV(2) | | | | | |
| R19B | 3 | Wet weight crop yield for Fodder (kg/m**2) | 3 | not used | 3 | 1.100E+00 | 3 |
| | --- | 3 YV(3) | | | | | |
| R19B | 3 | Growing Season for Non-Leafy (years) | 3 | not used | 3 | 1.700E-01 | 3 |
| | --- | 3 TE(1) | | | | | |
| R19B | 3 | Growing Season for Leafy (years) | 3 | not used | 3 | 2.500E-01 | 3 |
| | --- | 3 TE(2) | | | | | |
| R19B | 3 | Growing Season for Fodder (years) | 3 | not used | 3 | 8.000E-02 | 3 |
| | --- | 3 TE(3) | | | | | |

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Summary : Ra-226 15 pCi/g with Actual Cover Scenario
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Site-Specific Parameter Summary

(continued)

| 0 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
|--------------------------------|---|--|---|-----------|---|----------|---|
| Menu | 3 | Used by RESRAD | 3 | Parameter | 3 | User | 3 |
| (If different from user input) | 3 | Parameter | 3 | Name | 3 | Input | 3 |
| | 3 | | 3 | | 3 | Default | 3 |
| AAAAA | 3 | Translocation Factor for Non-Leafy | 3 | TIV(1) | 3 | not used | 3 |
| AAAAA | 3 | Translocation Factor for Leafy | 3 | TIV(2) | 3 | not used | 3 |
| AAAAA | 3 | Translocation Factor for Fodder | 3 | TIV(3) | 3 | not used | 3 |
| AAAAA | 3 | Dry Foliar Interception Fraction for Non-Leafy | 3 | RDRY(1) | 3 | not used | 3 |
| AAAAA | 3 | Dry Foliar Interception Fraction for Leafy | 3 | RDRY(2) | 3 | not used | 3 |
| AAAAA | 3 | Dry Foliar Interception Fraction for Fodder | 3 | RDRY(3) | 3 | not used | 3 |
| AAAAA | 3 | Wet Foliar Interception Fraction for Non-Leafy | 3 | RWET(1) | 3 | not used | 3 |
| AAAAA | 3 | Wet Foliar Interception Fraction for Leafy | 3 | RWET(2) | 3 | not used | 3 |
| AAAAA | 3 | Wet Foliar Interception Fraction for Fodder | 3 | RWET(3) | 3 | not used | 3 |
| AAAAA | 3 | Weathering Removal Constant for Vegetation | 3 | WLAM | 3 | not used | 3 |
| AAAAA | 3 | | 3 | | 3 | | 3 |
| C14 | 3 | C-12 concentration in water (g/cm**3) | 3 | C12WTR | 3 | not used | 3 |
| C14 | 3 | C-12 concentration in contaminated soil (g/g) | 3 | C12CZ | 3 | not used | 3 |
| C14 | 3 | Fraction of vegetation carbon from soil | 3 | CSOIL | 3 | not used | 3 |
| C14 | 3 | Fraction of vegetation carbon from air | 3 | CAIR | 3 | not used | 3 |

| | | | | |
|------|--|-----------|-----------|------------|
| C14 | C-14 evasion layer thickness in soil (m) | DMC | not used | 3.000E-01 |
| C14 | C-14 evasion flux rate from soil (1/sec) | EVS | not used | 7.000E-07 |
| C14 | C-12 evasion flux rate from soil (1/sec) | REVS | not used | 1.000E-10 |
| C14 | Fraction of grain in beef cattle feed | AVFG4 | not used | 8.000E-01 |
| C14 | Fraction of grain in milk cow feed | AVFG5 | not used | 2.000E-01 |
| STOR | Storage times of contaminated foodstuffs (days): | | | |
| STOR | Fruits, non-leafy vegetables, and grain | STOR_T(1) | 1.400E+01 | 1.400E+01 |
| STOR | Leafy vegetables | STOR_T(2) | 1.000E+00 | 1.000E+00 |
| STOR | Milk | STOR_T(3) | 1.000E+00 | 1.000E+00 |
| STOR | Meat and poultry | STOR_T(4) | 2.000E+01 | 2.000E+01 |
| STOR | Fish | STOR_T(5) | 7.000E+00 | 7.000E+00 |
| STOR | Crustacea and mollusks | STOR_T(6) | 7.000E+00 | 7.000E+00 |
| STOR | Well water | STOR_T(7) | 1.000E+00 | 1.000E+00 |
| STOR | Surface water | STOR_T(8) | 1.000E+00 | 1.000E+00 |
| STOR | Livestock fodder | STOR_T(9) | 4.500E+01 | 4.500E+01 |
| R021 | Thickness of building foundation (m) | FLOOR1 | not used | 1.500E-01 |
| R021 | Bulk density of building foundation (g/cm**3) | DENSFL | not used | 2.400E+00 |
| R021 | Total porosity of the cover material | TPCV | 4.000E-01 | 4.000E-01 |
| R021 | Total porosity of the building foundation | TPFL | not used | 1.000E-01 |
| R021 | Volumetric water content of the cover material | PH2OCV | 5.000E-02 | 5.000E-02 |
| R021 | Volumetric water content of the foundation | PH2OFL | not used | 3.000E-02 |
| R021 | Diffusion coefficient for radon gas (m/sec): | | | |
| R021 | in cover material | DIFCV | 2.000E-06 | 2.000E-06 |
| R021 | in foundation material | DIFFL | not used | 3.000E-07 |
| R021 | in contaminated zone soil | DIFCZ | 2.000E-06 | 2.000E-06 |
| R021 | Radon vertical dimension of mixing (m) | HMX | 2.000E+00 | 2.000E+00 |
| R021 | Average building air exchange rate (1/hr) | REXG | not used | 5.000E-01 |
| R021 | Height of the building (room) (m) | HRM | not used | 2.500E+00 |
| R021 | Building interior area factor | FAI | not used | 0.000E+00 |
| R021 | Building depth below ground surface (m) | | not used | -1.000E+00 |

code computed (time dependent) ³ DMFLR021 ³ Emanating power of Rn-222 gas ³ 2.500E-01 ³ 2.500E-01 ³---- ³ EMANA(1)R021 ³ Emanating power of Rn-220 gas ³ not used ³ 1.500E-01 ³---- ³ EMANA(2)TITL ³ Number of graphical time points ³ 32 ³ --- ³---- ³ NPTS

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Summary : Ra-226 15 pCi/g with Actual Cover Scenario

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Site-Specific Parameter Summary

(continued)

| 0 | Used by RESRAD | Parameter | User | Input | Default |
|--------------------------------|----------------|-----------|------|-------|---------|
| Menu | | Parameter | | | |
| (If different from user input) | | Name | | | |

AA

AA

TITL ³ Maximum number of integration points for dose ³ 17 ³ --- ³---- ³ LYMAXTITL ³ Maximum number of integration points for risk ³ 1 ³ --- ³---- ³ KYMAX

ii

ii

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 | active |
| Find peak pathway doses | active |

ii

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Summary : Ra-226 15 pCi/g with Actual Cover Scenario

File : C:\USERS\BRIAN\DESKTOP\LISA OTHER WORK\SEPT RESRAD ANALYSIS

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Contaminated Zone Dimensions

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Area: 868.36 square meters

Thickness: 1.50 meters

Cover Depth: 1.70 meters

Initial Soil Concentrations, pCi/g

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

Ra-226 1.500E+01

Total Dose TDOSE(t), mrem/yr

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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 =
 2.000E-01 years

0 Water Independent Pathways (Inhalation
 excludes radon)
 0

| | Ground | | Inhalation | | Radon | | Plant | |
|-----------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| | Meat | Milk | Soil | | | | | |
| Radio- | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| Ra-226 | 1.542E-06 | 0.0014 | 0.000E+00 | 0.0000 | 1.113E-03 | 0.9986 | 0.000E+00 | 0.0000 |
| 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | | | |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| Total | 1.542E-06 | 0.0014 | 0.000E+00 | 0.0000 | 1.113E-03 | 0.9986 | 0.000E+00 | 0.0000 |
| 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | | | |

0

Total Dose Contributions TDOSE(i,p,t) for Individual
 Radionuclides (i) and Pathways (p) As mrem/yr and Fraction of Total Dose At t =
 2.000E-01 years

0 Water Dependent Pathways
 0

| | Water | | Fish | | Radon | | Plant | |
|-----------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| | Meat | Milk | All Pathways* | | | | | |
| Radio- | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| 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 | 1.115E-03 | 1.0000 | | | |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| 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 | 1.115E-03 | 1.0000 | | | |

0*Sum of all water independent and dependent pathways.

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Summary : Ra-226 15 pCi/g with Actual Cover Scenario

File : C:\USERS\BRIAN\DESKTOP\LISA OTHER WORK\SEPT RESRAD ANALYSIS

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

0 Water Independent Pathways (Inhalation
 excludes radon)
 0

| | Ground | | Inhalation | | Radon | | Plant | |
|---------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| | Meat | Milk | Soil | | | | | |
| Radio- | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| Ra-226 | 1.536E-06 | 0.0014 | 0.000E+00 | 0.0000 | 1.108E-03 | 0.9986 | 0.000E+00 | 0.0000 |

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0.000E+00 0.0000 0.000E+00 0.0000 0.000E+00 0.0000
 iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii
 iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii
 Total 1.536E-06 0.0014 0.000E+00 0.0000 1.108E-03 0.9986 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+01 years

| | Water | | Fish | | Radon | | Water Dependent Pathways Plant | |
|-----------|-----------|-----------|---------------|-----------|-----------|---------|-----------------------------------|---------|
| | Meat | Milk | All Pathways* | | | | | |
| Radio- | AAAAA | | AAAAA | | AAAAA | | AAAAA | |
| | AAAAA | | AAAAA | | AAAAA | | AAAAA | |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| 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 | 1.110E-03 | 1.0000 | | | |
| iiiiii | iiiiii | iiiiii | iiiiii | iiiiii | iiiiii | iiiiii | iiiiii | iiiiii |
| iiiiii | iiiiii | iiiiii | iiiiii | iiiiii | iiiiii | iiiiii | iiiiii | iiiiii |
| 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 | 1.110E-03 | 1.0000 | | | |

0*Sum of all water independent and dependent pathways.

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Summary : Ra-226 15 pCi/g With Actual Cover Scenario

File : C:\USERS\BRIAN\DESKTOP\LISA OTHER WORK\SEPT RESRAD ANALYSIS

2016\2262FEBREALTHICKNESS.RAD

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

1.000E+02 years

excludes radon) Water Independent Pathways (Inhalation

| | Ground | | Inhalation | | Radon | | Plant | |
|-----------|-----------|-----------|------------|-----------|-----------|---------|-----------|---------|
| | Meat | Milk | Soil | | | | | |
| Radio- | AAAAA | | AAAAA | | AAAAA | | AAAAA | |
| | AAAAA | | AAAAA | | AAAAA | | AAAAA | |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| Ra-226 | 1.477E-06 | 0.0014 | 0.000E+00 | 0.0000 | 1.066E-03 | 0.9986 | 0.000E+00 | 0.0000 |
| 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | | | |
| iiiiii | iiiiii | iiiiii | iiiiii | iiiiii | iiiiii | iiiiii | iiiiii | iiiiii |
| iiiiii | iiiiii | iiiiii | iiiiii | iiiiii | iiiiii | iiiiii | iiiiii | iiiiii |
| Total | 1.477E-06 | 0.0014 | 0.000E+00 | 0.0000 | 1.066E-03 | 0.9986 | 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+02 years

Water Dependent Pathways
 Plant

| | Water | | Fish | | Radon | | Water Dependent Pathways Plant | |
|---------|---------|--------|---------------|--------|---------|--------|-----------------------------------|--------|
| | Meat | Milk | All Pathways* | | | | | |
| Radio- | AAAAA | | AAAAA | | AAAAA | | AAAAA | |
| | AAAAA | | AAAAA | | AAAAA | | AAAAA | |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |


```

mrem/yr  fract.  mrem/yr  fract.  mrem/yr  fract.  mrem/yr  fract.  mrem/yr  fract.
AAAAAAAA AAAAAAAAAA AAAAAA  AAAAAAAAAA AAAAAA  AAAAAAAAAA AAAAAA  AAAAAAAAAA AAAAAA
AAAAAAAAA AAAAAA  AAAAAAAAAA AAAAAA  AAAAAAAAAA AAAAAA
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  1.067E-03 1.0000
iiiiiii  iiiiiiiii  iiiiii  iiiiiiiii  iiiiii  iiiiiiiii  iiiiii  iiiiiiiii  iiiiii
iiiiiiiiii  iiiiii  iiiiiiiii  iiiiii  iiiiiiiii  iiiiii
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  1.067E-03 1.0000
0*Sum of all water independent and dependent pathways.
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Total Dose Contributions TDOSE(i,p,t) for Individual

Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t =

1.000E+03 years

0
excludes radon)

Water Independent Pathways (Inhalation

| | Ground | Milk | Inhalation | Soil | Radon | Plant |
|-----------|-----------|-----------|------------|-----------|-----------|---------|
| Meat | | | | | | |
| Radio- | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| Ra-226 | 1.000E-06 | 0.0014 | 0.000E+00 | 0.0000 | 7.217E-04 | 0.9986 |
| 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.0000 |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| Total | 1.000E-06 | 0.0014 | 0.000E+00 | 0.0000 | 7.217E-04 | 0.9986 |
| 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.0000 |

0

Total Dose Contributions TDOSE(i,p,t) for Individual

Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t =

1.000E+03 years

0

Water Dependent Pathways

| | Water | Milk | Fish | All Pathways* | Radon | Plant |
|-----------|-----------|-----------|-----------|---------------|-----------|---------|
| Meat | | | | | | |
| Radio- | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| 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 | 7.227E-04 | 1.0000 | 0.0000 |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| 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 | 7.227E-04 | 1.0000 | 0.0000 |

0*Sum of all water independent and dependent pathways.

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T< Limit = 180 days

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Summary : Ra-226 15 pCi/g With Actual Cover Scenario

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Dose/Source Ratios Summed Over All Pathways

Parent and Progeny Principal Radionuclide Contributions Indicated

| Parent (mrem/yr)/(pCi/g) | Product (j) | Thread Fraction | DSR(j,t) At Time in Years | | | | |
|-----------------------------|----------------|--------------------|---------------------------|-----------|-----------|-----------|-----------|
| 1.000E+03 | | | 0.000E+00 | 2.000E-01 | 1.000E+01 | 1.000E+02 | 3.000E+02 |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| Ra-226+D | Ra-226+D | 1.000E+00 | 7.431E-05 | 7.430E-05 | 7.399E-05 | 7.116E-05 | 6.525E-05 |
| 4.818E-05 | | | | | | | |
| Ra-226+D | Pb-210+D | 1.000E+00 | 3.926E-16 | 5.483E-16 | 7.062E-15 | 2.310E-14 | 2.211E-14 |
| 1.633E-14 | | | | | | | |
| Ra-226+D | äDSR(j) | | 7.431E-05 | 7.430E-05 | 7.399E-05 | 7.116E-05 | 6.525E-05 |
| 4.818E-05 | | | | | | | |

0

Basic Radiation Dose Limit = 2.500E+01 mrem/yr

| ONuclide (i) | t= | 0.000E+00 | 2.000E-01 | 1.000E+01 | 1.000E+02 | 3.000E+02 | 1.000E+03 |
|-----------------|----|-----------|-----------|-----------|-----------|-----------|-----------|
| AAAAAAA | | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA |
| Ra-226 | | 3.364E+05 | 3.365E+05 | 3.379E+05 | 3.513E+05 | 3.831E+05 | 5.189E+05 |

iiiiiii iiiiiiiiii iiiiiiiiii iiiiiiiiii iiiiiiiiii iiiiiiiiii iiiiiiiiii

0

| Onuclide (i) | Initial (pCi/g) | tmin (years) | DSR(i,tmin) | G(i,tmin) (pCi/g) | DSR(i,tmax) | G(i,tmax) (pCi/g) |
|-----------------|--------------------|----------------------|-------------|----------------------|-------------|----------------------|
| AAAAAAA | AAAAAAAAA | AAAAAAAAAAAAAAAAAAAA | AAAAAAAAA | AAAAAAAAA | AAAAAAAAA | AAAAAAAAA |
| Ra-226 | 1.500E+01 | 0.000E+00 | 7.431E-05 | 3.364E+05 | 7.431E-05 | 3.364E+05 |
| TTTTTTT | TTTTTTTTT | TTTTTTTTTTTTTTTTTTTT | TTTTTTTTT | TTTTTTTTT | TTTTTTTTT | TTTTTTTTT |

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| ONuclide (j) | Parent (i) | THF(i) | DOSE(j,t), mrem/yr | | | | |
|-----------------|---------------|-----------|--------------------|-----------|-----------|-----------|-----------|
| | | | t= 0.000E+00 | 2.000E-01 | 1.000E+01 | 1.000E+02 | 3.000E+02 |
| 1.000E+03 | | | | | | | |
| AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA |
| AAAAAAA | | | | | | | |
| Ra-226 | Ra-226 | 1.000E+00 | 1.115E-03 | 1.115E-03 | 1.110E-03 | 1.067E-03 | 9.788E-04 |
| 7.227E-04 | | | | | | | |
| 0Pb-210 | Ra-226 | 1.000E+00 | 5.889E-15 | 8.225E-15 | 1.059E-13 | 3.464E-13 | 3.316E-13 |
| 2.449E-13 | | | | | | | |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| iiiiiii | | | | | | | |

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

| ONuclide | Parent | THF(i) | S(j,t), pCi/g | | | | |
|-----------|---------|-----------|---------------|-----------|-----------|-----------|-----------|
| (j) | (i) | | t= 0.000E+00 | 2.000E-01 | 1.000E+01 | 1.000E+02 | 3.000E+02 |
| 1.000E+03 | | | | | | | |
| AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA |
| AAAAAAA | | | | | | | |
| Ra-226 | Ra-226 | 1.000E+00 | 1.500E+01 | 1.500E+01 | 1.494E+01 | 1.436E+01 | 1.317E+01 |
| 9.726E+00 | | | | | | | |
| 0Pb-210 | Ra-226 | 1.000E+00 | 0.000E+00 | 9.337E-02 | 4.000E+00 | 1.362E+01 | 1.305E+01 |
| 9.636E+00 | | | | | | | |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| iiiiiii | | | | | | | |

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

ORESCALC.EXE execution time = 226RaActualCover.txt.REP
7.53 seconds

Input - UNATFEB.rad

UNATFEB.RAD

```

&DB
CODENAME = 'RESRAD-ONSITE',
ICRPTRANS = 'ICRP107',
HAFTIM = '180 days',
EXTERNAL_DCF= 'DCFPK3.02',
DFFILE = 'DOE STD-1196-2011 (Reference Person)',
RISKLIB= 'DCFPK3.02 Morbidity',
DOSELIB= 'DOE STD-1196-2011 (Reference Person)',
NANUC = 9 ,
NIY = 6 ,
NPD = 13 ,
NPTS = 32 ,
NS = 1 ,
NPDS = 22 ,
U_activity = 'pci',
U_dose_unit = 'mrem' ,
nDA11 = 5 ,
nUniqueNuc = 35 ,
&END
&INDATA
TITLE = 'Natural Uranium 100 pCi/g',
DIRECTORY_NAME = 'C:\USERS\BRIAN\DESKTOP\LISA OTHER WORK\SEPT RESRAD ANALYSIS
2016\' ,
NPTS = 32 ,
TDISK = ' ' , VERS = '7.2' ,
XSPACE = 'LOG' ,
FINDPEAK = 0 ,
LYMAX = 17 ,
KYMAX = 1 ,
COVER0 = .15 ,
DENSECV = 1.5 ,
VCV = 0 ,
DENSECZ = 1.5 ,
VCZ = .001 ,
TPCZ = .4 ,
FCCZ = .2 ,
HCCZ = .001 ,
BCZ = 0 ,
HUMID = 8 ,
EVAPTR = .5 ,
PRECIP = .41 ,
RI = 0 ,
IDITCH = 0 ,
RUNOFF = .2 ,
WAREA = 1000000 ,
EPS = .001 ,
NS = 1 ,
TI = 0 ,
DENSEAQ = 1.5 ,
TPSZ = .4 ,
EPSZ = .2 ,
FCSZ = .2 ,
HCSZ = 100 ,
HGWT = .02 ,
BSZ = 5.3 ,
VWT = .001 ,
DWIBWT = 10 ,
MODEL = 0 ,
UW = 250 ,
AREA = 868.36 ,
THICK0 = .15 ,
SUBMFRACT = 0 ,
LCZPAQ = 100 ,

```

UNATFEB.RAD

BRDL = 25,
T(1) = 0,
T(2) = .2,
T(3) = 10,
T(4) = 100,
T(5) = 300,
T(6) = 1000,
T(7) = 0,
T(8) = 0,
T(9) = 0,
T(10) = 0,
INHALR = 8400,
MLINH = .0001,
ED = 30,
SHF1 = .7,
SHF3 = .4,
FIND = 0,
FOTD = 1,
FS = 1,
RAD_SHAPE(1) = 50,
RAD_SHAPE(2) = 70.71068,
RAD_SHAPE(3) = 0,
RAD_SHAPE(4) = 0,
RAD_SHAPE(5) = 0,
RAD_SHAPE(6) = 0,
RAD_SHAPE(7) = 0,
RAD_SHAPE(8) = 0,
RAD_SHAPE(9) = 0,
RAD_SHAPE(10) = 0,
RAD_SHAPE(11) = 0,
RAD_SHAPE(12) = 0,
FRACA(1) = 1,
FRACA(2) = .2732395,
FRACA(3) = 0,
FRACA(4) = 0,
FRACA(5) = 0,
FRACA(6) = 0,
FRACA(7) = 0,
FRACA(8) = 0,
FRACA(9) = 0,
FRACA(10) = 0,
FRACA(11) = 0,
FRACA(12) = 0,
DIET(1) = 160,
DIET(2) = 14,
DIET(3) = 92,
DIET(4) = 63,
DIET(5) = 5.4,
DIET(6) = .9,
SOIL = 36.5,
DWI = 510,
FDW = 1,
FHHW = 1,
FLW = 1,
FIRW = 1,
FR9 = .5,
FPLANT = -1,
FMEAT = -1,
FMILK = -1,
LFI5 = 68,
LFI6 = 55,
LWI5 = 50,
LWI6 = 160,

UNATFEB.RAD

LSI = .5,
MLFD = .0001,
DM = .15,
DROOT = .9,
FGWDW = 1,
FGWHH = 1,
FGWLW = 1,
FGWIR = 1,
STOR_T(1) = 14,
STOR_T(2) = 1,
STOR_T(3) = 1,
STOR_T(4) = 20,
STOR_T(5) = 7,
STOR_T(6) = 7,
STOR_T(7) = 1,
STOR_T(8) = 1,
STOR_T(9) = 45,
FLOOR1 = .15,
DENSFL = 2.4,
TPCV = .4,
TPFL = .1,
PH2OCV = .05,
PH2OFL = .03,
DIFCV = .000002,
DIFFL = .0000003,
DIFCZ = .000002,
HMX = 2,
WIND = 2.68,
REXG = .5,
HRM = 2.5,
FAI = 0,
DMFL = -1,
EMANA(1) = .25,
EMANA(2) = .15,
C12WTR = .00002,
C12CZ = .03,
CSOIL = .02,
CAIR = .98,
DMC = .3,
EVS = .0000007,
REVS = 1E-10,
AVFG4 = .8,
AVFG5 = .2,
H(1) = 4,
H(2) = 4,
H(3) = 4,
H(4) = 4,
H(5) = 4,
DENSUZ(1) = 1.5,
DENSUZ(2) = 1.5,
DENSUZ(3) = 1.5,
DENSUZ(4) = 1.5,
DENSUZ(5) = 1.5,
TPUZ(1) = .4,
TPUZ(2) = .4,
TPUZ(3) = .4,
TPUZ(4) = .4,
TPUZ(5) = .4,
EPUZ(1) = .2,
EPUZ(2) = .2,
EPUZ(3) = .2,
EPUZ(4) = .2,
EPUZ(5) = .2,

UNATFEB.RAD

FCUZ(1) = .2,
FCUZ(2) = .2,
FCUZ(3) = .2,
FCUZ(4) = .2,
FCUZ(5) = .2,
BUZ(1) = 5.3,
BUZ(2) = 5.3,
BUZ(3) = 5.3,
BUZ(4) = 5.3,
BUZ(5) = 5.3,
HCUZ(1) = 10,
HCUZ(2) = 10,
HCUZ(3) = 10,
HCUZ(4) = 10,
HCUZ(5) = 10,
INDPOPFLAG = 0,
OFFDISTANCE(1) = 250,
NUMDISTANCES = 0,
AMBIENTTEMP = 10,
LIDHEIGHT = 1000,
SOURCEHEIGHT = 10,
AGVEG(1) = 0,
AGVEG(2) = .5,
AGVEG(3) = .5,
AGMILK(1) = 0,
AGMILK(2) = .5,
AGMILK(3) = .5,
AGMEAT(1) = 0,
AGMEAT(2) = .5,
AGMEAT(3) = .5,
BEEFDENSITY = .164,
MILKEDENSITY = .0207,
VEGLANDFRACTION = .0185,
YV(1) = .7,
YV(2) = 1.5,
YV(3) = 1.1,
TE(1) = .17,
TE(2) = .25,
TE(3) = .08,
TIV(1) = .1,
TIV(2) = 1,
TIV(3) = 1,
WLAM = 20,
RWET(1) = .25,
RWET(2) = .25,
RWET(3) = .25,
RDRY(1) = .25,
RDRY(2) = .25,
RDRY(3) = .25,
NUCNAM = 'Ac-227+D', 'Pa-231', 'Pb-210+D', 'Ra-226+D', 'Th-230',
'U-234', 'U-235+D', 'U-238', 'U-238+D', 'LAST',
S = 5*0, 49.2, 2.2, 2*48.6,
W = 9*0,
DCACTC = 20, 50, 100, 70, 60000, 4*1E+34,
DCACTU1 = 20, 50, 100, 70, 60000, 4*1E+34,
DCACTS = 20, 50, 100, 70, 60000, 4*1E+34,
RLEACH = 9*0,
SOLUBK0 = 9*0,
SDENSCV = 1.5,
SDENSCZ = 1.5,
STHICK0 = 10,
NSEN = 3,
NUM_SAMPS = 300, NUMVAR = 1,

UNATFEB.RAD

```
UNCPD = 1 ,
UNCPND = 1 ,
SELPATH = 131,
&END
&DCF
T_DCF2= .6713621, 0.8769, .0401672, 3.823283E-02, 0.3848, 0.03737,
.0337824, 0.032116, 3.214782E-02,
T_DCF3= 2.308074E-03, 0.0020683, 1.025566E-02, 1.677388E-03,
0.0009361, 2.1497E-04, 2.048357E-04, 1.9388E-04, 2.111993E-04,
BIOFAC2= 1000, 110, 100, 250, 500, 60, 60, 60,
BIOFAC1= 15, 10, 300, 50, 100, 10, 10, 10,
RTF2= .00002, .005, .0008, .001, .0001, .00034, .00034,
.00034, .00034,
RTF3= .00002, .000005, .0003, .001, .000005, .0006, .0006,
.0006, .0006,
RTF1= .0025, .01, .01, .04, .001, .0025, .0025, .0025,
.0025,
SLPF1= 1.628418E-06, 1.273E-07, 4.295087E-09, 8.36718E-06, 8.453E-10,
2.533E-10, 5.7597E-07, 1.238E-10, 1.190658E-07,
SLPF2= 2.132479E-07, 7.621E-08, 3.0825E-08, 2.822095E-08, 3.407E-08,
2.782E-08, 2.50115E-08, 2.364E-08, 2.367078E-08,
SLPF3= 6.538402E-10, 2.257E-10, 3.44202E-09, 5.149498E-10, 1.191E-10,
9.545E-11, 9.7555E-11, 8.657E-11, 1.205048E-10,
SLPF4= 4.871387E-10, 1.724E-10, 2.669116E-09, 3.853363E-10,
9.138E-11, 7.066E-11, 7.1744E-11, 6.4E-11, 8.709332E-11,
SLPF5= 6.538402E-10, 2.257E-10, 3.44202E-09, 5.149498E-10, 1.191E-10,
9.545E-11, 9.7555E-11, 8.657E-11, 1.205048E-10,
T_SLPFRN= 1.8E-12, 1.9E-13, 3.7E-12, 3E-15, 6.2E-12, 3.9E-11,
1.5E-11, 3.7E-11,
T_KFACTR= 388, 188, 388, 188,
&END
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Output - Unat.txt

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| | |
|---|-------------------------------------|
| A-1 ³ Pa-234 (Source: DCFPAK3.02) | ³ 8.275E+00 ³ |
| 8.275E+00 ³ DCF1(11) | |
| A-1 ³ Pa-234m (Source: DCFPAK3.02) | ³ 1.257E-01 ³ |
| 1.257E-01 ³ DCF1(12) | |
| A-1 ³ Pb-210 (Source: DCFPAK3.02) | ³ 2.092E-03 ³ |
| 2.092E-03 ³ DCF1(13) | |
| A-1 ³ Pb-211 (Source: DCFPAK3.02) | ³ 3.680E-01 ³ |
| 3.680E-01 ³ DCF1(14) | |
| A-1 ³ Pb-214 (Source: DCFPAK3.02) | ³ 1.257E+00 ³ |
| 1.257E+00 ³ DCF1(15) | |
| A-1 ³ Po-210 (Source: DCFPAK3.02) | ³ 5.641E-05 ³ |
| 5.641E-05 ³ DCF1(16) | |
| A-1 ³ Po-211 (Source: DCFPAK3.02) | ³ 4.707E-02 ³ |
| 4.707E-02 ³ DCF1(17) | |
| A-1 ³ Po-214 (Source: DCFPAK3.02) | ³ 4.801E-04 ³ |
| 4.801E-04 ³ DCF1(18) | |
| A-1 ³ Po-215 (Source: DCFPAK3.02) | ³ 9.452E-04 ³ |
| 9.452E-04 ³ DCF1(19) | |
| A-1 ³ Po-218 (Source: DCFPAK3.02) | ³ 9.228E-09 ³ |
| 9.228E-09 ³ DCF1(20) | |
| A-1 ³ Ra-223 (Source: DCFPAK3.02) | ³ 5.791E-01 ³ |
| 5.791E-01 ³ DCF1(21) | |
| A-1 ³ Ra-226 (Source: DCFPAK3.02) | ³ 3.176E-02 ³ |
| 3.176E-02 ³ DCF1(22) | |
| A-1 ³ Rn-218 (Source: DCFPAK3.02) | ³ 4.259E-03 ³ |
| 4.259E-03 ³ DCF1(23) | |
| A-1 ³ Rn-219 (Source: DCFPAK3.02) | ³ 2.970E-01 ³ |
| 2.970E-01 ³ DCF1(24) | |
| A-1 ³ Rn-222 (Source: DCFPAK3.02) | ³ 2.130E-03 ³ |
| 2.130E-03 ³ DCF1(25) | |
| A-1 ³ Th-227 (Source: DCFPAK3.02) | ³ 5.641E-01 ³ |
| 5.641E-01 ³ DCF1(26) | |
| A-1 ³ Th-230 (Source: DCFPAK3.02) | ³ 1.106E-03 ³ |
| 1.106E-03 ³ DCF1(27) | |
| A-1 ³ Th-231 (Source: DCFPAK3.02) | ³ 3.250E-02 ³ |
| 3.250E-02 ³ DCF1(28) | |
| A-1 ³ Th-234 (Source: DCFPAK3.02) | ³ 2.316E-02 ³ |
| 2.316E-02 ³ DCF1(29) | |
| A-1 ³ Tl-206 (Source: DCFPAK3.02) | ³ 1.278E-02 ³ |
| 1.278E-02 ³ DCF1(30) | |
| A-1 ³ Tl-207 (Source: DCFPAK3.02) | ³ 2.391E-02 ³ |
| 2.391E-02 ³ DCF1(31) | |
| A-1 ³ Tl-210 (Source: DCFPAK3.02) | ³ 1.677E+01 ³ |
| 1.677E+01 ³ DCF1(32) | |
| A-1 ³ U-234 (Source: DCFPAK3.02) | ³ 3.456E-04 ³ |
| 3.456E-04 ³ DCF1(33) | |
| A-1 ³ U-235 (Source: DCFPAK3.02) | ³ 7.005E-01 ³ |
| 7.005E-01 ³ DCF1(34) | |
| A-1 ³ U-238 (Source: DCFPAK3.02) | ³ 1.713E-04 ³ |
| 1.713E-04 ³ DCF1(35) | |

B-1 ³ Dose conversion factors for inhalation, mrem/pCi:

| | |
|---------------------------------|-------------------------------------|
| B-1 ³ Ac-227+D | ³ 6.714E-01 ³ |
| 5.957E-01 ³ DCF2(1) | |
| B-1 ³ Pa-231 | ³ 8.769E-01 ³ |
| 8.769E-01 ³ DCF2(2) | |
| B-1 ³ Pb-210+D | ³ 4.017E-02 ³ |
| 2.231E-02 ³ DCF2(3) | |
| B-1 ³ Ra-226+D | ³ 3.823E-02 ³ |
| 3.811E-02 ³ DCF2(4) | |
| B-1 ³ Th-230 | ³ 3.848E-01 ³ |

| | | |
|---|-----------|---|
| 3 | 3.737E-02 | 3 |
| 3 | 3.378E-02 | 3 |
| 3 | 3.212E-02 | 3 |
| 3 | 3.215E-02 | 3 |
| 3 | | 3 |

9 3

3 2.308E-03 3

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Dose Library: DOE STD-1196-2011 (Reference Person)

3 Current 3

3 value# 3

[illegible]

| | |
|---------------------------------|------------------------|
| D-1 ³ Pa-231 | ³ 2.068E-03 |
| 2.068E-03 ³ DCF3(2) | |
| D-1 ³ Pb-210+D | ³ 1.026E-02 |
| 3.774E-03 ³ DCF3(3) | |
| D-1 ³ Ra-226+D | ³ 1.677E-03 |
| 1.676E-03 ³ DCF3(4) | |
| D-1 ³ Th-230 | ³ 9.361E-04 |
| 9.361E-04 ³ DCF3(5) | |
| D-1 ³ U-234 | ³ 2.150E-04 |
| 2.150E-04 ³ DCF3(6) | |
| D-1 ³ U-235+D | ³ 2.048E-04 |
| 2.031E-04 ³ DCF3(7) | |
| D-1 ³ U-238 | ³ 1.939E-04 |
| 1.939E-04 ³ DCF3(8) | |
| D-1 ³ U-238+D | ³ 2.112E-04 |
| 1.939E-04 ³ DCF3(9) | |

3 3

| | | | |
|-----------|--------------|----------|---|
| D-34 | ³ | Ac-227+D | , plant/soil concentration ratio, dimensionless |
| 2.500E-03 | ³ | RTF(| 1,1) |
| D-34 | ³ | Ac-227+D | , beef/livestock-intake ratio, (pci/kg)/(pci/d) |
| 2.000E-05 | ³ | RTF(| 1,2) |
| D-34 | ³ | Ac-227+D | , milk/livestock-intake ratio, (pci/L)/(pci/d) |
| 2.000E-05 | ³ | RTF(| 1,3) |
| D-34 | ³ | | |

3 2.500E-03 3
3 2.000E-05 3
3 2.000E-05 3
3 3

D-34 ³ Pa-231 , plant/soil concentration ratio, dimensionless
1.000E-02 ³ RTF(2,1)
D-34 ³ Pa-231 , beef/livestock-intake ratio, (pci/kg)/(pci/d)
5.000E-03 ³ RTF(2,2)

3 1.000E-02 3

3 5.000E-03 3

| | | |
|--|---|-------------------------------------|
| D-34 ³ Pa-231 | , milk/livestock-intake ratio, (pCi/L)/(pCi/d) | ³ 5.000E-06 ³ |
| 5.000E-06 ³ RTF(| 2,3) | ³ |
| D-34 ³ | | ³ |
| D-34 ³ Pb-210+D | , plant/soil concentration ratio, dimensionless | ³ 1.000E-02 ³ |
| 1.000E-02 ³ RTF(| 3,1) | ³ |
| D-34 ³ Pb-210+D | , beef/livestock-intake ratio, (pCi/kg)/(pCi/d) | ³ 8.000E-04 ³ |
| 8.000E-04 ³ RTF(| 3,2) | ³ |
| D-34 ³ Pb-210+D | , milk/livestock-intake ratio, (pCi/L)/(pCi/d) | ³ 3.000E-04 ³ |
| 3.000E-04 ³ RTF(| 3,3) | ³ |
| D-34 ³ | | ³ |
| D-34 ³ Ra-226+D | , plant/soil concentration ratio, dimensionless | ³ 4.000E-02 ³ |
| 4.000E-02 ³ RTF(| 4,1) | ³ |
| D-34 ³ Ra-226+D | , beef/livestock-intake ratio, (pCi/kg)/(pCi/d) | ³ 1.000E-03 ³ |
| 1.000E-03 ³ RTF(| 4,2) | ³ |
| D-34 ³ Ra-226+D | , milk/livestock-intake ratio, (pCi/L)/(pCi/d) | ³ 1.000E-03 ³ |
| 1.000E-03 ³ RTF(| 4,3) | ³ |
| D-34 ³ | | ³ |
| D-34 ³ Th-230 | , plant/soil concentration ratio, dimensionless | ³ 1.000E-03 ³ |
| 1.000E-03 ³ RTF(| 5,1) | ³ |
| D-34 ³ Th-230 | , beef/livestock-intake ratio, (pCi/kg)/(pCi/d) | ³ 1.000E-04 ³ |
| 1.000E-04 ³ RTF(| 5,2) | ³ |
| D-34 ³ Th-230 | , milk/livestock-intake ratio, (pCi/L)/(pCi/d) | ³ 5.000E-06 ³ |
| 5.000E-06 ³ RTF(| 5,3) | ³ |
| D-34 ³ | | ³ |
| D-34 ³ U-234 | , plant/soil concentration ratio, dimensionless | ³ 2.500E-03 ³ |
| 2.500E-03 ³ RTF(| 6,1) | ³ |
| D-34 ³ U-234 | , beef/livestock-intake ratio, (pCi/kg)/(pCi/d) | ³ 3.400E-04 ³ |
| 3.400E-04 ³ RTF(| 6,2) | ³ |
| D-34 ³ U-234 | , milk/livestock-intake ratio, (pCi/L)/(pCi/d) | ³ 6.000E-04 ³ |
| 6.000E-04 ³ RTF(| 6,3) | ³ |
| D-34 ³ | | ³ |
| D-34 ³ U-235+D | , plant/soil concentration ratio, dimensionless | ³ 2.500E-03 ³ |
| 2.500E-03 ³ RTF(| 7,1) | ³ |
| D-34 ³ U-235+D | , beef/livestock-intake ratio, (pCi/kg)/(pCi/d) | ³ 3.400E-04 ³ |
| 3.400E-04 ³ RTF(| 7,2) | ³ |
| D-34 ³ U-235+D | , milk/livestock-intake ratio, (pCi/L)/(pCi/d) | ³ 6.000E-04 ³ |
| 6.000E-04 ³ RTF(| 7,3) | ³ |
| D-34 ³ | | ³ |
| D-34 ³ U-238 | , plant/soil concentration ratio, dimensionless | ³ 2.500E-03 ³ |
| 2.500E-03 ³ RTF(| 8,1) | ³ |
| D-34 ³ U-238 | , beef/livestock-intake ratio, (pCi/kg)/(pCi/d) | ³ 3.400E-04 ³ |
| 3.400E-04 ³ RTF(| 8,2) | ³ |
| D-34 ³ U-238 | , milk/livestock-intake ratio, (pCi/L)/(pCi/d) | ³ 6.000E-04 ³ |
| 6.000E-04 ³ RTF(| 8,3) | ³ |
| D-34 ³ | | ³ |
| D-34 ³ U-238+D | , plant/soil concentration ratio, dimensionless | ³ 2.500E-03 ³ |
| 2.500E-03 ³ RTF(| 9,1) | ³ |
| D-34 ³ U-238+D | , beef/livestock-intake ratio, (pCi/kg)/(pCi/d) | ³ 3.400E-04 ³ |
| 3.400E-04 ³ RTF(| 9,2) | ³ |
| D-34 ³ U-238+D | , milk/livestock-intake ratio, (pCi/L)/(pCi/d) | ³ 6.000E-04 ³ |
| 6.000E-04 ³ RTF(| 9,3) | ³ |
| D-5 ³ | | ³ |
| D-5 ³ Bioaccumulation factors, fresh water, L/kg: | | ³ |
| D-5 ³ Ac-227+D | , fish | ³ 1.500E+01 ³ |

1.500E+01 ³ BIOFAC(1,1)
D-5 ³ Ac-227+D , crustacea and mollusks ³ 1.000E+03 ³
1.000E+03 ³ BIOFAC(1,2)
D-5 ³ ³

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Summary : Natural Uranium 100 pci/g
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Dose Conversion Factor (and Related) Parameter Summary

(continued)

Dose Library: DOE STD-1196-2011 (Reference Person)

| Base | Parameter | Current |
|-------|-----------|---------|
| Menu | Parameter | Value# |
| Case* | Name | |

[illegible]

| | | | | | | |
|-----------|--------------|--------------|--------------------------|--------------|-----------|--------------|
| D-5 | ³ | Pa-231 | , fish | ³ | 1.000E+01 | ³ |
| 1.000E+01 | ³ | BIOFAC(2,1) | | | | |
| D-5 | ³ | Pa-231 | , crustacea and mollusks | ³ | 1.100E+02 | ³ |
| 1.100E+02 | ³ | BIOFAC(2,2) | | | | |
| D-5 | ³ | | | ³ | | ³ |

| | | | | | | |
|-----------|--------------|----------|------------------------|--------------|-----------|--------------|
| D-5 | ³ | Pb-210+D | fish | ³ | 3.000E+02 | ³ |
| 3.000E+02 | ³ | BIOFAC(| 3,1) | ³ | | ³ |
| D-5 | ³ | Pb-210+D | crustacea and mollusks | ³ | 1.000E+02 | ³ |
| 1.000E+02 | ³ | BIOFAC(| 3,2) | ³ | | ³ |
| D-5 | ³ | | | ³ | | ³ |

| | | | | | | |
|-----------|---|----------|------------------------|---|-----------|---|
| D-5 | 3 | Ra-226-D | fish | 3 | 5.000E+01 | 3 |
| 5.000E+01 | 3 | BIOFAC(| 4,1) | | | |
| D-5 | 3 | Ra-226-D | crustacea and mollusks | 3 | 2.500E+02 | 3 |
| 2.500E+02 | 3 | BIOFAC(| 4,2) | | | |
| D-5 | 3 | | | 3 | | 3 |

| | | | |
|-----------|--------------|------------------------|-----------|
| D-5 | Th-230 | fish | 1.000E+02 |
| 1.000E+02 | BIOFAC(5,1) | | |
| D-5 | Th-230 | crustacea and mollusks | 5.000E+02 |
| 5.000E+02 | BIOFAC(5,2) | | |
| D-5 | | | |

| | | | | | | |
|-----------|---|---------|--------------------------|---|-----------|---|
| D-5 | 3 | U-234 | , fish | 3 | 1.000E+01 | 3 |
| 1.000E+01 | 3 | BIOFAC(| 6,1) | | | |
| D-5 | 3 | U-234 | , crustacea and mollusks | 3 | 6.000E+01 | 3 |
| 6.000E+01 | 3 | BIOFAC(| 6,2) | | | |
| D-5 | 3 | | | 3 | | 3 |

| | | | | | | |
|-----------|---|---------|------------------------|---|-----------|---|
| D-5 | 3 | U-235+D | fish | 3 | 1.000E+01 | 3 |
| 1.000E+01 | 3 | BIOFAC(| 7,1) | | | |
| D-5 | 3 | U-235+D | crustacea and mollusks | 3 | 6.000E+01 | 3 |
| 6.000E+01 | 3 | BIOFAC(| 7,2) | | | |
| D-5 | 3 | | | 3 | | 3 |

| | | | |
|-----------|--------------|------------------------|-----------|
| D-5 | U-238 | fish | 1.000E+01 |
| 1.000E+01 | BIOFAC(8,1) | | |
| D-5 | U-238 | crustacea and mollusks | 6.000E+01 |
| 6.000E+01 | BIOFAC(8,2) | | |
| D-5 | | | |

D-5 3 U-238+D , fish 3 1.000E+01 3
 1.000E+01 3 BIOFAC(9,1)
 D-5 3 U-238+D , crustacea and mollusks 3 6.000E+01 3
 6.000E+01 3 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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5
 Summary : Natural Uranium 100 pCi/g
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Site-Specific Parameter Summary

0 3 User 3
 Used by RESRAD 3 Parameter
 Menu 3 Parameter 3 Input 3 Default 3
 (If different from user input) 3 Name

 #####

R011 3 Area of contaminated zone (m**2) 3 8.684E+02 3 1.000E+04 3

--- 3 AREA 3

R011 3 Thickness of contaminated zone (m) 3 1.500E-01 3 2.000E+00 3

--- 3 THICK0 3

R011 3 Fraction of contamination that is submerged 3 0.000E+00 3 0.000E+00 3

--- 3 SUBMFRACT 3

R011 3 Length parallel to aquifer flow (m) 3 not used 3 1.000E+02 3

--- 3 LCZPAQ 3

R011 3 Basic radiation dose limit (mrem/yr) 3 2.500E+01 3 3.000E+01 3

--- 3 BRDL 3

R011 3 Time since placement of material (yr) 3 0.000E+00 3 0.000E+00 3

--- 3 TI 3

R011 3 Times for calculations (yr) 3 2.000E-01 3 1.000E+00 3

--- 3 T(2) 3

R011 3 Times for calculations (yr) 3 1.000E+01 3 3.000E+00 3

--- 3 T(3) 3

R011 3 Times for calculations (yr) 3 1.000E+02 3 1.000E+01 3

--- 3 T(4) 3

R011 3 Times for calculations (yr) 3 3.000E+02 3 3.000E+01 3

--- 3 T(5) 3

R011 3 Times for calculations (yr) 3 1.000E+03 3 1.000E+02 3

--- 3 T(6) 3

R011 3 Times for calculations (yr) 3 not used 3 3.000E+02 3

--- 3 T(7) 3

R011 3 Times for calculations (yr) 3 not used 3 1.000E+03 3

--- 3 T(8) 3

R011 3 Times for calculations (yr) 3 not used 3 0.000E+00 3

--- 3 T(9) 3

R011 3 Times for calculations (yr) 3 not used 3 0.000E+00 3

--- 3 T(10) 3

R012 3 Initial principal radionuclide (pCi/g): U-234 3 4.920E+01 3 0.000E+00 3

--- 3 S1(6) 3

R012 3 Initial principal radionuclide (pCi/g): U-235 3 2.200E+00 3 0.000E+00 3

--- 3 S1(7) 3

R012 3 Initial principal radionuclide (pCi/g): U-238 3 4.860E+01 3 0.000E+00 3

--- 3 S1(8) 3

R012 3 Concentration in groundwater (pCi/L): U-234 3 not used 3 0.000E+00 3

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| | | | | | | |
|------|-----|---------------------|---|------------------------|------------------------|--------------|
| R012 | --- | ³ W1(6) | Concentration in groundwater (pCi/L): U-235 | ³ not used | ³ 0.000E+00 | ³ |
| R012 | --- | ³ W1(7) | Concentration in groundwater (pCi/L): U-238 | ³ not used | ³ 0.000E+00 | ³ |
| | --- | ³ W1(8) | | ³ | ³ | ³ |
| R013 | --- | ³ | Cover depth (m) | ³ 1.500E-01 | ³ 0.000E+00 | ³ |
| R013 | --- | ³ COVER0 | Density of cover material (g/cm**3) | ³ 1.500E+00 | ³ 1.500E+00 | ³ |
| R013 | --- | ³ DENSVC | Cover depth erosion rate (m/yr) | ³ 0.000E+00 | ³ 1.000E-03 | ³ |
| R013 | --- | ³ VCV | Density of contaminated zone (g/cm**3) | ³ 1.500E+00 | ³ 1.500E+00 | ³ |
| R013 | --- | ³ DENSCH | Contaminated zone erosion rate (m/yr) | ³ 1.000E-03 | ³ 1.000E-03 | ³ |
| R013 | --- | ³ VCZ | Contaminated zone total porosity | ³ 4.000E-01 | ³ 4.000E-01 | ³ |
| R013 | --- | ³ TPCZ | Contaminated zone field capacity | ³ 2.000E-01 | ³ 2.000E-01 | ³ |
| R013 | --- | ³ FCCZ | Contaminated zone hydraulic conductivity (m/yr) | ³ 1.000E-03 | ³ 1.000E+01 | ³ |
| R013 | --- | ³ HCCZ | Contaminated zone b parameter | ³ 0.000E+00 | ³ 5.300E+00 | ³ |
| R013 | --- | ³ BCZ | Average annual wind speed (m/sec) | ³ 2.680E+00 | ³ 2.000E+00 | ³ |
| R013 | --- | ³ WIND | Humidity in air (g/m**3) | ³ not used | ³ 8.000E+00 | ³ |
| R013 | --- | ³ HUMID | Evapotranspiration coefficient | ³ 5.000E-01 | ³ 5.000E-01 | ³ |
| R013 | --- | ³ EVAPTR | Precipitation (m/yr) | ³ 4.100E-01 | ³ 1.000E+00 | ³ |
| R013 | --- | ³ PRECIP | Irrigation (m/yr) | ³ 0.000E+00 | ³ 2.000E-01 | ³ |
| R013 | --- | ³ RI | Irrigation mode | ³ overhead | ³ overhead | ³ |
| R013 | --- | ³ IDITCH | Runoff coefficient | ³ 2.000E-01 | ³ 2.000E-01 | ³ |
| R013 | --- | ³ RUNOFF | Watershed area for nearby stream or pond (m**2) | ³ not used | ³ 1.000E+06 | ³ |
| R013 | --- | ³ WAREA | Accuracy for water/soil computations | ³ not used | ³ 1.000E-03 | ³ |
| | --- | ³ EPS | | ³ | ³ | ³ |
| R014 | --- | ³ | Density of saturated zone (g/cm**3) | ³ not used | ³ 1.500E+00 | ³ |
| R014 | --- | ³ DENSAQ | Saturated zone total porosity | ³ not used | ³ 4.000E-01 | ³ |
| R014 | --- | ³ TPSZ | Saturated zone effective porosity | ³ not used | ³ 2.000E-01 | ³ |
| R014 | --- | ³ EPSZ | Saturated zone field capacity | ³ not used | ³ 2.000E-01 | ³ |
| R014 | --- | ³ FCSZ | Saturated zone hydraulic conductivity (m/yr) | ³ not used | ³ 1.000E+02 | ³ |
| R014 | --- | ³ HCSZ | Saturated zone hydraulic gradient | ³ not used | ³ 2.000E-02 | ³ |
| R014 | --- | ³ HGWT | Saturated zone b parameter | ³ not used | ³ 5.300E+00 | ³ |
| R014 | --- | ³ BSZ | Water table drop rate (m/yr) | ³ not used | ³ 1.000E-03 | ³ |
| | --- | ³ VWT | | | | |

Summary : Natural Uranium 100 pCi/g
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Site-Specific Parameter Summary

(continued)

| Menu | Used by RESRAD | Parameter (If different from user input) | Parameter Name | User Input | Default |
|--|----------------|--|-------------------|---------------|-----------|
| AA | | | | | |
| R014 | | Well pump intake depth (m below water table) | DWIBWT | not used | 1.000E+01 |
| R014 | | Model: Nondispersion (ND) or Mass-Balance (MB) | MODEL | not used | ND |
| R014 | | Well pumping rate (m ³ /yr) | UW | not used | 2.500E+02 |
| R015 | | Number of unsaturated zone strata | NS | not used | 1 |
| R015 | | Unsat. zone 1, thickness (m) | H(1) | not used | 4.000E+00 |
| R015 | | Unsat. zone 1, soil density (g/cm ³) | DENSUZ(1) | not used | 1.500E+00 |
| R015 | | Unsat. zone 1, total porosity | TPUZ(1) | not used | 4.000E-01 |
| R015 | | Unsat. zone 1, effective porosity | EPUZ(1) | not used | 2.000E-01 |
| R015 | | Unsat. zone 1, field capacity | FCUZ(1) | not used | 2.000E-01 |
| R015 | | Unsat. zone 1, soil-specific b parameter | BUZ(1) | not used | 5.300E+00 |
| R015 | | Unsat. zone 1, hydraulic conductivity (m/yr) | HCUZ(1) | not used | 1.000E+01 |
| R016 | | Distribution coefficients for U-234 | | | |
| R016 | | Contaminated zone (cm ³ /g) | DCNUCC(6) | 1.000E+34 | 5.000E+01 |
| R016 | | Unsat. zone 1 (cm ³ /g) | DCNUCU(6,1) | not used | 5.000E+01 |
| R016 | | Saturated zone (cm ³ /g) | DCNUCS(6) | not used | 5.000E+01 |
| R016 | | Leach rate (/yr) | ALEACH(6) | 0.000E+00 | 0.000E+00 |
| R016 | | Solubility constant | SOLUBK(6) | 0.000E+00 | 0.000E+00 |
| R016 | | Distribution coefficients for U-235 | | | |
| R016 | | Contaminated zone (cm ³ /g) | DCNUCC(7) | 1.000E+34 | 5.000E+01 |
| R016 | | Unsat. zone 1 (cm ³ /g) | DCNUCU(7,1) | not used | 5.000E+01 |
| R016 | | Saturated zone (cm ³ /g) | DCNUCS(7) | not used | 5.000E+01 |
| R016 | | Leach rate (/yr) | ALEACH(7) | 0.000E+00 | 0.000E+00 |

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| | | | | |
|------|---|--------------|-----------|-----------|
| R016 | Solubility constant | SOLUBK(7) | 0.000E+00 | 0.000E+00 |
| | not used | | | |
| R016 | Distribution coefficients for U-238 | | | |
| R016 | Contaminated zone (cm**3/g) | DCNUCC(8) | 1.000E+34 | 5.000E+01 |
| R016 | Unsaturated zone 1 (cm**3/g) | DCNUCU(8,1) | not used | 5.000E+01 |
| R016 | Saturated zone (cm**3/g) | DCNUCS(8) | not used | 5.000E+01 |
| R016 | Leach rate (/yr) | ALEACH(8) | 0.000E+00 | 0.000E+00 |
| | 7.289E-35 | | | |
| R016 | Solubility constant | SOLUBK(8) | 0.000E+00 | 0.000E+00 |
| | not used | | | |
| R016 | Distribution coefficients for daughter Ac-227 | | | |
| R016 | Contaminated zone (cm**3/g) | DCNUCC(1) | 2.000E+01 | 2.000E+01 |
| R016 | Unsaturated zone 1 (cm**3/g) | DCNUCU(1,1) | not used | 2.000E+01 |
| R016 | Saturated zone (cm**3/g) | DCNUCS(1) | not used | 2.000E+01 |
| R016 | Leach rate (/yr) | ALEACH(1) | 0.000E+00 | 0.000E+00 |
| | 3.596E-02 | | | |
| R016 | Solubility constant | SOLUBK(1) | 0.000E+00 | 0.000E+00 |
| | not used | | | |
| R016 | Distribution coefficients for daughter Pa-231 | | | |
| R016 | Contaminated zone (cm**3/g) | DCNUCC(2) | 5.000E+01 | 5.000E+01 |
| R016 | Unsaturated zone 1 (cm**3/g) | DCNUCU(2,1) | not used | 5.000E+01 |
| R016 | Saturated zone (cm**3/g) | DCNUCS(2) | not used | 5.000E+01 |
| R016 | Leach rate (/yr) | ALEACH(2) | 0.000E+00 | 0.000E+00 |
| | 1.450E-02 | | | |
| R016 | Solubility constant | SOLUBK(2) | 0.000E+00 | 0.000E+00 |
| | not used | | | |

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Summary : Natural Uranium 100 pCi/g
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Site-Specific Parameter Summary

| | | | |
|--|-----------------------------|------------|---------------------|
| (continued) | | | |
| 0 | Used by RESRAD | Parameter | User |
| Menu | Parameter | Input | Default |
| (If different from user input) | Name | | |
| AA AA R016 Distribution coefficients for daughter Pb-210 | | | |
| R016 | Contaminated zone (cm**3/g) | DCNUCC(3) | 1.000E+02 1.000E+02 |
| | --- | | |

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| | | | | |
|------|--|---------------|-----------|-----------|
| R016 | Unsaturated zone 1 (cm**3/g) | DCNUCU(3,1) | not used | 1.000E+02 |
| R016 | Saturated zone (cm**3/g) | DCNUCS(3) | not used | 1.000E+02 |
| R016 | Leach rate (/yr) | ALEACH(3) | 0.000E+00 | 0.000E+00 |
| R016 | Solubility constant | SOLUBK(3) | 0.000E+00 | 0.000E+00 |
| | not used | | | |
| R016 | Distribution coefficients for daughter Ra-226 | | | |
| R016 | Contaminated zone (cm**3/g) | DCNUCC(4) | 7.000E+01 | 7.000E+01 |
| R016 | Unsaturated zone 1 (cm**3/g) | DCNUCU(4,1) | not used | 7.000E+01 |
| R016 | Saturated zone (cm**3/g) | DCNUCS(4) | not used | 7.000E+01 |
| R016 | Leach rate (/yr) | ALEACH(4) | 0.000E+00 | 0.000E+00 |
| R016 | Solubility constant | SOLUBK(4) | 0.000E+00 | 0.000E+00 |
| | not used | | | |
| R016 | Distribution coefficients for daughter Th-230 | | | |
| R016 | Contaminated zone (cm**3/g) | DCNUCC(5) | 6.000E+04 | 6.000E+04 |
| R016 | Unsaturated zone 1 (cm**3/g) | DCNUCU(5,1) | not used | 6.000E+04 |
| R016 | Saturated zone (cm**3/g) | DCNUCS(5) | not used | 6.000E+04 |
| R016 | Leach rate (/yr) | ALEACH(5) | 0.000E+00 | 0.000E+00 |
| R016 | Solubility constant | SOLUBK(5) | 0.000E+00 | 0.000E+00 |
| | not used | | | |
| R017 | Inhalation rate (m**3/yr) | INHALR | 8.400E+03 | 8.400E+03 |
| R017 | Mass loading for inhalation (g/m**3) | MLINH | 1.000E-04 | 1.000E-04 |
| R017 | Exposure duration | ED | 3.000E+01 | 3.000E+01 |
| R017 | Shielding factor, inhalation | SHF3 | 4.000E-01 | 4.000E-01 |
| R017 | Shielding factor, external gamma | SHF1 | 7.000E-01 | 7.000E-01 |
| R017 | Fraction of time spent indoors | FIND | 0.000E+00 | 5.000E-01 |
| R017 | Fraction of time spent outdoors (on site) | FOTD | 1.000E+00 | 2.500E-01 |
| R017 | Shape factor flag, external gamma | FS | 1.000E+00 | 1.000E+00 |
| | >0 shows circular AREA. | | | |
| R017 | Radii of shape factor array (used if FS = -1): | | | |
| R017 | Outer annular radius (m), ring 1: | RAD_SHAPE(1) | not used | 5.000E+01 |
| R017 | Outer annular radius (m), ring 2: | RAD_SHAPE(2) | not used | 7.071E+01 |
| R017 | Outer annular radius (m), ring 3: | RAD_SHAPE(3) | not used | 0.000E+00 |
| R017 | Outer annular radius (m), ring 4: | | not used | 0.000E+00 |

| Variable | Unit | Ring | Value |
|----------|------|------|-----------|
| R017 | m | 5 | 0.000E+00 |
| R017 | m | 6 | 0.000E+00 |
| R017 | m | 7 | 0.000E+00 |
| R017 | m | 8 | 0.000E+00 |
| R017 | m | 9 | 0.000E+00 |
| R017 | m | 10 | 0.000E+00 |
| R017 | m | 11 | 0.000E+00 |
| R017 | m | 12 | 0.000E+00 |

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Summary : Natural Uranium 100 pCi/g
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(continued)

| Menu | Used by RESRAD | Parameter | User | Input | Default |
|--------------------------------|----------------|-----------|------|-------|---------|
| (If different from user input) | | Name | | | |

| R017 Fractions of annular areas within AREA: | | | | |
|---|-----------|----------|-----------|--|
| R017 Ring 1 | FRACA(1) | not used | 1.000E+00 | |
| R017 Ring 2 | FRACA(2) | not used | 2.732E-01 | |
| R017 Ring 3 | FRACA(3) | not used | 0.000E+00 | |
| R017 Ring 4 | FRACA(4) | not used | 0.000E+00 | |
| R017 Ring 5 | FRACA(5) | not used | 0.000E+00 | |
| R017 Ring 6 | FRACA(6) | not used | 0.000E+00 | |
| R017 Ring 7 | FRACA(7) | not used | 0.000E+00 | |
| R017 Ring 8 | FRACA(8) | not used | 0.000E+00 | |
| R017 Ring 9 | FRACA(9) | not used | 0.000E+00 | |
| R017 Ring 10 | FRACA(10) | not used | 0.000E+00 | |
| R017 Ring 11 | FRACA(11) | not used | 0.000E+00 | |
| R017 Ring 12 | FRACA(12) | not used | 0.000E+00 | |

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| | | | | |
|------|---|---------|-----------|-----------|
| R018 | Leafy vegetable consumption (kg/yr) | DIET(1) | not used | 1.400E+01 |
| R018 | Milk consumption (L/yr) | DIET(2) | not used | 9.200E+01 |
| R018 | Meat and poultry consumption (kg/yr) | DIET(3) | not used | 6.300E+01 |
| R018 | Fish consumption (kg/yr) | DIET(4) | not used | 5.400E+00 |
| R018 | Other seafood consumption (kg/yr) | DIET(5) | not used | 9.000E-01 |
| R018 | Soil ingestion rate (g/yr) | DIET(6) | 3.650E+01 | 3.650E+01 |
| R018 | Drinking water intake (L/yr) | SOIL | not used | 5.100E+02 |
| R018 | Contamination fraction of drinking water | DWI | not used | 1.000E+00 |
| R018 | Contamination fraction of household water | FDW | not used | 1.000E+00 |
| R018 | Contamination fraction of livestock water | FHHW | not used | 1.000E+00 |
| R018 | Contamination fraction of irrigation water | FLW | not used | 1.000E+00 |
| R018 | Contamination fraction of aquatic food | FIRW | not used | 5.000E-01 |
| R018 | Contamination fraction of plant food | FR9 | not used | -1 |
| R018 | Contamination fraction of meat | FPLANT | not used | -1 |
| R018 | Contamination fraction of milk | FMEAT | not used | -1 |
| | | FMILK | | |
| R019 | Livestock fodder intake for meat (kg/day) | LFI5 | not used | 6.800E+01 |
| R019 | Livestock fodder intake for milk (kg/day) | LFI6 | not used | 5.500E+01 |
| R019 | Livestock water intake for meat (L/day) | LWI5 | not used | 5.000E+01 |
| R019 | Livestock water intake for milk (L/day) | LWI6 | not used | 1.600E+02 |
| R019 | Livestock soil intake (kg/day) | LSI | not used | 5.000E-01 |
| R019 | Mass loading for foliar deposition (g/m**3) | MLFD | not used | 1.000E-04 |
| R019 | Depth of soil mixing layer (m) | DM | 1.500E-01 | 1.500E-01 |
| R019 | Depth of roots (m) | DROOT | not used | 9.000E-01 |
| R019 | Drinking water fraction from ground water | FGWDW | not used | 1.000E+00 |
| R019 | Household water fraction from ground water | FGWHH | not used | 1.000E+00 |
| R019 | Livestock water fraction from ground water | FGWLW | not used | 1.000E+00 |
| R019 | Irrigation fraction from ground water | FGWIR | not used | 1.000E+00 |
| R19B | Wet weight crop yield for Non-Leafy (kg/m**2) | YV(1) | not used | 7.000E-01 |
| R19B | Wet weight crop yield for Leafy (kg/m**2) | YV(2) | not used | 1.500E+00 |

| | | | | |
|------|----------------------------------|-----------|----------|-----------|
| 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) | | |

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Summary : Natural Uranium 100 pCi/g

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Site-Specific Parameter Summary

(continued)

| | | | | |
|--------------------------------|----------------|-----------|---------|---------|
| 0 | Used by RESRAD | Parameter | User | Default |
| Menu | Parameter | Input | Default | |
| (If different from user input) | Name | | | |

AA
 AA

| | | | | |
|------|--|---------|----------|-----------|
| 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 |
| | --- | EVSIN | | |
| C14 | C-12 evasion flux rate from soil (1/sec) | | not used | 1.000E-10 |
| | --- | REVSIN | | |
| 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 | | | |
| 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 | |
| | --- HMX | | | |
| 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 | | | |

Summary : Natural Uranium 100 pCi/g
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Site-Specific Parameter Summary

(continued)

| | | | |
|--|----------------|-------|---------|
| 0 | | | |
| Used by RESRAD | Parameter | User | |
| Menu (If different from user input) | Parameter Name | Input | Default |

```

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
TITL 3 Maximum number of integration points for dose      3      17      3      ---      3
      ---
      3 LYMAX
TITL 3 Maximum number of integration points for risk      3      1      3      ---      3
      ---
      3 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 | active |

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Summary : Natural Uranium 100 pCi/g
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| Contaminated Zone Dimensions | | Initial Soil Concentrations, pCi/g | |
|----------------------------------|----------------------|------------------------------------|-----------|
| AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA | | AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA | |
| Area: | 868.36 square meters | U-234 | 4.920E+01 |
| Thickness: | 0.15 meters | U-235 | 2.200E+00 |
| Cover Depth: | 0.15 meters | U-238 | 4.860E+01 |

Total Dose TDOSE(t), mrem/yr

Basic Radiation Dose Limit = 2.500E+01 mrem/yr

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

[illegible]

| | | | | | | |
|------------|-----------|-----------|-----------|-----------|-----------|-----------|
| t (years): | 0.000E+00 | 2.000E-01 | 1.000E+01 | 1.000E+02 | 3.000E+02 | 1.000E+03 |
| TDOSE(t): | 7.383E-01 | 7.383E-01 | 7.383E-01 | 7.394E-01 | 7.438E-01 | 7.609E-01 |

M(t): 2.953E-02 2.953E-02 2.953E-02 2.958E-02 2.975E-02 3.044E-02
 OMaximum TDOSE(t): 7.609E-01 mrem/yr at t = 1.000E+03 years
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Summary : Natural Uranium 100 pci/g
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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

0 Water Independent Pathways (Inhalation
 excludes radon)

| | Ground | | Inhalation | | Radon | | Plant | |
|---------|-----------|--------|------------|--------|-----------|--------|-----------|--------|
| | Meat | Milk | Soil | | | | | |
| Radio- | AAAAA | | AAAAA | | AAAAA | | AAAAA | |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| U-234 | 1.546E-04 | 0.0002 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| U-235 | 5.953E-02 | 0.0806 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| U-238 | 6.786E-01 | 0.9192 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| Total | 7.383E-01 | 1.0000 | 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

0 Water Dependent Pathways
 0 Plant

| | Water | | Milk | | Fish | | All Pathways* | |
|---------|-----------|--------|-----------|--------|-----------|--------|---------------|--------|
| Radio- | AAAAA | | AAAAA | | AAAAA | | AAAAA | |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| U-234 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 1.546E-04 | 0.0002 | 0.000E+00 | 0.0000 |
| U-235 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 5.953E-02 | 0.0806 | 0.000E+00 | 0.0000 |
| U-238 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 6.786E-01 | 0.9192 | 0.000E+00 | 0.0000 |
| Total | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 7.383E-01 | 1.0000 | 0.000E+00 | 0.0000 |

0*Sum of all water independent and dependent pathways.

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Summary : Natural Uranium 100 pci/g
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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 =
2.000E-01 years
0
excludes radon)

| | Ground | | Inhalation | | Radon | | Plant | |
|-----------|-----------|-----------|------------|-----------|-----------|---------|-----------|---------|
| | Meat | Milk | Soil | | | | | |
| Radio- | AAAAA | | AAAAA | | AAAAA | | AAAAA | |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| U-234 | 1.546E-04 | 0.0002 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.0000 | 0.000E+00 | 0.0000 |
| U-235 | 5.953E-02 | 0.0806 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.0000 | 0.000E+00 | 0.0000 |
| U-238 | 6.786E-01 | 0.9192 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.0000 | 0.000E+00 | 0.0000 |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| Total | 7.383E-01 | 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 | 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 =
2.000E-01 years
0

| | Water | | Fish | | Water Dependent Pathways | | Plant | |
|-----------|-----------|-----------|---------------|-----------|--------------------------|---------|-----------|---------|
| | Meat | Milk | All Pathways* | | Radon | | | |
| Radio- | AAAAA | | AAAAA | | AAAAA | | AAAAA | |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| 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 | 1.546E-04 | 0.0002 | 0.0000 | 0.000E+00 | 0.0000 |
| U-235 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 5.953E-02 | 0.0806 | 0.0000 | 0.000E+00 | 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 | 6.786E-01 | 0.9192 | 0.0000 | 0.000E+00 | 0.0000 |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| Total | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 7.383E-01 | 1.0000 | 0.0000 | 0.000E+00 | 0.0000 |

0*Sum of all water independent and dependent pathways.

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T« Limit = 180 days

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Summary : Natural Uranium 100 pCi/g

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Total Dose Contributions TDOSE(i,p,t) for Individual
Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t =
1.000E+01 years
0

excludes radon)
0
Ground Inhalation Radon Plant

Meat Milk

Soil
Page 17

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| Radio- | mrem/yr | | fract. | | mrem/yr | | fract. | | mrem/yr | | fract. | |
|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|--------|--------|
| U-234 | 1.689E-04 | 0.0002 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.0000 | 0.0000 |
| U-235 | 5.954E-02 | 0.0806 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.0000 | 0.0000 |
| U-238 | 6.786E-01 | 0.9191 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.0000 | 0.0000 |
| Total | 7.383E-01 | 1.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.0000 | 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+01 years

| Radio- | Water | | Fish | | Radon | | Water Dependent Pathways | |
|--------|-----------|--------|---------------|--------|-----------|--------|--------------------------|--------|
| | Meat | Milk | All Pathways* | | | | Plant | |
| U-234 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| U-235 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| U-238 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| Total | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |

0*Sum of all water independent and dependent pathways.

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T< Limit = 180 days

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Summary : Natural Uranium 100 pci/g

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Total Dose Contributions TDOSE(i,p,t) for Individual

Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t =

1.000E+02 years

excludes radon)

Water Independent Pathways (Inhalation

| Radio- | Ground | | Inhalation | | Radon | | Plant | |
|--------|-----------|--------|------------|--------|-----------|--------|-----------|--------|
| | Meat | Milk | Soil | | | | | |
| U-234 | 1.129E-03 | 0.0015 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |

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| | | | | | | | | |
|-----------|-----------|-----------|-----------|-----------|-----------|---------|-----------|---------|
| U-235 | 5.969E-02 | 0.0807 | 0.000E+00 | 0.0000 | 0.000E+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 | 6.786E-01 | 0.9177 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | | | |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | | | |
| Total | 7.394E-01 | 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+02 years

| | Water | | Fish | | Water Dependent Pathways | | Plant | |
|-----------|-----------|-----------|---------------|-----------|--------------------------|---------|-----------|---------|
| | Meat | Milk | All Pathways* | | Radon | | | |
| Radio- | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| 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 | 1.129E-03 | 0.0015 | | | |
| U-235 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 5.969E-02 | 0.0807 | | | |
| 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 | 6.786E-01 | 0.9177 | | | |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | | | |
| Total | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 7.394E-01 | 1.0000 | | | |

0*Sum of all water independent and dependent pathways.

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T« Limit = 180 days

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Summary : Natural Uranium 100 pCi/g

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

| | Ground | | Inhalation | | Radon | | Plant | |
|-----------|-----------|-----------|------------|-----------|-----------|---------|-----------|---------|
| | Meat | Milk | Soil | | | | | |
| Radio- | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| U-234 | 5.403E-03 | 0.0073 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | | | |
| U-235 | 5.975E-02 | 0.0803 | 0.000E+00 | 0.0000 | 0.000E+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 | 6.786E-01 | 0.9124 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | | | |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | | | |
| Total | 7.438E-01 | 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 | | | |

0

Total Dose Contributions TDOSE(i,p,t) for Individual
Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t =

3.000E+02 years

0

0

| Meat | Water | | Fish | | All Pathways* | | Water Dependent Pathways | |
|---------|-----------|---------|-----------|---------|---------------|---------|--------------------------|---------|
| | Radon | Plant | Radon | Plant | Radon | Plant | Radon | Plant |
| Radio- | AAAA | AAAA | AAAA | AAAA | AAAA | AAAA | AAAA | AAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |
| U-234 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| U-235 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| U-238 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| Total | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |

*Sum of all water independent and dependent pathways.

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T« Limit = 180 days

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Summary : Natural Uranium 100 pCi/g

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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+03 years

0

excludes radon)

0

| Meat | Ground | | Inhalation | | Radon | | Plant | |
|---------|-----------|---------|------------|---------|-----------|---------|-----------|---------|
| | Radon | Plant | Radon | Plant | Radon | Plant | Radon | Plant |
| Radio- | AAAA | AAAA | AAAA | AAAA | AAAA | AAAA | AAAA | AAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |
| U-234 | 2.250E-02 | 0.0296 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| U-235 | 5.976E-02 | 0.0785 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| U-238 | 6.786E-01 | 0.8919 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| Total | 7.609E-01 | 1.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |

0

Total Dose Contributions TDOSE(i,p,t) for Individual
Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t =

1.000E+03 years

0

0

| Meat | Water | | Fish | | Water Dependent Pathways | |
|---------|---------|---------|---------|---------|--------------------------|---------|
| | Radon | Plant | Radon | Plant | Radon | Plant |
| Radio- | AAAA | AAAA | AAAA | AAAA | AAAA | AAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |

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Radio- AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA
 AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA
 Nuclide mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract.
 mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract.
 AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA
 AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA
 U-234 0.000E+00 0.0000 0.000E+00 0.0000 0.000E+00 0.0000 0.000E+00 0.0000
 0.000E+00 0.0000 0.000E+00 0.0000 2.250E-02 0.0296
 U-235 0.000E+00 0.0000 0.000E+00 0.0000 0.000E+00 0.0000 0.000E+00 0.0000
 0.000E+00 0.0000 0.000E+00 0.0000 5.976E-02 0.0785
 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 6.786E-01 0.8919
 iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii
 iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii
 Total 0.000E+00 0.0000 0.000E+00 0.0000 0.000E+00 0.0000 0.000E+00 0.0000
 0.000E+00 0.0000 0.000E+00 0.0000 7.609E-01 1.0000

0*Sum of all water independent and dependent pathways.

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T« Limit = 180 days

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Summary : Natural Uranium 100 pCi/g

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Dose/Source Ratios Summed Over All Pathways

Parent and Progeny Principal Radionuclide Contributions Indicated

| 0 Parent (mrem/yr)/(pCi/g) (i) | Product (j) | Thread Fraction | DSR(j,t) At Time in Years | | | | |
|--------------------------------------|----------------|--------------------|---------------------------|-----------|-----------|-----------|-----------|
| 1.000E+03 | | | 0.000E+00 | 2.000E-01 | 1.000E+01 | 1.000E+02 | 3.000E+02 |
| AAAAAAAAA | AAAAAAAAA | AAAAAAAAA | AAAAAAAAA | AAAAAAAAA | AAAAAAAAA | AAAAAAAAA | AAAAAAAAA |
| U-234 | U-234 | 1.000E+00 | 3.141E-06 | 3.141E-06 | 3.141E-06 | 3.141E-06 | 3.139E-06 |
| 3.133E-06 | Th-230 | 1.000E+00 | 6.891E-11 | 9.648E-11 | 1.447E-09 | 1.384E-08 | 4.127E-08 |
| 1.362E-07 | Ra-226+D | 1.000E+00 | 9.080E-10 | 1.561E-09 | 2.902E-07 | 1.980E-05 | 1.066E-04 |
| 4.539E-04 | Pb-210+D | 1.000E+00 | 6.222E-16 | 1.287E-15 | 2.568E-12 | 9.129E-10 | 6.760E-09 |
| 3.163E-08 | äDSR(j) | | 3.142E-06 | 3.143E-06 | 3.433E-06 | 2.295E-05 | 1.098E-04 |
| 4.572E-04 | U-235+D | 1.000E+00 | 2.706E-02 | 2.706E-02 | 2.706E-02 | 2.706E-02 | 2.706E-02 |
| 2.706E-02 | Pa-231 | 1.000E+00 | 1.020E-07 | 1.427E-07 | 1.996E-06 | 1.084E-05 | 1.394E-05 |
| 1.412E-05 | Ac-227+D | 1.000E+00 | 1.427E-08 | 2.445E-08 | 3.655E-06 | 6.256E-05 | 8.735E-05 |
| 8.879E-05 | äDSR(j) | | 2.706E-02 | 2.706E-02 | 2.707E-02 | 2.713E-02 | 2.716E-02 |
| 2.716E-02 | U-238 | 5.450E-07 | 3.121E-12 | 3.121E-12 | 3.121E-12 | 3.121E-12 | 3.121E-12 |
| 3.121E-12 | U-238+D | 1.000E+00 | 1.396E-02 | 1.396E-02 | 1.396E-02 | 1.396E-02 | 1.396E-02 |
| 1.396E-02 | U-234 | 1.000E+00 | 4.435E-12 | 6.209E-12 | 9.313E-11 | 8.913E-10 | 2.664E-09 |
| 8.862E-09 | Th-230 | 1.000E+00 | 6.486E-17 | 1.116E-16 | 2.147E-14 | 1.964E-12 | 1.753E-11 |
| 1.932E-10 | Ra-226+D | 1.000E+00 | 6.413E-16 | 1.328E-15 | 2.899E-12 | 2.029E-09 | 3.643E-08 |
| 5.900E-07 | Pb-210+D | 1.000E+00 | 3.520E-22 | 8.741E-22 | 1.956E-17 | 7.858E-14 | 2.116E-12 |
| 3.999E-11 | | | | | | | |

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U-238+D aDSR(j) 1.396E-02 1.396E-02 1.396E-02 1.396E-02 1.396E-02
 1.396E-02
 ffffffff ffffffff ffffffff ffffffff ffffffff ffffffff ffffffff
 ffffffff

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

0

Single Radionuclide Soil Guidelines G(i,t) in pCi/g

Basic Radiation Dose Limit = 2.500E+01 mrem/yr

| ONuclide (i) | t= 0.000E+00 | 2.000E-01 | 1.000E+01 | 1.000E+02 | 3.000E+02 | 1.000E+03 |
|--------------|--------------|-----------|-----------|-----------|-----------|-----------|
| U-234 | 7.956E+06 | 7.954E+06 | 7.282E+06 | 1.089E+06 | 2.276E+05 | 5.468E+04 |
| U-235 | 9.239E+02 | 9.239E+02 | 9.237E+02 | 9.214E+02 | 9.204E+02 | 9.204E+02 |
| U-238 | 1.790E+03 | 1.790E+03 | 1.790E+03 | 1.790E+03 | 1.790E+03 | 1.790E+03 |
| ffffff | ffffff | ffffff | ffffff | ffffff | ffffff | ffffff |

0

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 = 1.000E+03 years

| ONuclide (i) | Initial (pCi/g) | tmin (years) | DSR(i,tmin) | G(i,tmin) (pCi/g) | DSR(i,tmax) | G(i,tmax) (pCi/g) |
|--------------|-----------------|--------------|-------------|-------------------|-------------|-------------------|
| U-234 | 4.920E+01 | 1.000E+03 | 4.572E-04 | 5.468E+04 | 4.572E-04 | 5.468E+04 |
| U-235 | 2.200E+00 | 757 n 2 | 2.716E-02 | 9.204E+02 | 2.716E-02 | 9.204E+02 |
| U-238 | 4.860E+01 | 1.000E+03 | 1.396E-02 | 1.790E+03 | 1.396E-02 | 1.790E+03 |
| ffffff | ffffff | ffffff | ffffff | ffffff | ffffff | ffffff |

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Summary : Natural Uranium 100 pCi/g

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Individual Nuclide Dose Summed Over All Pathways

Parent Nuclide and Branch Fraction Indicated

| ONuclide (j) | Parent (i) | THF(i) | t= 0.000E+00 | 2.000E-01 | 1.000E+01 | 1.000E+02 | 3.000E+02 |
|--------------|------------|-----------|--------------|-----------|-----------|-----------|-----------|
| 1.000E+03 | | | | | | | |
| U-234 | U-234 | 1.000E+00 | 1.546E-04 | 1.546E-04 | 1.546E-04 | 1.545E-04 | 1.544E-04 |
| U-234 | U-238 | 1.000E+00 | 2.155E-10 | 3.017E-10 | 4.526E-09 | 4.332E-08 | 1.295E-07 |
| U-234 | aDOSE(j) | | 1.546E-04 | 1.546E-04 | 1.546E-04 | 1.546E-04 | 1.546E-04 |
| Th-230 | U-234 | 1.000E+00 | 3.391E-09 | 4.747E-09 | 7.119E-08 | 6.807E-07 | 2.030E-06 |
| Th-230 | U-238 | 1.000E+00 | 3.152E-15 | 5.422E-15 | 1.043E-12 | 9.544E-11 | 8.519E-10 |
| Th-230 | aDOSE(j) | | 3.391E-09 | 4.747E-09 | 7.120E-08 | 6.808E-07 | 2.031E-06 |
| Ra-226 | U-234 | 1.000E+00 | 4.467E-08 | 7.680E-08 | 1.428E-05 | 9.741E-04 | 5.246E-03 |
| Ra-226 | U-238 | 1.000E+00 | 3.117E-14 | 6.455E-14 | 1.409E-10 | 9.863E-08 | 1.770E-06 |

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| | | | | | | |
|-----------------|-----------|-----------|-----------|-----------|-----------|-----------|
| Ra-226 äDOSE(j) | | 4.467E-08 | 7.680E-08 | 1.428E-05 | 9.742E-04 | 5.248E-03 |
| 2.236E-02 | | | | | | |
| OPb-210 U-234 | 1.000E+00 | 3.061E-14 | 6.330E-14 | 1.263E-10 | 4.491E-08 | 3.326E-07 |
| 1.556E-06 | | | | | | |
| Pb-210 U-238 | 1.000E+00 | 1.710E-20 | 4.248E-20 | 9.508E-16 | 3.819E-12 | 1.029E-10 |
| 1.944E-09 | | | | | | |
| Pb-210 äDOSE(j) | | 3.061E-14 | 6.330E-14 | 1.263E-10 | 4.492E-08 | 3.327E-07 |
| 1.558E-06 | | | | | | |
| OU-235 U-235 | 1.000E+00 | 5.953E-02 | 5.953E-02 | 5.953E-02 | 5.953E-02 | 5.953E-02 |
| 5.953E-02 | | | | | | |
| OPa-231 U-235 | 1.000E+00 | 2.244E-07 | 3.139E-07 | 4.392E-06 | 2.384E-05 | 3.066E-05 |
| 3.106E-05 | | | | | | |
| OAc-227 U-235 | 1.000E+00 | 3.140E-08 | 5.379E-08 | 8.042E-06 | 1.376E-04 | 1.922E-04 |
| 1.953E-04 | | | | | | |
| OU-238 U-238 | 5.450E-07 | 1.517E-10 | 1.517E-10 | 1.517E-10 | 1.517E-10 | 1.517E-10 |
| 1.517E-10 | | | | | | |
| U-238 U-238 | 1.000E+00 | 6.786E-01 | 6.786E-01 | 6.786E-01 | 6.786E-01 | 6.786E-01 |
| 6.786E-01 | | | | | | |
| U-238 äDOSE(j) | | 6.786E-01 | 6.786E-01 | 6.786E-01 | 6.786E-01 | 6.786E-01 |
| 6.786E-01 | | | | | | |
| iiiiiiii iiii | iiiiiiii | iiiiiiii | iiiiiiii | iiiiiiii | iiiiiiii | iiiiiiii |
| iiiiiiii | | | | | | |

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

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T« Limit = 180 days

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Summary : Natural Uranium 100 pCi/g

File : C:\USERS\BRIAN\DESKTOP\LISA OTHER WORK\SEPT RESRAD ANALYSIS

2016\UNATFEB.RAD

| | | Individual Nuclide Soil Concentration | | | | | |
|---------------|-----------|--|---------------|-----------|-----------|-----------|-----------|
| | | Parent Nuclide and Branch Fraction Indicated | | | | | |
| ONuclide | Parent | THF(i) | S(j,t), pCi/g | | | | |
| (j) | (i) | | t= 0.000E+00 | 2.000E-01 | 1.000E+01 | 1.000E+02 | 3.000E+02 |
| 1.000E+03 | | | | | | | |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| AAAAA | | | | | | | |
| U-234 U-234 | 1.000E+00 | 4.920E+01 | 4.920E+01 | 4.920E+01 | 4.919E+01 | 4.916E+01 | |
| 4.906E+01 | | | | | | | |
| U-234 U-238 | 1.000E+00 | 0.000E+00 | 2.744E-05 | 1.372E-03 | 1.372E-02 | 4.115E-02 | |
| 1.370E-01 | | | | | | | |
| U-234 äs(j): | | 4.920E+01 | 4.920E+01 | 4.920E+01 | 4.920E+01 | 4.920E+01 | |
| 4.920E+01 | | | | | | | |
| OTh-230 U-234 | 1.000E+00 | 0.000E+00 | 9.048E-05 | 4.524E-03 | 4.519E-02 | 1.352E-01 | |
| 4.470E-01 | | | | | | | |
| Th-230 U-238 | 1.000E+00 | 0.000E+00 | 2.524E-11 | 6.308E-08 | 6.304E-06 | 5.664E-05 | |
| 6.258E-04 | | | | | | | |
| Th-230 äs(j): | | 0.000E+00 | 9.048E-05 | 4.524E-03 | 4.519E-02 | 1.353E-01 | |
| 4.476E-01 | | | | | | | |
| ORa-226 U-234 | 1.000E+00 | 0.000E+00 | 3.917E-09 | 9.455E-06 | 7.043E-04 | 3.817E-03 | |
| 1.628E-02 | | | | | | | |
| Ra-226 U-238 | 1.000E+00 | 0.000E+00 | 7.284E-16 | 8.869E-11 | 7.094E-08 | 1.286E-06 | |
| 2.089E-05 | | | | | | | |
| Ra-226 äs(j): | | 0.000E+00 | 3.917E-09 | 9.455E-06 | 7.044E-04 | 3.818E-03 | |
| 1.630E-02 | | | | | | | |
| OPb-210 U-234 | 1.000E+00 | 0.000E+00 | 8.139E-12 | 9.038E-07 | 3.665E-04 | 2.737E-03 | |
| 1.283E-02 | | | | | | | |
| Pb-210 U-238 | 1.000E+00 | 0.000E+00 | 1.136E-18 | 6.455E-12 | 3.099E-08 | 8.445E-07 | |
| 1.601E-05 | | | | | | | |
| Pb-210 äs(j): | | 0.000E+00 | 8.139E-12 | 9.038E-07 | 3.665E-04 | 2.737E-03 | |
| 1.285E-02 | | | | | | | |
| OU-235 U-235 | 1.000E+00 | 2.200E+00 | 2.200E+00 | 2.200E+00 | 2.200E+00 | 2.200E+00 | |
| 2.200E+00 | | | | | | | |
| OPa-231 U-235 | 1.000E+00 | 0.000E+00 | 9.296E-06 | 4.333E-04 | 2.455E-03 | 3.164E-03 | |

UNat.txt.REP

3.205E-03
 0Ac-227 U-235 1.000E+00 0.000E+00 2.948E-08 5.690E-05 1.057E-03 1.481E-03
 1.505E-03
 0U-238 U-238 5.450E-07 2.649E-05 2.649E-05 2.649E-05 2.649E-05 2.649E-05
 2.649E-05
 U-238 U-238 1.000E+00 4.860E+01 4.860E+01 4.860E+01 4.860E+01 4.860E+01
 4.860E+01
 U-238 as(j): 4.860E+01 4.860E+01 4.860E+01 4.860E+01 4.860E+01
 4.860E+01
 1111111 1111111 1111111 1111111 1111111 1111111 1111111
 1111111

THF(i) is the thread fraction of the parent nuclide.
 ORESCALC.EXE execution time = 35.60 seconds

Input - 230FEB.rad

230FEB.RAD

&DB

CODENAME = 'RESRAD-ONSITE',
ICRPTRANS = 'ICRP107',
HAFTIM = '180 days',
EXTERNAL_DCF = 'DCFPK3.02',
DFFILE = 'DOE STD-1196-2011 (Reference Person)',
RISKLIB = 'DCFPK3.02 Morbidity',
DOSELIB = 'DOE STD-1196-2011 (Reference Person)',
NANUC = 3,
NIY = 6,
NPD = 3,
NPTS = 32,
NS = 1,
NPDS = 6,
U_activity = 'pci',
U_dose_unit = 'mrem',
nDAll = 2,
nUniqueNuc = 15,
&END

&INDATA

TITLE = 'Th-230 100 pci/g',
DIRECTORY_NAME = 'C:\USERS\BRIAN\DESKTOP\LISA OTHER WORK\SEPT RESRAD ANALYSIS
2016\',
NPTS = 32,
TDISK = ' ', VERS = '7.2',
XSPACE = 'LOG',
FINDPEAK = 0,
LYMAX = 17,
KYMAY = 1,
COVER0 = .15,
DENSCV = 1.5,
VCV = 0,
DENSCZ = 1.5,
VCZ = .001,
TPCZ = .4,
FCCZ = .2,
HCCZ = .001,
BCZ = 0,
HUMID = 8,
EVAPTR = .5,
PRECIP = .41,
RI = 0,
IDITCH = 0,
RUNOFF = .2,
WAREA = 1000000,
EPS = .001,
NS = 1,
TI = 0,
DENSEAQ = 1.5,
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EPSZ = .2,
FCSZ = .2,
HCSZ = 100,
HGWT = .02,
BSZ = 5.3,
VWT = .001,
DWIBWT = 10,
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UW = 250,
AREA = 868.36,
THICK0 = .15,
SUBMFRACT = 0,
LCZPAQ = 100,

BRDL = 25,
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T(2) = .2,
T(3) = 10,
T(4) = 100,
T(5) = 300,
T(6) = 1000,
T(7) = 0,
T(8) = 0,
T(9) = 0,
T(10) = 0,
INHALR = 8400,
MLINH = .0001,
ED = 30,
SHF1 = .7,
SHF3 = .4,
FIND = 0,
FOTD = 1,
FS = 1,
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RAD_SHAPE(2) = 70.71068,
RAD_SHAPE(3) = 0,
RAD_SHAPE(4) = 0,
RAD_SHAPE(5) = 0,
RAD_SHAPE(6) = 0,
RAD_SHAPE(7) = 0,
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RAD_SHAPE(9) = 0,
RAD_SHAPE(10) = 0,
RAD_SHAPE(11) = 0,
RAD_SHAPE(12) = 0,
FRACA(1) = 1,
FRACA(2) = .2732395,
FRACA(3) = 0,
FRACA(4) = 0,
FRACA(5) = 0,
FRACA(6) = 0,
FRACA(7) = 0,
FRACA(8) = 0,
FRACA(9) = 0,
FRACA(10) = 0,
FRACA(11) = 0,
FRACA(12) = 0,
DIET(1) = 160,
DIET(2) = 14,
DIET(3) = 92,
DIET(4) = 63,
DIET(5) = 5.4,
DIET(6) = .9,
SOIL = 36.5,
DWI = 510,
FDW = 1,
FHHW = 1,
FLW = 1,
FIRW = 1,
FR9 = .5,
FPLANT = -1,
FMEAT = -1,
FMILK = -1,
LFI5 = 68,
LFI6 = 55,
LWI5 = 50,
LWI6 = 160,

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LSI = .5,
MLFD = .0001,
DM = .15,
DROOT = .9,
FGWDW = 1,
FGWHH = 1,
FGWLW = 1,
FGWIR = 1,
STOR_T(1) = 14,
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STOR_T(3) = 1,
STOR_T(4) = 20,
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STOR_T(6) = 7,
STOR_T(7) = 1,
STOR_T(8) = 1,
STOR_T(9) = 45,
FLOOR1 = .15,
DENSFL = 2.4,
TPCV = .4,
TPFL = .1,
PH2OCV = .05,
PH2OFL = .03,
DIFCV = .000002,
DIFFL = .0000003,
DIFCZ = .000002,
HMX = 2,
WIND = 2.68,
REXG = .5,
HRM = 2.5,
FAI = 0,
DMFL = -1,
EMANA(1) = .25,
EMANA(2) = .15,
C12WTR = .00002,
C12CZ = .03,
CSOIL = .02,
CAIR = .98,
DMC = .3,
EVSN = .0000007,
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AVFG4 = .8,
AVFG5 = .2,
H(1) = 4,
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H(3) = 4,
H(4) = 4,
H(5) = 4,
DENSUZ(1) = 1.5,
DENSUZ(2) = 1.5,
DENSUZ(3) = 1.5,
DENSUZ(4) = 1.5,
DENSUZ(5) = 1.5,
TPUZ(1) = .4,
TPUZ(2) = .4,
TPUZ(3) = .4,
TPUZ(4) = .4,
TPUZ(5) = .4,
EPUZ(1) = .2,
EPUZ(2) = .2,
EPUZ(3) = .2,
EPUZ(4) = .2,
EPUZ(5) = .2,

FCUZ(1) = .2,
FCUZ(2) = .2,
FCUZ(3) = .2,
FCUZ(4) = .2,
FCUZ(5) = .2,
BUZ(1) = 5.3,
BUZ(2) = 5.3,
BUZ(3) = 5.3,
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BUZ(5) = 5.3,
HCUZ(1) = 10,
HCUZ(2) = 10,
HCUZ(3) = 10,
HCUZ(4) = 10,
HCUZ(5) = 10,
INDPOPFLAG = 0,
OFFDISTANCE(1) = 250,
NUMDISTANCES = 0,
AMBIENTTEMP = 10,
LIDHEIGHT = 1000,
SOURCEHEIGHT = 10,
AGVEG(1) = 0,
AGVEG(2) = .5,
AGVEG(3) = .5,
AGMILK(1) = 0,
AGMILK(2) = .5,
AGMILK(3) = .5,
AGMEAT(1) = 0,
AGMEAT(2) = .5,
AGMEAT(3) = .5,
BEEFDENSITY = .164,
MILKDENSITY = .0207,
VEGLANDFRACTION = .0185,
YV(1) = .7,
YV(2) = 1.5,
YV(3) = 1.1,
TE(1) = .17,
TE(2) = .25,
TE(3) = .08,
TIV(1) = .1,
TIV(2) = 1,
TIV(3) = 1,
WLAM = 20,
RWET(1) = .25,
RWET(2) = .25,
RWET(3) = .25,
RDRY(1) = .25,
RDRY(2) = .25,
RDRY(3) = .25,
NUCNAM = 'Pb-210+D', 'Ra-226+D', 'Th-230', 'LAST',
S = 2*0, 100,
W = 3*0,
DCACTC = 100, 70, 1E+34,
DCACTU1 = 100, 70, 1E+34,
DCACTS = 100, 70, 1E+34,
RLEACH = 3*0,
SOLUBK0 = 3*0,
SDENSCV = 1.5,
SDENSCZ = 1.5,
STHICK0 = 10,
NSENA = 3,
NUM_SAMPS = 300, NUMVAR = 1,
UNCPPD = 1 ,

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UNCPND = 1 ,
SELPATH = 131,
&END
&DCF
T_DCF2= .0401672, 3.823283E-02, 0.3848,
T_DCF3= 1.025566E-02, 1.677388E-03, 0.0009361,
BIOFAC2= 100, 250, 500,
BIOFAC1= 300, 50, 100,
RTF2= .0008, .001, .0001,
RTF3= .0003, .001, .000005,
RTF1= .01, .04, .001,
SLPF1= 4.295087E-09, 8.36718E-06, 8.453E-10,
SLPF2= 3.0825E-08, 2.822095E-08, 3.407E-08,
SLPF3= 3.44202E-09, 5.149498E-10, 1.191E-10,
SLPF4= 2.669116E-09, 3.853363E-10, 9.138E-11,
SLPF5= 3.44202E-09, 5.149498E-10, 1.191E-10,
T_SLPFRN= 1.8E-12, 1.9E-13, 3.7E-12, 3E-15, 6.2E-12, 3.9E-11,
1.5E-11, 3.7E-11,
T_KFACTR= 388, 188, 388, 188,
&END

Output - Thorium.txt

1
Summary : Th-230 100 pCi/g
File : C:\USERS\BRIAN\DESKTOP\LISA OTHER WORK\SEPT RESRAD ANALYSIS
2016\230FEB.RAD

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| Total Dose Components | |
| Time = 0.000E+00 | 10 |
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2
Summary : Th-230 100 pCi/g
File : C:\USERS\BRIAN\DESKTOP\LISA OTHER WORK\SEPT RESRAD ANALYSIS
2016\230FEB.RAD

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: DOE STD-1196-2011 (Reference Person)

| Base Menu Case* | Parameter Name | Parameter Value# | Current |
|-----------------|--|------------------|-----------|
| A-1 | DCF's for external ground radiation, (mrem/yr)/(pCi/g) | | |
| A-1 | At-218 (Source: DCFPAK3.02) | 5.567E-05 | 5.567E-05 |
| A-1 | Bi-210 (Source: DCFPAK3.02) | 5.473E-03 | 5.473E-03 |
| A-1 | Bi-214 (Source: DCFPAK3.02) | 9.135E+00 | 9.135E+00 |
| A-1 | Hg-206 (Source: DCFPAK3.02) | 6.127E-01 | 6.127E-01 |
| A-1 | Pb-210 (Source: DCFPAK3.02) | 2.092E-03 | 2.092E-03 |
| A-1 | Pb-214 (Source: DCFPAK3.02) | 1.257E+00 | 1.257E+00 |
| A-1 | Po-210 (Source: DCFPAK3.02) | 5.641E-05 | 5.641E-05 |
| A-1 | Po-214 (Source: DCFPAK3.02) | 4.801E-04 | 4.801E-04 |
| A-1 | Po-218 (Source: DCFPAK3.02) | 9.228E-09 | 9.228E-09 |
| A-1 | Ra-226 (Source: DCFPAK3.02) | 3.176E-02 | 3.176E-02 |

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| | | | | | | |
|-----------|--------------|-----------|----------------------|--------------|-----------|--------------|
| A-1 | ³ | Rn-218 | (Source: DCFPAK3.02) | ³ | 4.259E-03 | ³ |
| 4.259E-03 | ³ | DCF1(11) | | ³ | | ³ |
| A-1 | ³ | Rn-222 | (Source: DCFPAK3.02) | ³ | 2.130E-03 | ³ |
| 2.130E-03 | ³ | DCF1(12) | | ³ | | ³ |
| A-1 | ³ | Th-230 | (Source: DCFPAK3.02) | ³ | 1.106E-03 | ³ |
| 1.106E-03 | ³ | DCF1(13) | | ³ | | ³ |
| A-1 | ³ | Tl-206 | (Source: DCFPAK3.02) | ³ | 1.278E-02 | ³ |
| 1.278E-02 | ³ | DCF1(14) | | ³ | | ³ |
| A-1 | ³ | Tl-210 | (Source: DCFPAK3.02) | ³ | 1.677E+01 | ³ |
| 1.677E+01 | ³ | DCF1(15) | | ³ | | ³ |

B-1 ³ Dose conversion factors for inhalation, mrem/pCi:

| | | | | | | |
|-----------|--------------|----------|--|--------------|-----------|--------------|
| B-1 | ³ | Pb-210+D | | ³ | 4.017E-02 | ³ |
| 2.231E-02 | ³ | DCF2(1) | | ³ | | ³ |
| B-1 | ³ | Ra-226+D | | ³ | 3.823E-02 | ³ |
| 3.811E-02 | ³ | DCF2(2) | | ³ | | ³ |
| B-1 | ³ | Th-230 | | ³ | 3.848E-01 | ³ |
| 3.848E-01 | ³ | DCF2(3) | | ³ | | ³ |

D-1 ³ Dose conversion factors for ingestion, mrem/pCi:

| | | | | | | |
|-----------|--------------|----------|--|--------------|-----------|--------------|
| D-1 | ³ | Pb-210+D | | ³ | 1.026E-02 | ³ |
| 3.774E-03 | ³ | DCF3(1) | | ³ | | ³ |
| D-1 | ³ | Ra-226+D | | ³ | 1.677E-03 | ³ |
| 1.676E-03 | ³ | DCF3(2) | | ³ | | ³ |
| D-1 | ³ | Th-230 | | ³ | 9.361E-04 | ³ |
| 9.361E-04 | ³ | DCF3(3) | | ³ | | ³ |

D-34 ³ Food transfer factors:

| | | | | | | |
|-----------|--------------|-----------|---|--------------|-----------|--------------|
| D-34 | ³ | Pb-210+D | plant/soil concentration ratio, dimensionless | ³ | 1.000E-02 | ³ |
| 1.000E-02 | ³ | RTF(1,1) | | ³ | | ³ |
| D-34 | ³ | Pb-210+D | beef/livestock-intake ratio, (pCi/kg)/(pCi/d) | ³ | 8.000E-04 | ³ |
| 8.000E-04 | ³ | RTF(1,2) | | ³ | | ³ |
| D-34 | ³ | Pb-210+D | milk/livestock-intake ratio, (pCi/L)/(pCi/d) | ³ | 3.000E-04 | ³ |
| 3.000E-04 | ³ | RTF(1,3) | | ³ | | ³ |
| D-34 | ³ | | | ³ | | ³ |
| D-34 | ³ | Ra-226+D | plant/soil concentration ratio, dimensionless | ³ | 4.000E-02 | ³ |
| 4.000E-02 | ³ | RTF(2,1) | | ³ | | ³ |
| D-34 | ³ | Ra-226+D | beef/livestock-intake ratio, (pCi/kg)/(pCi/d) | ³ | 1.000E-03 | ³ |
| 1.000E-03 | ³ | RTF(2,2) | | ³ | | ³ |
| D-34 | ³ | Ra-226+D | milk/livestock-intake ratio, (pCi/L)/(pCi/d) | ³ | 1.000E-03 | ³ |
| 1.000E-03 | ³ | RTF(2,3) | | ³ | | ³ |
| D-34 | ³ | | | ³ | | ³ |
| D-34 | ³ | Th-230 | plant/soil concentration ratio, dimensionless | ³ | 1.000E-03 | ³ |
| 1.000E-03 | ³ | RTF(3,1) | | ³ | | ³ |
| D-34 | ³ | Th-230 | beef/livestock-intake ratio, (pCi/kg)/(pCi/d) | ³ | 1.000E-04 | ³ |
| 1.000E-04 | ³ | RTF(3,2) | | ³ | | ³ |
| D-34 | ³ | Th-230 | milk/livestock-intake ratio, (pCi/L)/(pCi/d) | ³ | 5.000E-06 | ³ |
| 5.000E-06 | ³ | RTF(3,3) | | ³ | | ³ |

D-5 ³ Bioaccumulation factors, fresh water, L/kg:

| | | | | | | |
|-----------|--------------|--------------|------------------------|--------------|-----------|--------------|
| D-5 | ³ | Pb-210+D | fish | ³ | 3.000E+02 | ³ |
| 3.000E+02 | ³ | BIOFAC(1,1) | | ³ | | ³ |
| D-5 | ³ | Pb-210+D | crustacea and mollusks | ³ | 1.000E+02 | ³ |

Thorium.txt.REP

| | | | | |
|------|---|--------|-----------|-----------|
| R011 | Times for calculations (yr) | T(3) | 1.000E+01 | 3.000E+00 |
| R011 | Times for calculations (yr) | T(4) | 1.000E+02 | 1.000E+01 |
| R011 | Times for calculations (yr) | T(5) | 3.000E+02 | 3.000E+01 |
| R011 | Times for calculations (yr) | T(6) | 1.000E+03 | 1.000E+02 |
| R011 | Times for calculations (yr) | T(7) | not used | 3.000E+02 |
| R011 | Times for calculations (yr) | T(8) | not used | 1.000E+03 |
| R011 | Times for calculations (yr) | T(9) | not used | 0.000E+00 |
| R011 | Times for calculations (yr) | T(10) | not used | 0.000E+00 |
| | | | | |
| R012 | Initial principal radionuclide (pci/g): | Th-230 | 1.000E+02 | 0.000E+00 |
| R012 | Concentration in groundwater (pci/L): | Th-230 | not used | 0.000E+00 |
| | | | | |
| R013 | Cover depth (m) | COVER0 | 1.500E-01 | 0.000E+00 |
| R013 | Density of cover material (g/cm**3) | DENSCV | 1.500E+00 | 1.500E+00 |
| R013 | Cover depth erosion rate (m/yr) | VCV | 0.000E+00 | 1.000E-03 |
| R013 | Density of contaminated zone (g/cm**3) | DENSCZ | 1.500E+00 | 1.500E+00 |
| R013 | Contaminated zone erosion rate (m/yr) | VCZ | 1.000E-03 | 1.000E-03 |
| R013 | Contaminated zone total porosity | TPCZ | 4.000E-01 | 4.000E-01 |
| R013 | Contaminated zone field capacity | FCCZ | 2.000E-01 | 2.000E-01 |
| R013 | Contaminated zone hydraulic conductivity (m/yr) | HCCZ | 1.000E-03 | 1.000E+01 |
| R013 | Contaminated zone b parameter | BCZ | 0.000E+00 | 5.300E+00 |
| R013 | Average annual wind speed (m/sec) | WIND | 2.680E+00 | 2.000E+00 |
| R013 | Humidity in air (g/m**3) | HUMID | not used | 8.000E+00 |
| R013 | Evapotranspiration coefficient | EVAPTR | 5.000E-01 | 5.000E-01 |
| R013 | Precipitation (m/yr) | PRECIP | 4.100E-01 | 1.000E+00 |
| R013 | Irrigation (m/yr) | RI | 0.000E+00 | 2.000E-01 |
| R013 | Irrigation mode | IDITCH | overhead | overhead |
| R013 | Runoff coefficient | RUNOFF | 2.000E-01 | 2.000E-01 |
| R013 | Watershed area for nearby stream or pond (m**2) | WAREA | not used | 1.000E+06 |
| R013 | Accuracy for water/soil computations | EPS | not used | 1.000E-03 |
| | | | | |
| R014 | Density of saturated zone (g/cm**3) | | not used | 1.500E+00 |

Thorium.txt.REP

| Menu | Parameter | Parameter Name | User Input | Default |
|------|--|----------------|------------|-----------|
| R014 | Saturated zone total porosity | DENSAQ | not used | 4.000E-01 |
| R014 | Saturated zone effective porosity | TPSZ | not used | 2.000E-01 |
| R014 | Saturated zone field capacity | EPSZ | not used | 2.000E-01 |
| R014 | Saturated zone hydraulic conductivity (m/yr) | FCSZ | not used | 1.000E+02 |
| R014 | Saturated zone hydraulic gradient | HCSZ | not used | 2.000E-02 |
| R014 | Saturated zone b parameter | HGWT | not used | 5.300E+00 |
| R014 | Water table drop rate (m/yr) | BSZ | not used | 1.000E-03 |
| R014 | Well pump intake depth (m below water table) | VWT | not used | 1.000E+01 |
| R014 | Model: Nondispersion (ND) or Mass-Balance (MB) | DWIBWT | not used | ND |
| R014 | Well pumping rate (m ³ /yr) | MODEL | not used | 2.500E+02 |
| | | UW | | |

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Site-Specific Parameter Summary

(continued)

| Menu | Parameter | Parameter Name | User Input | Default |
|------|--|----------------|------------|-----------|
| R015 | Number of unsaturated zone strata | NS | not used | 1 |
| R015 | Unsat. zone 1, thickness (m) | H(1) | not used | 4.000E+00 |
| R015 | Unsat. zone 1, soil density (g/cm ³) | DENSUZ(1) | not used | 1.500E+00 |
| R015 | Unsat. zone 1, total porosity | TPUZ(1) | not used | 4.000E-01 |
| R015 | Unsat. zone 1, effective porosity | EPUZ(1) | not used | 2.000E-01 |
| R015 | Unsat. zone 1, field capacity | FCUZ(1) | not used | 2.000E-01 |
| R015 | Unsat. zone 1, soil-specific b parameter | BUZ(1) | not used | 5.300E+00 |
| R015 | Unsat. zone 1, hydraulic conductivity (m/yr) | HCUZ(1) | not used | 1.000E+01 |
| R016 | Distribution coefficients for Th-230 | | | |
| R016 | Contaminated zone (cm ³ /g) | DCNUCC(3) | 1.000E+34 | 6.000E+04 |
| R016 | Unsaturated zone 1 (cm ³ /g) | DCNUCU(3,1) | not used | 6.000E+04 |
| R016 | Saturated zone (cm ³ /g) | | not used | 6.000E+04 |

Thorium.txt.REP

| | | | | | | | | |
|------|---|---|--------------|---|-----------|---|-----------|---|
| R016 | --- | 3 | DCNUCS(3) | 3 | 0.000E+00 | 3 | 0.000E+00 | 3 |
| | Leach rate (/yr) | | | | | | | |
| R016 | 7.289E-35 | 3 | ALEACH(3) | 3 | 0.000E+00 | 3 | 0.000E+00 | 3 |
| | Solubility constant | | | | | | | |
| | not used | 3 | SOLUBK(3) | 3 | | 3 | | 3 |
| R016 | Distribution coefficients for daughter Pb-210 | 3 | | 3 | | 3 | | 3 |
| R016 | Contaminated zone (cm**3/g) | 3 | DCNUCC(1) | 3 | 1.000E+02 | 3 | 1.000E+02 | 3 |
| | --- | | | | | | | |
| R016 | Unsaturated zone 1 (cm**3/g) | 3 | DCNUCU(1,1) | 3 | not used | 3 | 1.000E+02 | 3 |
| | --- | | | | | | | |
| R016 | Saturated zone (cm**3/g) | 3 | DCNUCS(1) | 3 | not used | 3 | 1.000E+02 | 3 |
| | --- | | | | | | | |
| R016 | Leach rate (/yr) | 3 | ALEACH(1) | 3 | 0.000E+00 | 3 | 0.000E+00 | 3 |
| | 7.270E-03 | | | | | | | |
| R016 | Solubility constant | 3 | SOLUBK(1) | 3 | 0.000E+00 | 3 | 0.000E+00 | 3 |
| | not used | 3 | | 3 | | 3 | | 3 |
| R016 | Distribution coefficients for daughter Ra-226 | 3 | | 3 | | 3 | | 3 |
| R016 | Contaminated zone (cm**3/g) | 3 | DCNUCC(2) | 3 | 7.000E+01 | 3 | 7.000E+01 | 3 |
| | --- | | | | | | | |
| R016 | Unsaturated zone 1 (cm**3/g) | 3 | DCNUCU(2,1) | 3 | not used | 3 | 7.000E+01 | 3 |
| | --- | | | | | | | |
| R016 | Saturated zone (cm**3/g) | 3 | DCNUCS(2) | 3 | not used | 3 | 7.000E+01 | 3 |
| | --- | | | | | | | |
| R016 | Leach rate (/yr) | 3 | ALEACH(2) | 3 | 0.000E+00 | 3 | 0.000E+00 | 3 |
| | 1.037E-02 | | | | | | | |
| R016 | Solubility constant | 3 | SOLUBK(2) | 3 | 0.000E+00 | 3 | 0.000E+00 | 3 |
| | not used | 3 | | 3 | | 3 | | 3 |
| R017 | Inhalation rate (m**3/yr) | 3 | INHALR | 3 | 8.400E+03 | 3 | 8.400E+03 | 3 |
| | --- | | | | | | | |
| R017 | Mass loading for inhalation (g/m**3) | 3 | MLINH | 3 | 1.000E-04 | 3 | 1.000E-04 | 3 |
| | --- | | | | | | | |
| R017 | Exposure duration | 3 | ED | 3 | 3.000E+01 | 3 | 3.000E+01 | 3 |
| | --- | | | | | | | |
| R017 | Shielding factor, inhalation | 3 | SHF3 | 3 | 4.000E-01 | 3 | 4.000E-01 | 3 |
| | --- | | | | | | | |
| R017 | Shielding factor, external gamma | 3 | SHF1 | 3 | 7.000E-01 | 3 | 7.000E-01 | 3 |
| | --- | | | | | | | |
| R017 | Fraction of time spent indoors | 3 | FIND | 3 | 0.000E+00 | 3 | 5.000E-01 | 3 |
| | --- | | | | | | | |
| R017 | Fraction of time spent outdoors (on site) | 3 | FOTD | 3 | 1.000E+00 | 3 | 2.500E-01 | 3 |
| | --- | | | | | | | |
| R017 | Shape factor flag, external gamma | 3 | FS | 3 | 1.000E+00 | 3 | 1.000E+00 | 3 |
| | >0 shows circular AREA. | | | | | | | |

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Site-Specific Parameter Summary

(continued)

| 0 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
|--------------------------------|----------------|-----------|-----------|------|-------|---------|---|
| Menu | Used by RESRAD | Parameter | Parameter | User | Input | Default | |
| (If different from user input) | | Parameter | Name | | | | |

[illegible]

| R017 | | Radii of shape factor array (used if FS = -1): | | | | |
|------|--|--|--|----------|--|-----------|
| | | Outer annular radius (m), ring 1: | | not used | | 5.000E+01 |
| | | --- RAD_SHAPE(1) | | | | |
| | | Outer annular radius (m), ring 2: | | not used | | 7.071E+01 |
| | | --- RAD_SHAPE(2) | | | | |
| | | Outer annular radius (m), ring 3: | | not used | | 0.000E+00 |
| | | --- RAD_SHAPE(3) | | | | |
| | | Outer annular radius (m), ring 4: | | not used | | 0.000E+00 |
| | | --- RAD_SHAPE(4) | | | | |
| | | Outer annular radius (m), ring 5: | | not used | | 0.000E+00 |
| | | --- RAD_SHAPE(5) | | | | |
| | | Outer annular radius (m), ring 6: | | not used | | 0.000E+00 |
| | | --- RAD_SHAPE(6) | | | | |
| | | Outer annular radius (m), ring 7: | | not used | | 0.000E+00 |
| | | --- RAD_SHAPE(7) | | | | |
| | | Outer annular radius (m), ring 8: | | not used | | 0.000E+00 |
| | | --- RAD_SHAPE(8) | | | | |
| | | Outer annular radius (m), ring 9: | | not used | | 0.000E+00 |
| | | --- RAD_SHAPE(9) | | | | |
| | | Outer annular radius (m), ring 10: | | not used | | 0.000E+00 |
| | | --- RAD_SHAPE(10) | | | | |
| | | Outer annular radius (m), ring 11: | | not used | | 0.000E+00 |
| | | --- RAD_SHAPE(11) | | | | |
| | | Outer annular radius (m), ring 12: | | not used | | 0.000E+00 |
| | | --- RAD_SHAPE(12) | | | | |

| R017 3 Fractions of annular areas within AREA: | | | 3 | 3 | 3 |
|--|---------|-------------|------------|---|-------------|
| R017 3 | Ring 1 | 3 FRACA(1) | 3 not used | 3 | 1.000E+00 3 |
| R017 3 | Ring 2 | 3 FRACA(2) | 3 not used | 3 | 2.732E-01 3 |
| R017 3 | Ring 3 | 3 FRACA(3) | 3 not used | 3 | 0.000E+00 3 |
| R017 3 | Ring 4 | 3 FRACA(4) | 3 not used | 3 | 0.000E+00 3 |
| R017 3 | Ring 5 | 3 FRACA(5) | 3 not used | 3 | 0.000E+00 3 |
| R017 3 | Ring 6 | 3 FRACA(6) | 3 not used | 3 | 0.000E+00 3 |
| R017 3 | Ring 7 | 3 FRACA(7) | 3 not used | 3 | 0.000E+00 3 |
| R017 3 | Ring 8 | 3 FRACA(8) | 3 not used | 3 | 0.000E+00 3 |
| R017 3 | Ring 9 | 3 FRACA(9) | 3 not used | 3 | 0.000E+00 3 |
| R017 3 | Ring 10 | 3 FRACA(10) | 3 not used | 3 | 0.000E+00 3 |
| R017 3 | Ring 11 | 3 FRACA(11) | 3 not used | 3 | 0.000E+00 3 |
| R017 3 | Ring 12 | 3 FRACA(12) | 3 not used | 3 | 0.000E+00 3 |

| | | | |
|------|--|----------|-----------|
| 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) | | |

| Code | Variable | Unit | Value | Unit |
|------|--|------|-----------|-----------|
| 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 |
| | LF15 | | | |
| R019 | Livestock fodder intake for milk (kg/day) | | not used | 5.500E+01 |
| | LF16 | | | |
| 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 |
| | LS1 | | | |

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(continued)

| | Menu | Parameter (If different from user input) | Name | User Input | Default |
|------|------|---|-------|------------|-----------|
| R019 | | Mass loading for foliar deposition (g/m**3) | MLFD | not used | 1.000E-04 |
| R019 | | Depth of soil mixing layer (m) | DM | 1.500E-01 | 1.500E-01 |
| R019 | | Depth of roots (m) | DROOT | not used | 9.000E-01 |
| R019 | | Drinking water fraction from ground water | EGWDW | not used | 1.000E+00 |

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| | | | |
|------|--|----------|-----------|
| 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 |
| | EVSIN | | |
| C14 | C-12 evasion flux rate from soil (1/sec) | not used | 1.000E-10 |
| | REVSIN | | |
| 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): | | |

Thorium.txt.REP

| | | | |
|------|---|-----------|-----------|
| 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 | Used by RESRAD | Parameter | User | Default |
|--|--|-----------|----------|-----------|
| (If different from user input) | | Name | Input | |
| AA | | | | |
| R021 | Volumetric water content of the cover material | PH2OCV | not used | 5.000E-02 |
| R021 | Volumetric water content of the foundation | PH2OFL | not used | 3.000E-02 |
| R021 | Diffusion coefficient for radon gas (m/sec): | | | |
| R021 | in cover material | DIFCV | not used | 2.000E-06 |
| R021 | in foundation material | DIFFL | not used | 3.000E-07 |
| R021 | in contaminated zone soil | DIFCZ | not used | 2.000E-06 |
| R021 | Radon vertical dimension of mixing (m) | HMIX | not used | 2.000E+00 |
| R021 | Average building air exchange rate (1/hr) | REXG | not used | 5.000E-01 |
| R021 | Height of the building (room) (m) | HRM | not used | 2.500E+00 |
| R021 | Building interior area factor | | not used | 0.000E+00 |

Thorium.txt.REP

```

    ---
    3 FAI
R021 3 Building depth below ground surface (m) 3 not used 3 -1.000E+00 3
    ---
    3 DMFL
R021 3 Emanating power of Rn-222 gas 3 not used 3 2.500E-01 3
    ---
    3 EMANA(1)
R021 3 Emanating power of Rn-220 gas 3 not used 3 1.500E-01 3
    ---
    3 EMANA(2)
    3
    3
    3
TITL 3 Number of graphical time points 3 32 3 --- 3
    ---
    3 NPTS
TITL 3 Maximum number of integration points for dose 3 17 3 --- 3
    ---
    3 LYMAX
TITL 3 Maximum number of integration points for risk 3 1 3 --- 3
    ---
    3 KYMAX
  
```

ifff
 ifff

Summary of Pathway Selections

```

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

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| | |
|----------------------------------|------------------------------------|
| Contaminated Zone Dimensions | Initial Soil Concentrations, pCi/g |
| AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA | AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA |
| Area: 868.36 square meters | Th-230 1.000E+02 |
| Thickness: 0.15 meters | |
| Cover Depth: 0.15 meters | |

Total Dose TDOSE(t), mrem/yr

Basic Radiation Dose Limit = 2.500E+01 mrem/yr

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

AA

| | | | | | | |
|-------------------|--|-----------|-----------|-----------|-----------|-----------|
| t (years): | 0.000E+00 | 2.000E-01 | 1.000E+01 | 1.000E+02 | 3.000E+02 | 1.000E+03 |
| TDOSE(t): | 3.110E-02 | 4.290E-02 | 5.912E-01 | 3.642E+00 | 5.275E+00 | 5.454E+00 |
| M(t): | 1.244E-03 | 1.716E-03 | 2.365E-02 | 1.457E-01 | 2.110E-01 | 2.181E-01 |
| Maximum TDOSE(t): | 5.466E+00 mrem/yr at t = 654 ñ 1 years | | | | | |

Total Dose Contributions TDOSE(i,p,t) for Individual

Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t =

6.537E+02 years

0
excludes radon)

Water Independent Pathways (Inhalation

| | Ground | | Inhalation | | Radon | | Plant | |
|-----------|-----------|-----------|------------|-----------|-----------|-----------|-----------|---------|
| | Meat | Milk | Soil | | | | | |
| Radio- | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |
| Nuclide | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| Th-230 | 5.466E+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 | 0.000E+00 | 0.0000 | |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | |
| Total | 5.466E+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 | 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 =

6.537E+02 years

0
excludes radon)Water Dependent Pathways
Plant

| | Water | | Fish | | Radon | | Plant | |
|-----------|-----------|-----------|---------------|-----------|-----------|-----------|-----------|---------|
| | Meat | Milk | All Pathways* | | | | | |
| Radio- | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |
| Nuclide | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| 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 | 5.466E+00 | 1.0000 | 0.000E+00 | 0.0000 | |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | |
| iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | |
| 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 | 5.466E+00 | 1.0000 | 0.000E+00 | 0.0000 | |

0*Sum of all water independent and dependent pathways.

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T< Limit = 180 days

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Summary : Th-230 100 pCi/g

File : C:\USERS\BRIAN\DESKTOP\LISA OTHER WORK\SEPT RESRAD ANALYSIS

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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

0
excludes radon)

Water Independent Pathways (Inhalation

| | Ground | | Inhalation | | Radon | | Plant | |
|---------|-----------|---------|------------|---------|-----------|---------|-----------|---------|
| | Meat | Milk | Soil | | | | | |
| Radio- | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |
| Nuclide | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| Th-230 | 3.110E-02 | 1.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |

Thorium.txt.REP

0.000E+00 0.0000 0.000E+00 0.0000 0.000E+00 0.0000
 iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii
 iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii
 Total 3.110E-02 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
 0

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

0
 0 Water Fish Radon Water Dependent Pathways
 Meat Milk All Pathways* Plant
 Radio- AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA
 AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA
 Nuclide mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract.
 mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract.
 AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA
 AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA
 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 3.110E-02 1.0000
 iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii
 iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii
 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 3.110E-02 1.0000

0*Sum of all water independent and dependent pathways.

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T« Limit = 180 days

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Summary : Th-230 100 pCi/g

File : C:\USERS\BRIAN\DESKTOP\LISA OTHER WORK\SEPT RESRAD ANALYSIS

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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 =

2.000E-01 years

0
 0 excludes radon) Water Independent Pathways (Inhalation

0 Ground Inhalation Radon Plant
 Meat Milk Soil
 Radio- AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA
 AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA
 Nuclide mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract.
 mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract.
 AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA
 AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA
 Th-230 4.290E-02 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
 iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii
 iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii iiiiii
 Total 4.290E-02 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
 0

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

2.000E-01 years

0
 0 Water Fish Radon Water Dependent Pathways
 Meat Milk All Pathways* Plant

Radio- AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA
 AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA
 Nuclide mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract.
 mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract.

| mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | | | | |
|---------|-----------|---------|-----------|---------|-----------|--------|-----------|--------|--|
| AAAAAAA | AAAAAAAAA | AAAAAA | AAAAAAAAA | AAAAAA | AAAAAAAAA | AAAAAA | AAAAAAAAA | AAAAAA | |
| Th-230 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | |
| Total | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | |

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

| 1.000E+01 years | | | | | | | | | |
|--|-----------|---------|-----------|------------|-----------|---------|-----------|---------|--------|
| excludes radon) | | | | | | | | | |
| Water Independent Pathways (Inhalation | | | | | | | | | |
| Meat | | Ground | | Inhalation | | Radon | | Plant | |
| Radio- | | Milk | | Soil | | | | | |
| Nuclide | | mrem/yr | | mrem/yr | | mrem/yr | | mrem/yr | |
| fract. | | fract. | | fract. | | fract. | | fract. | |
| Th-230 | 5.912E-01 | 1.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.0000 |
| Total | 5.912E-01 | 1.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.0000 |

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)

| 1.000E+01 years | | | | | | | | | |
|---|--|------|--|---------------|--|--------------------------|--|-------|--|
| 0 | | | | | | | | | |
| 0 | | | | | | | | | |
| Water | | Fish | | Radon | | Water Dependent Pathways | | Plant | |
| Meat | | Milk | | All Pathways* | | | | | |
| Radio- AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA | | | | | | | | | |
| Nuclide mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. | | | | | | | | | |
| mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. | | | | | | | | | |
| AAAAAA AAAAAAA AAAAAA AAAAAAA AAAAAA AAAAAAA AAAAAA AAAAAA AAAAAA AAAAAA | | | | | | | | | |
| AAAAAA AAAAAA AAAAAAA AAAAAA AAAAAAA AAAAAA AAAAAA AAAAAA AAAAAA AAAAAA | | | | | | | | | |
| 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 5.912E-01 1.0000 | | | | | | | | | |
| iiiiiii iiiiiiiiii iiiiii iiiiiiiiii iiiiii iiiiiiiiii iiiiii iiiiiiiiii iiiiii | | | | | | | | | |
| iiiiiii iiiiii iiiiiiiiii iiiiii iiiiiiiiii iiiiii | | | | | | | | | |
| 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 5.912E-01 1.0000 | | | | | | | | | |
| 0*Sum of all water independent and dependent pathways. | | | | | | | | | |

Total Dose Contributions TDOSE(i,p,t) for Individual
Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t =
1.000E+02 years
0
excludes radon)
0 Water Independent Pathways (Inhalation

| | Ground | | Inhalation | | Radon | | Plant | |
|---------|-----------|--------|------------|--------|-----------|--------|-----------|--------|
| | Meat | Milk | Soil | | | | | |
| Radio- | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| Th-230 | 3.642E+00 | 1.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |
| Total | 3.642E+00 | 1.0000 | 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+02 years
0
0 Water Dependent Pathways
0 Meat Water Milk Fish All Pathways* Radon Plant

| | Meat | Water | Milk | Fish | All Pathways* | Radon | Plant |
|---------|-----------|--------|-----------|--------|---------------|--------|-----------|
| Radio- | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr |
| Th-230 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 |
| Total | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 3.642E+00 | 1.0000 | 0.000E+00 |

0*Sum of all water independent and dependent pathways.

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T« Limit = 180 days

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Summary : Th-230 100 pCi/g

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Total Dose Contributions TDOSE(i,p,t) for Individual
Radionuclides (i) and Pathways (p)

As mrem/yr and Fraction of Total Dose At t =
3.000E+02 years
0
excludes radon)
0 Water Independent Pathways (Inhalation

| | Ground | | Inhalation | | Radon | | Plant | |
|---------|-----------|--------|------------|--------|-----------|--------|-----------|--------|
| | Meat | Milk | Soil | | | | | |
| Radio- | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA |
| Nuclide | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. | mrem/yr | fract. |
| Th-230 | 5.275E+00 | 1.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 | 0.000E+00 | 0.0000 |

Thorium.txt.REP

```

iiiiiii iiii iiii iiii iiii iiii iiii iiii
iiiiiii iiii iiii iiii iiii iiii iiii
Total 5.275E+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
0

```

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

```

0
0
Meat Water Fish Radon Water Dependent Pathways
Plant
Meat Milk All Pathways*
Radio- AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA
Nuclide mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract.
mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract.
AAAAAAA AAAAAAAAAA AAAAAA AAAAAAAAAA AAAAAA AAAAAAAAAA AAAAAA AAAAAAAAAA AAAAAA
AAAAAAAAA AAAAAA AAAAAAAAAA AAAAAA AAAAAAAAAA AAAAAA
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 5.275E+00 1.0000
iiiiiii iiii iiii iiii iiii iiii iiii iiii
iiiiiii iiii iiii iiii iiii iiii iiii iiii
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 5.275E+00 1.0000
0*Sum of all water independent and dependent pathways.

```

1RESRAD-ONSITE, Version 7.2 T< Limit = 180 days 02/03/2017 14:41 Page
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Summary : Th-230 100 pCi/g
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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+03 years
0
excludes radon)
0
Ground Inhalation Radon Plant

```

Meat Milk Soil
Radio- AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA
Nuclide mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract.
mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract.
AAAAAAA AAAAAAAAAA AAAAAA AAAAAAAAAA AAAAAA AAAAAAAAAA AAAAAA AAAAAAAAAA AAAAAA
AAAAAAAAA AAAAAA AAAAAAAAAA AAAAAA AAAAAAAAAA AAAAAA
Th-230 5.454E+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
iiiiiii iiii iiii iiii iiii iiii iiii iiii
iiiiiii iiii iiii iiii iiii iiii iiii iiii
Total 5.454E+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
0

```

Total Dose Contributions TDOSE(i,p,t) for Individual
Radionuclides (i) and Pathways (p) As mrem/yr and Fraction of Total Dose At t =
1.000E+03 years
0
0
Water Fish Radon Water Dependent Pathways
Plant

```

Meat Milk All Pathways*
Radio- AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAA
Nuclide mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract.
mrem/yr fract. mrem/yr fract. mrem/yr fract. mrem/yr fract.

```

Thorium.txt.REP

```

AAAAAAAA AAAAAAAAAA AAAAAA AAAAAAAAAA AAAAAA AAAAAAAAAA AAAAAA AAAAAAAAAA AAAAAA
AAAAAAAA AAAAAA AAAAAAAAAA AAAAAA AAAAAAAAAA AAAAAA
Th-230 0.000E+00 0.0000 0.000E+00 0.000E+00 0.0000 0.000E+00 0.0000 0.000E+00 0.0000
0.000E+00 0.0000 0.000E+00 0.0000 5.454E+00 1.0000
iiiiiii iiiiiiiiii iiiiii iiiiiiiiii iiiiii iiiiiiiiii iiiiii iiiiiiiiii iiiiii
iiiiiii iiiiii iiiiiiiiii iiiiii iiiiiiiiii iiiiii
Total 0.000E+00 0.0000 0.000E+00 0.0000 0.000E+00 0.0000 0.000E+00 0.0000 0.000E+00 0.0000
0.000E+00 0.0000 0.000E+00 0.0000 5.454E+00 1.0000
0*Sum of all water independent and dependent pathways.

```

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Summary : Th-230 100 pCi/g
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 2016\230FEB.RAD

Dose/Source Ratios Summed Over All Pathways

Parent and Progeny Principal Radionuclide Contributions Indicated

| 0 Parent (mrem/yr)/(pCi/g) | Product (j) | Thread Fraction | DSR(j,t) At Time in Years | | | | | |
|----------------------------|-------------|-----------------|---------------------------|-----------|-----------|-----------|-----------|-----------|
| (i) | (j) | | 0.000E+00 | 2.000E-01 | 1.000E+01 | 1.000E+02 | 3.000E+02 | |
| 1.000E+03 | | | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | |
| Th-230 | Th-230 | 1.000E+00 | 1.499E-05 | 1.499E-05 | 1.499E-05 | 1.498E-05 | 1.495E-05 | |
| 1.485E-05 | Th-230 | Ra-226+D | 1.000E+00 | 2.960E-04 | 4.140E-04 | 5.896E-03 | 3.640E-02 | 5.273E-02 |
| 5.452E-02 | Th-230 | Pb-210+D | 1.000E+00 | 2.700E-10 | 4.632E-10 | 7.638E-08 | 2.123E-06 | 3.723E-06 |
| 3.910E-06 | Th-230 | äDSR(j) | 3.110E-04 | 4.290E-04 | 5.912E-03 | 3.642E-02 | 5.275E-02 | |
| 5.454E-02 | | | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | |

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

0 Single Radionuclide Soil Guidelines G(i,t) in pCi/g

Basic Radiation Dose Limit = 2.500E+01 mrem/yr

| ONuclide (i) | t= 0.000E+00 | 2.000E-01 | 1.000E+01 | 1.000E+02 | 3.000E+02 | 1.000E+03 |
|--------------|--------------|-----------|-----------|-----------|-----------|-----------|
| Th-230 | 8.040E+04 | 5.827E+04 | 4.229E+03 | 6.865E+02 | 4.739E+02 | 4.584E+02 |
| | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |

0

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 = 654 n 1 years

| ONuclide (i) | Initial (pCi/g) | tmin (years) | DSR(i,tmin) | G(i,tmin) (pCi/g) | DSR(i,tmax) | G(i,tmax) (pCi/g) |
|--------------|-----------------|--------------|-------------|-------------------|-------------|-------------------|
| Th-230 | 1.000E+02 | 654 n 1 | 5.466E-02 | 4.573E+02 | 5.466E-02 | 4.573E+02 |
| | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |

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Summary : Th-230 100 pCi/g
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Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

| ONuclide | Parent (j) | Parent (i) | THF(i) | t= 0.000E+00 | 2.000E-01 | 1.000E+01 | 1.000E+02 | 3.000E+02 |
|-----------|------------|------------|-----------|--------------|-----------|-----------|-----------|-----------|
| 1.000E+03 | | | | | | | | |
| AAAAAAA | AAAAAAA | AAAAAAA | | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA |
| AAAAAAA | | | | | | | | |
| Th-230 | Th-230 | | 1.000E+00 | 1.499E-03 | 1.499E-03 | 1.499E-03 | 1.498E-03 | 1.495E-03 |
| 1.485E-03 | | | | | | | | |
| ORa-226 | Th-230 | | 1.000E+00 | 2.960E-02 | 4.140E-02 | 5.896E-01 | 3.640E+00 | 5.273E+00 |
| 5.452E+00 | | | | | | | | |
| OPb-210 | Th-230 | | 1.000E+00 | 2.700E-08 | 4.632E-08 | 7.638E-06 | 2.123E-04 | 3.723E-04 |
| 3.910E-04 | | | | | | | | |
| iiiiiii | iiiiiii | iiiiiii | | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| iiiiiii | | | | | | | | |

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

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

| ONuclide | Parent (j) | Parent (i) | THF(i) | t= 0.000E+00 | 2.000E-01 | 1.000E+01 | 1.000E+02 | 3.000E+02 |
|-----------|------------|------------|-----------|--------------|-----------|-----------|-----------|-----------|
| 1.000E+03 | | | | | | | | |
| AAAAAAA | AAAAAAA | AAAAAAA | | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA | AAAAAAA |
| AAAAAAA | | | | | | | | |
| Th-230 | Th-230 | | 1.000E+00 | 1.000E+02 | 1.000E+02 | 9.999E+01 | 9.991E+01 | 9.972E+01 |
| 9.908E+01 | | | | | | | | |
| ORa-226 | Th-230 | | 1.000E+00 | 0.000E+00 | 8.655E-03 | 4.106E-01 | 2.647E+00 | 3.844E+00 |
| 3.976E+00 | | | | | | | | |
| OPb-210 | Th-230 | | 1.000E+00 | 0.000E+00 | 2.696E-05 | 5.757E-02 | 1.744E+00 | 3.070E+00 |
| 3.225E+00 | | | | | | | | |
| iiiiiii | iiiiiii | iiiiiii | | iiiiiii | iiiiiii | iiiiiii | iiiiiii | iiiiiii |
| iiiiiii | | | | | | | | |

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

ORESCALC.EXE execution time = 7.60 seconds