Westinghouse Electric Company LLC
Hematite Decommissioning Project
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USA

ATTN: Document Control Desk
Director, Office of Federal and State Materials and
Environmental Management Programs
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

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Our ref: HEM-10-23
Date: March 3, 2010

Subject: Additional Request for Alternate Disposal Approval and Exemption for Hematite Building Debris Waste (License No. SNM-00033, Docket No. 070-00036)

Reference: 1) Westinghouse (G. F. Couture) letter to NRC Document Control Desk HEM-09-52, dated May 21, 2009, "Request for Alternate Disposal Approval and Exemptions for Specific Hematite Decommissioning Project Waste"

Dear Sirs:

In Reference 1, Westinghouse Electric Company LLC requested that NRC approve alternate disposal of specified low-activity radioactive materials from our Hematite Decommissioning Project (HDP) for certain waste containing source material, byproduct material and Special Nuclear Material (SNM). In addition, Reference 1 requested an exemption from the 10 CFR 30.3 and §70.3 licensing requirements for byproduct material and SNM to allow Westinghouse to transfer the waste for disposal at the US Ecology Idaho, Inc. (USEI) RCRA Subtitle C disposal facility near Grand View, Idaho. This letter requests that additional waste be authorized for disposal under the authority of 10 CFR 20.2002 and requests an additional exemption from the 10 CFR 30.3 and §70.3 licensing requirements for the additional byproduct material and SNM. The additional waste primarily consists of debris from future demolition of HDP site buildings.

The enclosed Safety Assessment for the additional waste was developed in coordination with USEI and relies in part, upon the previous Safety Assessment of Reference 1. This document summarizes the characteristics of the additional waste material, the proposed manner and conditions of disposal, the nature of the environment at the disposal facility, the nature and location of other potentially affected facilities, and calculates the potential doses to members of the public during transport, railcar receipt, unloading, local transport and disposal, and potential future doses through the credible environmental pathways following disposal.

The enclosed Safety Assessment calculates that the proposed waste disposal (as initially requested in Reference 1, plus the additional waste described herein) would contribute 2 millirem or less per year to any individual, thus meeting the standard in NUREG 1757 by

limiting alternate disposal exposures to not more than "a few millirem per year" to any member of the public.

The enclosed Safety Assessment also projects that the waste will be several orders of magnitude below the concentrations that would present a criticality concern, and well below the threshold of material that would be classified as fissile during transport under U.S. Department of Transportation regulation.

Westinghouse suggests that the requested authorization and exemption can be performed as a categorical exclusion not requiring environmental review in accordance with 10 CFR 51.22(c)(11). The enclosed Safety Assessment demonstrates that the proposed disposal will not have a significant effect on the human environment individually or cumulatively with other §51.22(c)(11) actions. There are no special circumstances involved. The proposed action would result in a change in process operations (i.e., concerning the location that is used for the disposal of specific low level radioactive waste). Such a change:

(i) would cause no significant change in the types or significant increase in the amounts of any effluents that may be released offsite.
(ii) would cause no significant increase in individual or cumulative occupational radiation exposure. The attached Safety Assessment demonstrates that the radiation exposure is not significant.
(iii) would cause no significant construction impact. There is no construction impact concerning the location of waste disposal. The Idaho location has previously been approved and is currently used for the disposal of radiological and RCRA waste.
(iv) would cause no significant increase in the potential for or consequences from radiological accidents. The attached Safety Assessment evaluates the potential events.

We look forward to NRC's timely review of this request. Please contact me at (803) 647-2045 with any questions.

Sincerely,

G. F. Couture
Hematite Licensing Manager

Enclosure: Hematite Project Safety Assessment for the Land Fill Disposal of Building Debris Decommissioning Waste at US Ecology of Idaho

Cc: Mr. Kurt Hackmann, HDP Project Director
Mr. Jack Hayes, NRC Project Manager
Mr. Chad Hyslop, US Ecology Idaho, Inc.
Mr. Jim Kennedy, LLW Division, w/o enclosure
Mr. Keith McConnell, NRC Waste Management & Environmental Protection, w/o enclosure
Mr. Gerald Rood, Hematite RSO

Hematite Project Safety Assessment for the Land Fill Disposal of Building Debris Decommissioning Waste at US Ecology of Idaho

Prepared by
Westinghouse Electric Company LLC and
US Ecology Idaho, Inc.

Table of Contents

Attachments:

1) Case Summaries, MicroShield 7.02, Westinghouse Electric Company LLC, (08-MSD-7.02-1424)
2) RESRAD, Version 6.5 Cases
3) Dose to Inadvertent Intruder
4) NSA-TR-10-01, Revision 0, dated February 2010, “Nuclear Criticality Safety Assessment of the US Ecology Idaho (USEI) Site for the Land Fill Disposal of Building Debris Decommissioning Waste from the Hematite Site”

INTRODUCTION

Westinghouse Electric Company LLC (Westinghouse) provides this Safety Assessment to the U.S. Nuclear Regulatory Commission (NRC) in support of a request for authorization to dispose of waste at US Ecology's Idaho (USEI) facility in accordance with 10 CFR 20.2002. In addition, it supports a request for US Ecology to be exempted from byproduct material and SNM license requirements of 10 CFR 30.3 and §70.3 for that waste. This request refers to the information contained in Reference 1, and the associated information provided in Westinghouse's responses to NRC's Request for Additional Information and other information provided in the following letters:

References:
1) Westinghouse (G. F. Couture) letter to NRC (Document Control Desk), HEM-09-52, dated May 21, 2009, "Request for Alternate Disposal Approval and Exemptions for Specific Hematite Decommissioning Project Waste"
2) Westinghouse (E. K. Hackmann) letter to NRC (Document Control Desk), HEM-09-146, dated December 29, 2009, "Response to Request for Additional Information – Alternate Waste Disposal"
3) Westinghouse (E. K. Hackmann) letter to NRC (Document Control Desk), HEM-10-6, dated January 20, 2010, "Additional Information Concerning Alternate Waste Disposal"
4) Westinghouse (E. K. Hackmann) letter to NRC (Document Control Desk), HEM-10-9, dated January 21, 2010, "Corrected Compact Disks Concerning Alternate Waste Disposal"

1. EXECUTIVE SUMMARY

This information and radiological safety assessment was developed in coordination with USEI's health physics staff. This document describes the candidate waste and the proposed manner and conditions of disposal, provides an evaluation of pertinent information on the nature of the environment at the disposal facility, provides information on the location of other potentially affected facilities, and calculates the potential doses to members of the public during transport, during railcar receipt, unloading, local transport and disposal, and potential future doses through the credible environmental pathways following disposal.

This Safety Assessment also demonstrates that the waste will be several orders of magnitude below the concentrations that would present a criticality concern, and well below the threshold of material that would be classified as fissile during transport under U.S. Department of Transportation regulation.

This waste to be disposed in addition to that previously described in Reference 1 includes approximately 327,000 cubic feet of building debris containing low concentrations of both Special Nuclear Material (SNM) and byproduct material contaminants. A description of the waste to be disposed is provided in Section 5 and 6, including the physical and chemical

properties of the waste. Westinghouse's proposed method of documenting the waste transfer is also discussed in those sections of this assessment.

The calculated dose resulting from alternate disposal of this additional material is approximately 0.1 millirem (mrem) per year to any member of the public. The total calculated dose (i.e., the combined potential dose from the waste described in Reference 1 as modified by References 2 through 4 and the additional waste described herein), is 2 mrem per year to any member of the public, which is well within the "few millirem per year" exposure standard set forth in NUREG 1757 for alternate disposal approvals. These findings support NRC approval of alternate disposal in accordance with 10 CFR 20.2002.

This Safety Assessment also supports NRC concurrence that US Ecology can be exempted from byproduct material and SNM license requirements of 10 CFR 30.3 and §70.3, as allowed in §30.11 and §70.17. Such exemption from regulation under the Atomic Energy Act for disposal purposes is consistent with the diffuse, low concentrations of contaminants in the waste and with exemptions issued to others for managing wastes containing higher concentrations.

2. USEI FACILITY OPERATING HISTORY

Section 2 of the enclosure to Reference 1 describes the USEI facility near Grand View, Idaho.

3. DISPOSAL FACILITY CHARACTERISTICS

A description of the USEI facility located near Grand View, Idaho was included as Attachment 1 to the enclosure of Reference 1. Section 3 of that enclosure described the environmental characteristics of the facility that are relevant to estimating potential future dose through the credible environmental pathways following disposal.

4. USEI WASTE ACCEPTANCE CRITERIA

Section 4 of the enclosure to Reference 1 describes the USEI waste acceptance criteria (WAC).

5. MATERIAL DESCRIPTION & SUITABILITY

The waste consists of concrete, cinder block, structural steel, carbon and stainless steel equipment and roofing material lightly contaminated with both SNM and byproduct material, specifically uranium enriched in ^{235}U. The waste may also contain trace amounts of ^{99}Tc, ^{230}Th, ^{232}Th, ^{90}Sr, and ^{237}Np. The uranium enrichment averages approximately 5 weight-percent. Average concentrations for the target radionuclides following demolition and aggregation are provided in the Table 1, below.

Table 1
Concentration Measured in Hematite Waste

Radionuclide[1]	Average Concentration of Parent Nuclides (pCi/g)
Th-230	1.3E-02
Np-237 + D	2.0E-03
Tc-99	2.1E-01
Th-232 + C	1.5E-03
U-234	4.6E+01
U-235 + D	2.6E+00
U-238 + D	7.6E+00
Sr-90 + D	3.8E-02

[1]+D indicates inclusion of short lived progeny in dose calculations
+ C indicates inclusion of entire decay chain in dose calculations

Westinghouse estimates the volume of the waste to be approximately 327,000 ft^3. Based on an estimate of the density at time of shipment to be 40 lbs/ft^3, this is will be approximately 6,535 tons.

The volume of material associated with the process buildings, Building 115, Building 235 and Building 245 and installed equipment was determined based on facility drawings and walk downs. The weight of the material was then estimated based on an assumed installed density for concrete block of 65 pounds per cubic foot and an assumed installed density of other materials of 50 pounds per cubic foot. Other materials included sheet metal, I-beams, angle iron, grating, insulation, roofing material, piping, conduit, motor control centers and materials normally associated with the construction of buildings. The total mass of process building material is 5,745 tons. To ensure this assessment bounds the potential for exposure to members of the public, the estimates of volume and weight include a factor of 1.5 to account for uncertainty.

An estimate of collective ^{235}U mass and areal density associated with the surfaces of the buildings (floors, walls, ceilings and roofs) was obtained based on a correlation of the observed count rate of a sodium iodide (NaI) detector positioned in close proximity to building surfaces and the amount of ^{235}U per unit surface area as measured using a high-purity germanium (HPGe) detector. The response of the HPGe detector was in turn calibrated to areal density based on a high-fidelity computational analysis of the detector response to a known and specified contamination source term using the Monte Carlo N-Particle (MCNP) code.

For example, a calibration factor of 1E-9 $gram/cm^2/cpm$ when applied to an area of 10,000 cm^2 with surface activity of 10,000 cpm as measured with the NaI was assigned a gram value as follows:

$$(1 \times 10^{-9}\ g/cm^2/cpm)(10{,}000\ cpm)(10{,}000 cm^2) = 0.1\ gram\ ^{235}U$$

The amount of ^{234}U and ^{238}U were derived based on their relationship with ^{235}U at an enrichment of 5 weight-percent. Scaling factors for the process buildings were then used to define the concentrations of Tc-99 and the other trace radionuclides (^{230}Th, ^{232}Th, ^{237}Np, and ^{90}Sr).

The radioactivity inventory associated with the walls, ceilings, piping, and miscellaneous equipment was then adjusted to account for specific equipment that will be removed prior to building demolition, as well as the concrete floor slabs that will be removed at a later date. The average process building debris radionuclide concentrations in units of pCi/g were then calculated based on the remaining amount of activity and the mass of the building as described above. The total activity (sum of all nuclides and progeny) for this waste is approximately 75 pCi/g or ~2 percent of USEI's 3,000 pCi/g average total activity concentration limit.

Included in the waste describe above, Westinghouse plans to dispose 789 tons of waste from various out buildings (i.e., not attached to the processing buildings). Radiological surveys of the surfaces of these out buildings have been performed and the results of these surveys demonstrate that the average radionuclide concentration associated with the structural materials (i.e., roof, ceilings and walls) of these buildings is bounded by the estimates prepared for the process buildings (Attachment 4 herein). However, the concentration of the building debris derived from the demolition of these out buildings were conservatively assumed to be the same as the radionuclide concentration derived for the process building demolition debris (provided in Table 1).

To ensure the radiological characteristics of the waste are within the bounds of this safety assessment, an average concentration of 2,000 pCi/g was assumed (Table 2, Parent Nuclides at Assessed Concentration). This is approximately 28 times the measured concentration, but is within the range of detection for the sodium iodide detector and the method of survey to be used at the time of package preparation for shipment. This will be implemented by investigating through additional surveys and/or sampling of the contents any package that displays readings in excess of the detection level for the instrumentation and survey method. As a part of the process to further ensure that the average concentration of the waste remains within the bounds of this safety assessment, and that the maximum concentration does not exceed the WAC at USEI (Table 2, Parent Nuclides at USEI WAC), core samples of the building materials will be obtained prior to demolition from locations that indicate the most-elevated radioactivity concentrations. Following laboratory analysis of the samples, a comparison will be made to the USEI WAC and the bounds of this safety assessment. In addition to the measurements made at Hematite, radiological surveys of incoming material is an integral part of the USEI waste acceptance procedure and will provide a final check to ensure that material received meets the site waste acceptance criteria.

As indicated above, Westinghouse intends to limit the average radionuclide concentration in material shipped based on site survey capabilities. As such, Westinghouse has determined that a practical limiting condition on material concentration to be shipped to US Ecology would be material exhibiting a total average concentration of 2,000 pCi/g. Based on the relative concentration of radionuclides present in building materials, the resultant material concentrations are shown below in Table 2 (Parent Nuclides at Assessed Concentration).

Table 2
Relative Radionuclide Concentrations in Hematite Waste

Radionuclide[1]	Parent Nuclides at Assessed Concentration (pCi/g)	Parent Nuclides at USEI WAC (pCi/g)
Th-230	3.5E-01	5.25E-01
Np-237 +D	5.4E-02	8.10E-02
Tc-99	5.5E+00	8.25E+00
Th-232 +C	4.0E-02	6.00E-02
U-234	1.2E+03	1.80E+03
U-235 +D	6.9E+01	1.04E+02
U-238 +D	2.0E+02	3.00E+02
Sr-90 +D	1.0E+00	1.50E+00

[1] +D indicates inclusion of short lived progeny in dose calculations
+ C indicates inclusion of entire decay chain in dose calculations

Packages which, based on radiological survey, are suspected of exceeding concentrations shown in Table 2 (Parent Nuclides at Assessed Concentration) will be subjected to additional investigation to include surveys of the contents and/or additional sampling.

6. TRANSPORT AND DISPOSAL RADIOLOGICAL ASSESSMENTS

Using multiple conservative exposure scenarios, the dose equivalent was calculated for the Maximally Exposed Individual (MEI). Dose to the MEI is ~1.3 mrem in any scenario; this is consistent with the NUREG 1737 Vol.1, Rev.2, Consolidated Decommissioning Guidance-Decommissioning Guidance for Materials Licensees, Final Report, p. 15-31 criteria of a "few millirem/yr" to a member of the public. The transportation workers and workers at the USEI facility are treated as members of the public since the USEI facility is not licensed under the Atomic Energy Act. Evaluations of both potential external and internal doses to workers are discussed below. Based on the conservatively projected length of time of exposure and proximity to waste, the MEI for transportation and disposal is a USEI worker.

6.1 Dose Assessment Methodology

Internal and external dose calculations were performed as described in Section 6.1 of the enclosure to Reference 1. A copy of the MicroShield results using material concentrations found in Tables 1, and 2, above, is given in Attachment 1 herein.

Transportation will be by gondola railcar. The contents of each gondola railcar will be entirely enclosed in form-fitting, sift-proof, and closable wrappers meeting US Department of Transportation (DOT) Industrial Type-1 Package (IP-1) requirements. The IP-1 package precludes dispersal of waste to the air or loss of material during transport. A separate exposure

evaluation for members of the public along the transport route is not warranted since such exposure is bounded by that of the MEI onsite at USEI (who is also considered a member of the public). Based on a projected exposure rate of 3.9×10^{-3} mrem/hr at a distance of 1 foot from a loaded railcar an individual would have to be adjacent to a loaded railcar for 333 hr in order to achieve an exposure equal to that projected for the USEI onsite MEI (based on an exposure of 1.3 mrem for the MEI).

Based on the anticipated volume of material to be shipped, it is assumed that about 123 gondola cars will be received at USEI's rail transfer facility and that this volume of material will be transferred to the final disposal cell in approximately 370 truck loads. It is further assumed that the entire project will ship within one calendar year and all doses are associated with one calendar year.

Internal dose estimates due to inhalation assume that each worker is exposed to respirable dust at the highest rate found for any one worker. This dust loading was measured during USEI's August 2008 dust study for the full duration of each task performed (Reference 2). This is a very conservative assumption.

Dose assessment scenarios are described for each major waste activity at USEI, and results are summarized in Table 3 that follows.

6.2 Gondola Surveyor

Section 6.2 of the enclosure to Reference 1 describes the methodology for calculation of dose for the gondola surveyor. The estimated radiation field, internal and external dose rates per gondola and per surveyor based on the radionuclide concentrations in Tables 1 and 2 are provided in Tables 3 and 4. The inhalation doses for the gondola surveyor are considered to be very conservative since all surveying activities are conducted while the waste is packaged in form-fitting, sift-proof, and closable wrappers meeting US Department of Transportation (DOT) Industrial Type-1 Package (IP-1) requirements.

6.3 Excavator Operator

Section 6.3 of the enclosure to Reference 1 describes the methodology for calculation of dose for the excavator operator. The estimated radiation field, internal and external dose rates per gondola and per operator based on the radionuclide concentrations in Tables 1 and 2 are provided in Tables 3 and 4. This analysis contains several conservative assumptions including an assumption that the operator's respirable dust uptake is the same as the maximally exposed individual's recorded in USEI's recent dust study, and takes no credit for the respiratory protection provided to the operator by his enclosed cab and HEPA filtration system. A protection factor of at least 10 is appropriate for this worker, yet no credit for such is taken in this analysis.

6.4 Gondola Cleanout

Section 6.4 of the enclosure to Reference 1 describes the methodology for calculation of dose for the gondola cleanout person. The estimated radiation field, internal and external dose rates per

gondola and per person based on the radionuclide concentrations in Tables 1 and 2 are provided in Tables 3 and 4.

6.5 Truck Surveyor

Section 6.5 of the enclosure to Reference 1 describes the methodology for calculation of dose for the truck surveyor. The estimated radiation field, internal and external dose rates per truck and per person based on the radionuclide concentrations in Tables 1 and 2 are provided in Tables 3 and 4. The calculated dose is considered conservative since the trucks are surveyed after the waste has been placed in the lined and tarped trucks, minimizing uptake and internal dose potential.

6.6 Truck Driver

Section 6.6 of the enclosure to Reference 1 describes the methodology for calculation of dose for the truck driver. The estimated radiation field, internal and external dose rates per truck and per person based on the radionuclide concentrations in Tables 1 and 2 are provided in Tables 3 and 4. The inhalation doses to the truck driver are also conservatively stated since the truck driver is required by facility operations procedures to remain inside his closed, sealed truck cab with a HEPA filtration system during loading activities. A respiratory protection factor of 10 is appropriate for this activity. Following loading, the waste is immediately tarped for transport. This packaging precludes potential for uptake and internal dose during transport of the waste. No credit is taken for the HEPA filtration system in the cab of the truck, or for the packaging during transport for this calculation.

6.7 Stabilization Operator

Stabilization is not expected to be performed on the waste stream covered by this evaluation, as such no evaluation of dose to the stabilization operator position (as was performed in Section 6.7 of the enclosure to Reference 1) is required.

6.8 Cell Operator

Section 6.8 of the enclosure to Reference 1 describes the methodology for calculation of dose for the cell operator. The estimated radiation field, internal and external dose rates per gondola and per person based on the radionuclide concentrations in Tables 1 and 2 are provided in Tables 3, and 4. No credit is taken for the operator's respiratory protection.

The values in Table 3 and 4 were calculated based on conservative assumptions. Even with these conservative assumptions it is clear that all calculated doses are extremely low and well within the USNRC's "few millirem" criteria for alternate disposal.

Table 3
Summary of Doses to USEI Workers Average Concentration

Job Function	# of Workers	Minutes to perform task	Distance from object (meters)	Type of conveyance modeled	External dose rate (mrem/hr)	Internal dose rate per conveyance (mrem)	External dose rate per conveyance (mrem)	Total Internal (mrem)	Total External (mrem)	Total (mrem)
Gondola Surveyor	8	20	1	Gondola (123)	7.8E-05	6.8E-04	2.6E-05	1.0E-02	4.0E-04	1.1E-02
Excavator Operator	4	45	2	Gondola (123)	2.8E-05	1.5E-03	2.1E-05	4.7E-02	6.6E-04	4.8E-02
Gondola Cleanout	8	10	1	Gondola (123)	7.8E-05	3.4E-04	1.3E-05	5.2E-03	2.0E-04	5.4E-03
Truck Surveyor	8	5	1	Truck (370)	1.3E-04	1.7E-04	1.1E-05	7.9E-03	5.1E-04	8.4E-03
Truck Driver	14	45	0.6	Truck (370)	1.5E-04	1.5E-03	1.1E-04	4.0E-02	3.0E-03	4.3E-02
Stabilization Operator	N/A									
Cell Operator	2	15	1	Gondola (123)	1.3E-04	5.1E-04	3.2E-05	3.1E-02	2.0E-03	3.3E-02

Table 4
Summary of Doses to USEI Workers Based on Assessed Concentrations

Job Function	# of Workers	Minutes to perform task	Distance from object (meters)	Type of conveyance modeled	External dose rate (mrem/hr)	Internal dose rate per conveyance (mrem)	External dose rate per conveyance (mrem)	Total Internal (mrem)	Total External (mrem)	Total (mrem)
Gondola Surveyor	8	20	1	Gondola (123)	2.1E-03	1.8E-02	7.1E-04	2.8E-01	1.1E-02	2.9E-01
Excavator Operator	4	45	2	Gondola (123)	7.7E-04	4.1E-02	5.8E-04	1.3E+00	1.8E-02	1.3E+00
Gondola Cleanout	8	10	1	Gondola (123)	2.1E-03	9.1E-03	3.6E-04	1.4E-01	5.5E-03	1.5E-01
Truck Surveyor	8	5	1	Truck (370)	3.6E-03	4.6E-03	3.0E-04	2.1E-01	1.4E-02	2.2E-01
Truck Driver	14	45	0.6	Truck (370)	4.1E-03	4.1E-02	3.1E-03	1.1E+00	8.1E-02	1.2E+00
Stabilization Operator	N/A									
Cell Operator	2	15	1	Gondola (123)	3.5E-03	1.4E-02	8.8E-04	8.4E-01	5.4E-02	9.0E-01

7. POST-CLOSURE DOSE TO THE GENERAL PUBLIC

The USEI disposal permit requires the operator to demonstrate that no person will receive a dose in excess of 15 millirem for 1,000 years after closure of the facility. The RESRAD code is used to establish post closure dose estimates. For purposes of its permit, USEI must demonstrate compliance with this limit where all radionuclides are assumed to be distributed homogeneously over the volume of the contaminated zone. In response to the NRC's comments on Reference 1, an additional model with more consolidated waste placement was generated for this analysis.

Westinghouse estimates that the buildings referenced in this submittal will be entirely removed and disposed of at USEI within a one-year period. Because Westinghouse's building rubble waste will be co-mingled with all other waste receipts at USEI over this time period, the consolidated placement is based on the average volume of waste received over the duration of the project. Over the past 5 years USEI has received an average of 711,000 tons of waste per year, so this analysis assumes the building rubble from Westinghouse will be evenly distributed over 711,000 tons total waste.

In the RESRAD model, all waste is modeled as uniformly contaminated soil, rather than discrete volumes of concrete and metal. The density of the contaminated zone is adjusted, however, to the average density of the materials received, including building rubble, metal dusts, etc. The major contributor to post closure dose is Tc-99 which is highly mobile in both soil and concrete, though slightly more so in soil. Since the model assumed a soil matrix containing Tc-99 rather than concrete, this resulted in a more conservative estimate of peak dose.

Dose evaluation for an intruder scenario was structured based on the scenario for a low-level radioactive waste disposal facility set forth in NUREG-0782. Unless otherwise noted on the intruder scenario worksheet of Attachment 3 herein, all tables used and assumptions or entries made (except for radionuclides and their concentrations) were those found in or consistent with the scenario instructions in NUREG-0782. Calculated dose to the intruder is 1.4 mrem, well within the "few millirem" standard.

Based on these conservative assumptions and the values found in Table 2, the estimated peak post closure dose is 0.1 millirem and will be reached in year 247, well within the "few millirem" guidance.

8. CRITICALITY

A criticality safety assessment has been performed to evaluate the criticality risk associated with consignment of the building demolition debris decommissioning wastes discussed in Section 5. The results of this NCSA (provided in Attachment 4 herein) demonstrates that the disposal of Hematite building demolition debris decommissioning wastes at the USEI site poses no criticality safety concerns. The assessment has determined that there are very large margins of safety under normal (i.e., expected) conditions and that there is considerable tolerance to abnormal conditions. Under all foreseen abnormal conditions a criticality event

is demonstrated to be not credible due to the characteristics of the decommissioning wastes, or is shown to be precluded by controls in place at the Hematite site.

9. RECORDS OF TRANSFER

Section 9 of the enclosure to Reference 1 discussed the records for transfer of SNM to the disposal facility.

10. CUMULATIVE DOSES

Because this request adds additional volume to the initial exemption request (Reference 1), a discussion of cumulative doses is appropriate.

10.1 Public / Worker Doses

There are no cumulative internal/external doses to workers or members of the public during transport and disposal operations, since disposal of building rubble will occur in 2010 and disposal of HDP site burial pits and other site soils will occur in 2011 and beyond. As a result, doses resulting from the initial Reference 1 request and this subsequent request will occur in different calendar years. Therefore it is appropriate to consider these doses in different years separately. Nevertheless, if the doses were added together, no worker receives a dose that is greater than the NRC's "few millirem" guidance.

10.1 Post-Closure Doses to the General Public

Post-closure doses are cumulative, since all Tc-99 doses from both requests will occur in year 247 post closure. As a result, these doses are added together and presented in Table 5. Cumulative post-closure doses are still well within the NRC's "few millirem" guidance:

Table 5
Post-Closure Doses to the General Public

Exemption Request for Soil (Reference 1)	Exemption for Building Rubble	Cumulative Dose
1.9 mrem[1]	0.1 mrem	2 mrem

[1] This value represents a correction to that submitted in Attachment 1 to Reference 2, Performance Assessment Comment 2 (i.e., 2.931 mrem), which was overstated. See Attachment 2 herein for a revised RESRAD case, File: USEI_EGL_FINAL_03_25_05.RAD, which corrects the overstated value.

11. REQUESTED NRC ACTIONS

For the reasons noted above, Westinghouse requests that NRC take the following actions:

1. Approve 10 CFR 20.2002 alternate disposal of the specific HDP waste at USEI;
2. Issue an exemption from the 10 CFR 30.3 and §70.3 license requirements for USEI to possess byproduct material and SNM for the specific waste disposal; and
3. Concur with Westinghouse's USNRC Form 741 records transfer plan as discussed in Section 9 of the enclosure to Reference 1.

Attachment 1 to HEM-10-23
Date: March 3, 2010

Attachment 1

Case Summaries, MicroShield 7.02
Westinghouse Electric Company LLC (08-MSD-7.02-1424)

The MicroShield case summaries of the following pages are based upon the input data given below:

MicroShield Input Data
Average Concentrations

Primary Nuclide	**Concentration** pCi/g	**Input Value** $\mu Ci/cm^3$	**Notes**
Th-230	1.3E-02		*
Np-237	2.0E-03	1.3E-09	
Tc-99	2.1E-01		*
Th-232	1.5E-03	9.7E-10	
Ra-228			**
Th-228			**
U-234	4.6E+01	3.0E-05	
U-235	2.6E+00	1.6E-06	
U-238	7.6E+00	4.8E-06	
Sr-90	3.8E-02		*

* Not used in external dose calculation - no photon emissions
** Included with Th-232 progeny

MicroShield Input Data
Average Concentrations - Progeny Contribution

	Nuclide	Fraction	Input Value $\mu Ci/cm^3$
U-235 Progeny	Th-231	1	1.6E-06
U-238 Progeny	Pa-234	0.0016	7.7E-09
	Th-234	1	4.8E-06
	Pa-234m	1	4.8E-06
Th-232 Progeny	Ac-228	1	9.7E-10
	Bi-212	1	9.7E-10
	Pb-212	1	9.7E-10
	Po-212	0.6407	6.2E-10
	Po-216	1	9.7E-10
	Ra-224	1	9.7E-10
	Ra-228	1	9.7E-10
	Rn-220	1	9.7E-10
	Th-228	1	9.7E-10
	Tl-208	0.3593	3.5E-10
Np-237 Progeny	Pa-233	1	1.3E-09

MicroShield Input Data
Assessed Concentrations

Primary Nuclide	**Concentration** pCi/g	**Input Value** $\mu Ci/cm^3$	**Notes**
Th-230	3.5E-01		*
Np-237	5.4E-02	3.43E-08	
Tc-99	5.5E+00		*
Th-232	4.0E-02	2.59E-08	
Ra-228			**
Th-228			**
U-234	1.2E+03	7.97E-04	
U-235	6.9E+01	4.40E-05	
U-238	2.0E+02	1.30E-04	
Sr-90	1.0E+00		*

* Not used in external dose calculation - no photon emissions
** Included with Th-232 progeny

MicroShield Input Data
Assessed Concentrations - Progeny Contribution

	Nuclide	Fraction	Input Value $\mu Ci/cm^3$
U-235 Progeny	Th-231	1	4.40E-05
U-238 Progeny	Pa-234	0.0016	2.08E-07
	Th-234	1	1.30E-04
	Pa-234m	1	1.30E-04
Th-232 Progeny	Ac-228	1	2.59E-08
	Bi-212	1	2.59E-08
	Pb-212	1	2.59E-08
	Po-212	0.6407	1.66E-08
	Po-216	1	2.59E-08
	Ra-224	1	2.59E-08
	Ra-228	1	2.59E-08
	Rn-220	1	2.59E-08
	Th-228	1	2.59E-08
	Tl-208	0.3593	9.31E-09
Np-237 Progeny	Pa-233	1	3.43E-08

Case Summaries which follow:

Job Function	**Filenames**	**Run Date / Time**
Gondola Surveyor	gondola_transit_r5.ms7 gondola_transit_max.ms7	February 17, 2010 / 5:29:10 PM February 17, 2010 / 10:14:20 AM
Excavator Operator	gondola_1and2_meter_r5.ms7 gondola_1and2_meter_max.ms7	February 17, 2010 / 5:26:31 PM February 10, 2010 / 11:56:49 AM
Gondola Cleanout	GondolaCleanout_r5.ms7 GondolaCleanout_max.ms7	February 17, 2010 / 5:49:19 PM February 10, 2010 / 12:01:36 PM
Truck Surveyor	TruckSurveyor_r5.ms7 TruckSurveyor_max.ms7	February 17, 2010 / 5:45:16 PM February 10, 2010 / 12:03:59 PM
Truck Driver	TruckDriver_r5.ms7 TruckDriver_max.ms7	February 17, 2010 / 5:43:12 PM February 10, 2010 / 12:08:38 PM
Cell Operator	CellSurface_r5.ms7 CellSurface_max.ms7	February 17, 2010 / 5:24:13 PM February 10, 2010 / 11:52:50 AM

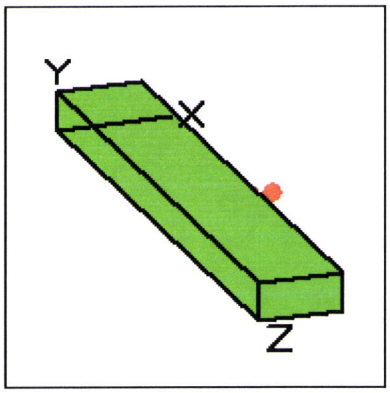
MicroShield 7.02
Westinghouse Electric Company (08-MSD-7.02-1424)

Date	By	Checked
2/26/2010	[illegible]	[illegible]

Filename	Run Date	Run Time	Duration
gondola transit r5.ms7	February 17, 2010	5:29:10 PM	00:00:01

Project Info	
Case Title	Case 1
Description	Case 1
Geometry	13 - Rectangular Volume

Source Dimensions	
Length	274.32 cm (9 ft)
Width	1.8e+3 cm (60 ft)
Height	121.92 cm (4 ft)



Dose Points			
A	X	Y	Z
#1	375.0 cm (12 ft 3.6 in)	60.96 cm (2 ft)	914.4 cm (30 ft)
#2	305.714 cm (10 ft 0.4 in)	60.96 cm (2 ft)	914.4 cm (30 ft)

Shields			
Shield N	Dimension	Material	Density
Source	6.12e+07 cm³	Concrete	0.64
Shield 1	.794 cm	Iron	7.86
Air Gap		Air	0.00122

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

Nuclide	Ci	Bq	µCi/cm³	Bq/cm³
Ac-228	5.9329e-008	2.1952e+003	9.6999e-010	3.5890e-005
Bi-212	5.9329e-008	2.1952e+003	9.6999e-010	3.5890e-005
Np-237	7.9514e-008	2.9420e+003	1.3000e-009	4.8100e-005
Pa-233	7.9514e-008	2.9420e+003	1.3000e-009	4.8100e-005
Pa-234	4.7097e-007	1.7426e+004	7.7000e-009	2.8490e-004
Pa-234m	2.9359e-004	1.0863e+007	4.8000e-006	1.7760e-001
Pb-212	5.9329e-008	2.1952e+003	9.6999e-010	3.5890e-005
Po-212	3.8012e-008	1.4064e+003	6.2147e-010	2.2995e-005
Po-216	5.9329e-008	2.1952e+003	9.6999e-010	3.5890e-005
Ra-224	5.9329e-008	2.1952e+003	9.6999e-010	3.5890e-005
Ra-228	5.9329e-008	2.1952e+003	9.6999e-010	3.5890e-005
Rn-220	5.9329e-008	2.1952e+003	9.6999e-010	3.5890e-005
Th-228	5.9329e-008	2.1952e+003	9.6999e-010	3.5890e-005

Th-231	9.7863e-005	3.6209e+006	1.6000e-006	5.9200e-002
Th-232	5.9329e-008	2.1952e+003	9.7000e-010	3.5890e-005
Th-234	2.9359e-004	1.0863e+007	4.8000e-006	1.7760e-001
Tl-208	2.1317e-008	7.8872e+002	3.4852e-010	1.2895e-005
U-234	1.8349e-003	6.7892e+007	3.0000e-005	1.1100e+000
U-235	9.7863e-005	3.6209e+006	1.6000e-006	5.9200e-002
U-238	2.9359e-004	1.0863e+007	4.8000e-006	1.7760e-001

Buildup: The material reference is Source Integration Parameters	
X Direction	10
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (375,60.96,914.4) cm					
Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	6.811e+03	8.998e-170	5.455e-31	7.718e-171	4.679e-32
0.03	5.310e+05	6.148e-28	1.375e-27	6.093e-30	1.362e-29
0.04	4.377e+01	5.547e-19	1.917e-18	2.453e-21	8.480e-21
0.05	8.012e+04	8.850e-11	4.648e-10	2.358e-13	1.238e-12
0.06	4.424e+05	1.033e-07	7.076e-07	2.051e-10	1.405e-09
0.08	4.416e+05	1.060e-05	8.466e-05	1.677e-08	1.340e-07
0.1	1.074e+06	1.696e-04	1.318e-03	2.595e-07	2.016e-06
0.15	5.695e+05	5.405e-04	3.452e-03	8.900e-07	5.685e-06
0.2	2.239e+06	4.467e-03	2.460e-02	7.884e-06	4.342e-05
0.3	3.311e+03	1.478e-05	6.651e-05	2.803e-08	1.262e-07
0.4	1.225e+03	9.121e-06	3.565e-05	1.777e-08	6.947e-08
0.5	1.894e+03	2.071e-05	7.270e-05	4.065e-08	1.427e-07
0.6	7.191e+03	1.073e-04	3.447e-04	2.094e-07	6.728e-07
0.8	3.680e+04	8.945e-04	2.520e-03	1.701e-06	4.794e-06
1.0	1.166e+05	4.137e-03	1.060e-02	7.625e-06	1.955e-05
1.5	2.733e+03	1.918e-04	4.203e-04	3.227e-07	7.072e-07
2.0	3.213e+02	3.609e-05	7.226e-05	5.581e-08	1.117e-07
3.0	7.871e+02	1.670e-04	2.990e-04	2.266e-07	4.057e-07
Totals	**5.556e+06**	**1.077e-02**	**4.389e-02**	**1.928e-05**	**7.783e-05**

Results - Dose Point # 2 - (305.7144,60.96,914.4) cm					
Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	6.811e+03	2.424e-177	9.380e-31	2.079e-178	8.046e-32
0.03	5.310e+05	1.291e-28	5.053e-28	1.279e-30	5.008e-30
0.04	4.377e+01	4.767e-19	1.670e-18	2.108e-21	7.384e-21
0.05	8.012e+04	1.114e-10	5.919e-10	2.966e-13	1.577e-12
0.06	4.424e+05	1.420e-07	9.796e-07	2.821e-10	1.946e-09

0.08	4.416e+05	1.538e-05	1.241e-04	2.433e-08	1.964e-07
0.1	1.074e+06	2.586e-04	2.075e-03	3.957e-07	3.174e-06
0.15	5.695e+05	8.969e-04	6.065e-03	1.477e-06	9.988e-06
0.2	2.239e+06	7.679e-03	4.479e-02	1.355e-05	7.905e-05
0.3	3.311e+03	2.614e-05	1.237e-04	4.959e-08	2.347e-07
0.4	1.225e+03	1.635e-05	6.677e-05	3.186e-08	1.301e-07
0.5	1.894e+03	3.745e-05	1.365e-04	7.351e-08	2.679e-07
0.6	7.191e+03	1.952e-04	6.479e-04	3.811e-07	1.265e-06
0.8	3.680e+04	1.641e-03	4.739e-03	3.122e-06	9.014e-06
1.0	1.166e+05	7.631e-03	1.993e-02	1.407e-05	3.673e-05
1.5	2.733e+03	3.562e-04	7.875e-04	5.993e-07	1.325e-06
2.0	3.213e+02	6.715e-05	1.348e-04	1.038e-07	2.085e-07
3.0	7.871e+02	3.103e-04	5.541e-04	4.210e-07	7.518e-07
Totals	**5.556e+06**	**1.913e-02**	**8.017e-02**	**3.430e-05**	**1.423e-04**

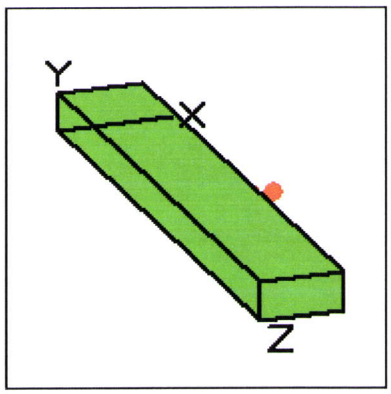
MicroShield 7.02
Westinghouse Electric Company (08-MSD-7.02-1424)

Date	By	Checked
2/26/2010	AW	

Filename	Run Date	Run Time	Duration
gondola_transit_max.ms7	February 17, 2010	10:14:20 AM	00:00:01

Project Info	
Case Title	Case 1
Description	Case 1
Geometry	13 - Rectangular Volume

Source Dimensions	
Length	274.32 cm (9 ft)
Width	1.8e+3 cm (60 ft)
Height	121.92 cm (4 ft)



Dose Points			
A	X	Y	Z
#1	375.0 cm (12 ft 3.6 in)	60.96 cm (2 ft)	914.4 cm (30 ft)
#2	305.714 cm (10 ft 0.4 in)	60.96 cm (2 ft)	914.4 cm (30 ft)

Shields			
Shield N	Dimension	Material	Density
Source	6.12e+07 cm³	Concrete	0.64
Shield 1	.794 cm	Iron	7.86
Air Gap		Air	0.00122

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

Nuclide	Ci	Bq	µCi/cm³	Bq/cm³
Ac-228	1.5841e-006	5.8613e+004	2.5900e-008	9.5829e-004
Bi-212	1.5841e-006	5.8613e+004	2.5900e-008	9.5829e-004
Np-237	2.0979e-006	7.7624e+004	3.4300e-008	1.2691e-003
Pa-233	2.0979e-006	7.7624e+004	3.4300e-008	1.2691e-003
Pa-234	1.2722e-005	4.7072e+005	2.0800e-007	7.6960e-003
Pa-234m	7.9514e-003	2.9420e+008	1.3000e-004	4.8100e+000
Pb-212	1.5841e-006	5.8613e+004	2.5900e-008	9.5829e-004
Po-212	1.0150e-006	3.7554e+004	1.6594e-008	6.1398e-004
Po-216	1.5841e-006	5.8613e+004	2.5900e-008	9.5829e-004
Ra-224	1.5841e-006	5.8613e+004	2.5900e-008	9.5829e-004
Ra-228	1.5841e-006	5.8613e+004	2.5900e-008	9.5829e-004
Rn-220	1.5841e-006	5.8613e+004	2.5900e-008	9.5829e-004
Th-228	1.5841e-006	5.8613e+004	2.5900e-008	9.5829e-004

Th-231	2.6912e-003	9.9576e+007	4.4000e-005	1.6280e+000
Th-232	1.5842e-006	5.8614e+004	2.5900e-008	9.5830e-004
Th-234	7.9514e-003	2.9420e+008	1.3000e-004	4.8100e+000
Tl-208	5.6918e-007	2.1060e+004	9.3058e-009	3.4431e-004
U-234	4.8748e-002	1.8037e+009	7.9700e-004	2.9489e+001
U-235	2.6912e-003	9.9576e+007	4.4000e-005	1.6280e+000
U-238	7.9514e-003	2.9420e+008	1.3000e-004	4.8100e+000

Buildup: The material reference is Source Integration Parameters	
X Direction	10
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (375,60.96,914.4) cm					
Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.873e+05	2.474e-168	1.500e-29	2.122e-169	1.287e-30
0.03	1.460e+07	1.691e-26	3.780e-26	1.676e-28	3.747e-28
0.04	1.175e+03	1.490e-17	5.149e-17	6.588e-20	2.277e-19
0.05	2.128e+06	2.351e-09	1.235e-08	6.263e-12	3.290e-11
0.06	1.199e+07	2.798e-06	1.917e-05	5.558e-09	3.809e-08
0.08	1.214e+07	2.913e-04	2.327e-03	4.610e-07	3.682e-06
0.1	2.923e+07	4.617e-03	3.586e-02	7.063e-06	5.487e-05
0.15	1.566e+07	1.486e-02	9.493e-02	2.447e-05	1.563e-04
0.2	6.158e+07	1.228e-01	6.765e-01	2.168e-04	1.194e-03
0.3	8.833e+04	3.943e-04	1.774e-03	7.479e-07	3.366e-06
0.4	3.302e+04	2.458e-04	9.607e-04	4.789e-07	1.872e-06
0.5	5.105e+04	5.584e-04	1.960e-03	1.096e-06	3.848e-06
0.6	1.940e+05	2.895e-03	9.300e-03	5.651e-06	1.815e-05
0.8	9.954e+05	2.420e-02	6.818e-02	4.602e-05	1.297e-04
1.0	3.157e+06	1.120e-01	2.871e-01	2.064e-04	5.292e-04
1.5	7.374e+04	5.175e-03	1.134e-02	8.706e-06	1.908e-05
2.0	8.676e+03	9.746e-04	1.951e-03	1.507e-06	3.018e-06
3.0	2.102e+04	4.460e-03	7.984e-03	6.051e-06	1.083e-05
Totals	**1.521e+08**	**2.935e-01**	**1.200e+00**	**5.255e-04**	**2.128e-03**

Results - Dose Point # 2 - (305.7144,60.96,914.4) cm					
Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.873e+05	6.665e-176	2.580e-29	5.717e-177	2.213e-30
0.03	1.460e+07	3.550e-27	1.390e-26	3.518e-29	1.377e-28
0.04	1.175e+03	1.280e-17	4.483e-17	5.661e-20	1.983e-19
0.05	2.128e+06	2.958e-09	1.572e-08	7.881e-12	4.189e-11
0.06	1.199e+07	3.849e-06	2.655e-05	7.645e-09	5.273e-08

0.08	1.214e+07	4.226e-04	3.411e-03	6.687e-07	5.397e-06
0.1	2.923e+07	7.039e-03	5.647e-02	1.077e-05	8.639e-05
0.15	1.566e+07	2.466e-02	1.668e-01	4.061e-05	2.746e-04
0.2	6.158e+07	2.112e-01	1.232e+00	3.727e-04	2.174e-03
0.3	8.833e+04	6.974e-04	3.301e-03	1.323e-06	6.261e-06
0.4	3.302e+04	4.407e-04	1.799e-03	8.587e-07	3.506e-06
0.5	5.105e+04	1.010e-03	3.680e-03	1.982e-06	7.224e-06
0.6	1.940e+05	5.268e-03	1.748e-02	1.028e-05	3.412e-05
0.8	9.954e+05	4.439e-02	1.282e-01	8.444e-05	2.438e-04
1.0	3.157e+06	2.066e-01	5.395e-01	3.808e-04	9.944e-04
1.5	7.374e+04	9.610e-03	2.125e-02	1.617e-05	3.575e-05
2.0	8.676e+03	1.813e-03	3.642e-03	2.804e-06	5.631e-06
3.0	2.102e+04	8.286e-03	1.480e-02	1.124e-05	2.007e-05
Totals	**1.521e+08**	**5.214e-01**	**2.192e+00**	**9.346e-04**	**3.891e-03**

MicroShield 7.02
Westinghouse Electric Company (08-MSD-7.02-1424)

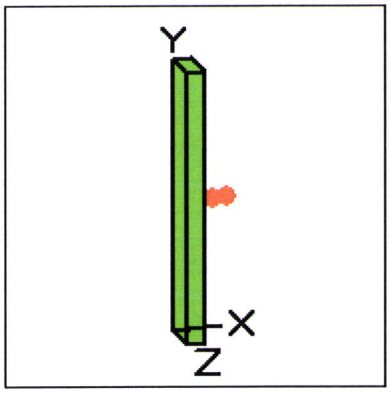
Date	By	Checked
2/26/2010	AW	

Filename	Run Date	Run Time	Duration
gondola_1and2_meter_r5.ms7	February 17, 2010	5:26:31 PM	00:00:01

Project Info	
Case Title	Case 1
Description	Case 1
Geometry	13 - Rectangular Volume

Source Dimensions	
Length	121.92 cm (4 ft)
Width	274.32 cm (9 ft)
Height	1.8e+3 cm (60 ft)

Dose Points			
A	X	Y	Z
#1	224.4 cm (7 ft 4.3 in)	914.4 cm (30 ft)	137.16 cm (4 ft 6.0 in)
#2	324.4 cm (10 ft 7.7 in)	914.4 cm (30 ft)	137.16 cm (4 ft 6.0 in)



Shields			
Shield N	Dimension	Material	Density
Source	6.12e+07 cm³	Concrete	0.64
Shield 1	2.53 cm	Iron	7.86
Air Gap		Air	0.00122

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

Nuclide	Ci	Bq	µCi/cm³	Bq/cm³
Ac-228	5.9329e-008	2.1952e+003	9.6999e-010	3.5890e-005
Bi-212	5.9329e-008	2.1952e+003	9.6999e-010	3.5890e-005
Np-237	7.9514e-008	2.9420e+003	1.3000e-009	4.8100e-005
Pa-233	7.9514e-008	2.9420e+003	1.3000e-009	4.8100e-005
Pa-234	4.7097e-007	1.7426e+004	7.7000e-009	2.8490e-004
Pa-234m	2.9359e-004	1.0863e+007	4.8000e-006	1.7760e-001
Pb-212	5.9329e-008	2.1952e+003	9.6999e-010	3.5890e-005
Po-212	3.8012e-008	1.4064e+003	6.2147e-010	2.2995e-005
Po-216	5.9329e-008	2.1952e+003	9.6999e-010	3.5890e-005
Ra-224	5.9329e-008	2.1952e+003	9.6999e-010	3.5890e-005
Ra-228	5.9329e-008	2.1952e+003	9.6999e-010	3.5890e-005
Rn-220	5.9329e-008	2.1952e+003	9.6999e-010	3.5890e-005
Th-228	5.9329e-008	2.1952e+003	9.6999e-010	3.5890e-005

Th-231	9.7863e-005	3.6209e+006	1.6000e-006	5.9200e-002
Th-232	5.9329e-008	2.1952e+003	9.7000e-010	3.5890e-005
Th-234	2.9359e-004	1.0863e+007	4.8000e-006	1.7760e-001
Tl-208	2.1317e-008	7.8872e+002	3.4852e-010	1.2895e-005
U-234	1.8349e-003	6.7892e+007	3.0000e-005	1.1100e+000
U-235	9.7863e-005	3.6209e+006	1.6000e-006	5.9200e-002
U-238	2.9359e-004	1.0863e+007	4.8000e-006	1.7760e-001

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

Results - Dose Point # 1 - (224.4,914.4,137.16) cm					
Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	6.811e+03	0.000e+00	6.865e-31	0.000e+00	5.888e-32
0.03	5.310e+05	3.655e-75	1.862e-28	3.622e-77	1.845e-30
0.04	4.377e+01	6.097e-40	4.071e-32	2.696e-42	1.800e-34
0.05	8.012e+04	3.837e-22	3.562e-21	1.022e-24	9.490e-24
0.06	4.424e+05	8.536e-15	1.267e-13	1.696e-17	2.516e-16
0.08	4.416e+05	2.936e-09	6.043e-08	4.646e-12	9.563e-11
0.1	1.074e+06	1.000e-06	2.137e-05	1.530e-09	3.270e-08
0.15	5.695e+05	3.710e-05	6.199e-04	6.110e-08	1.021e-06
0.2	2.239e+06	6.309e-04	8.525e-03	1.114e-06	1.505e-05
0.3	3.311e+03	3.563e-06	3.548e-05	6.759e-09	6.731e-08
0.4	1.225e+03	2.821e-06	2.263e-05	5.497e-09	4.409e-08
0.5	1.894e+03	7.532e-06	5.093e-05	1.478e-08	9.997e-08
0.6	7.191e+03	4.400e-05	2.590e-04	8.588e-08	5.056e-07
0.8	3.680e+04	4.373e-04	2.085e-03	8.318e-07	3.967e-06
1.0	1.166e+05	2.296e-03	9.369e-03	4.232e-06	1.727e-05
1.5	2.733e+03	1.307e-04	4.123e-04	2.200e-07	6.937e-07
2.0	3.213e+02	2.763e-05	7.498e-05	4.273e-08	1.159e-07
3.0	7.871e+02	1.442e-04	3.264e-04	1.957e-07	4.429e-07
Totals	**5.556e+06**	**3.763e-03**	**2.180e-02**	**6.811e-06**	**3.930e-05**

Results - Dose Point # 2 - (324.4,914.4,137.16) cm					
Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	6.811e+03	0.000e+00	4.101e-31	0.000e+00	3.518e-32
0.03	5.310e+05	3.903e-75	1.113e-28	3.868e-77	1.103e-30
0.04	4.377e+01	4.716e-40	2.432e-32	2.086e-42	1.076e-34
0.05	8.012e+04	3.288e-22	3.064e-21	8.760e-25	8.162e-24
0.06	4.424e+05	8.248e-15	1.232e-13	1.638e-17	2.447e-16

0.08	4.416e+05	2.865e-09	5.852e-08	4.534e-12	9.261e-11
0.1	1.074e+06	9.171e-07	1.917e-05	1.403e-09	2.933e-08
0.15	5.695e+05	3.085e-05	4.945e-04	5.081e-08	8.143e-07
0.2	2.239e+06	5.029e-04	6.472e-03	8.875e-07	1.142e-05
0.3	3.311e+03	2.737e-06	2.592e-05	5.193e-09	4.917e-08
0.4	1.225e+03	2.127e-06	1.626e-05	4.145e-09	3.167e-08
0.5	1.894e+03	5.608e-06	3.622e-05	1.101e-08	7.109e-08
0.6	7.191e+03	3.245e-05	1.829e-04	6.334e-08	3.569e-07
0.8	3.680e+04	3.178e-04	1.457e-03	6.046e-07	2.772e-06
1.0	1.166e+05	1.651e-03	6.502e-03	3.043e-06	1.198e-05
1.5	2.733e+03	9.234e-05	2.829e-04	1.554e-07	4.759e-07
2.0	3.213e+02	1.931e-05	5.108e-05	2.986e-08	7.899e-08
3.0	7.871e+02	9.967e-05	2.208e-04	1.352e-07	2.996e-07
Totals	**5.556e+06**	**2.758e-03**	**1.576e-02**	**4.991e-06**	**2.839e-05**

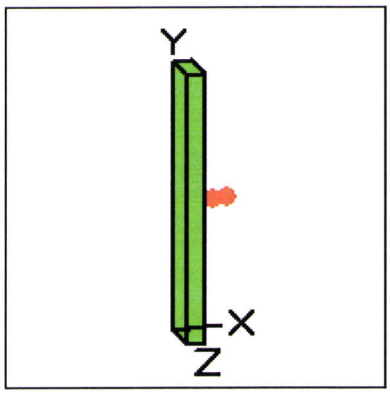
MicroShield 7.02
Westinghouse Electric Company (08-MSD-7.02-1424)

Date	By	Checked
2/26/2010	KW	

Filename	Run Date	Run Time	Duration
gondola_1and2_meter_max.ms7	February 10, 2010	11:56:49 AM	00:00:01

Project Info	
Case Title	Case 1
Description	Case 1
Geometry	13 - Rectangular Volume

Source Dimensions	
Length	121.92 cm (4 ft)
Width	274.32 cm (9 ft)
Height	1.8e+3 cm (60 ft)



Dose Points			
A	X	Y	Z
#1	224.4 cm (7 ft 4.3 in)	914.4 cm (30 ft)	137.16 cm (4 ft 6.0 in)
#2	324.4 cm (10 ft 7.7 in)	914.4 cm (30 ft)	137.16 cm (4 ft 6.0 in)

Shields			
Shield N	Dimension	Material	Density
Source	6.12e+07 cm³	Concrete	0.64
Shield 1	2.53 cm	Iron	7.86
Air Gap		Air	0.00122

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

Nuclide	Ci	Bq	µCi/cm³	Bq/cm³
Ac-228	1.5841e-006	5.8613e+004	2.5900e-008	9.5829e-004
Bi-212	1.5841e-006	5.8613e+004	2.5900e-008	9.5829e-004
Np-237	2.0979e-006	7.7624e+004	3.4300e-008	1.2691e-003
Pa-233	2.0979e-006	7.7624e+004	3.4300e-008	1.2691e-003
Pa-234	1.2722e-005	4.7072e+005	2.0800e-007	7.6960e-003
Pa-234m	7.9514e-003	2.9420e+008	1.3000e-004	4.8100e+000
Pb-212	1.5841e-006	5.8613e+004	2.5900e-008	9.5829e-004
Po-212	1.0150e-006	3.7554e+004	1.6594e-008	6.1398e-004
Po-216	1.5841e-006	5.8613e+004	2.5900e-008	9.5829e-004
Ra-224	1.5841e-006	5.8613e+004	2.5900e-008	9.5829e-004
Ra-228	1.5841e-006	5.8613e+004	2.5900e-008	9.5829e-004
Rn-220	1.5841e-006	5.8613e+004	2.5900e-008	9.5829e-004
Th-228	1.5841e-006	5.8613e+004	2.5900e-008	9.5829e-004

Th-231	2.6912e-003	9.9576e+007	4.4000e-005	1.6280e+000
Th-232	1.5842e-006	5.8614e+004	2.5900e-008	9.5830e-004
Th-234	7.9514e-003	2.9420e+008	1.3000e-004	4.8100e+000
Tl-208	5.6918e-007	2.1060e+004	9.3058e-009	3.4431e-004
U-234	4.8748e-002	1.8037e+009	7.9700e-004	2.9489e+001
U-235	2.6912e-003	9.9576e+007	4.4000e-005	1.6280e+000
U-238	7.9514e-003	2.9420e+008	1.3000e-004	4.8100e+000

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

Results - Dose Point # 1 - (224.4,914.4,137.16) cm					
Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.873e+05	0.000e+00	1.888e-29	0.000e+00	1.619e-30
0.03	1.460e+07	1.005e-73	5.120e-27	9.961e-76	5.075e-29
0.04	1.175e+03	1.637e-38	1.093e-30	7.241e-41	4.835e-33
0.05	2.128e+06	1.019e-20	9.464e-20	2.716e-23	2.521e-22
0.06	1.199e+07	2.313e-13	3.433e-12	4.595e-16	6.819e-15
0.08	1.214e+07	8.069e-08	1.661e-06	1.277e-10	2.628e-09
0.1	2.923e+07	2.722e-05	5.816e-04	4.165e-08	8.898e-07
0.15	1.566e+07	1.020e-03	1.704e-02	1.680e-06	2.807e-05
0.2	6.158e+07	1.735e-02	2.344e-01	3.062e-05	4.137e-04
0.3	8.833e+04	9.506e-05	9.467e-04	1.803e-07	1.796e-06
0.4	3.302e+04	7.602e-05	6.097e-04	1.481e-07	1.188e-06
0.5	5.105e+04	2.031e-04	1.373e-03	3.986e-07	2.696e-06
0.6	1.940e+05	1.187e-03	6.989e-03	2.317e-06	1.364e-05
0.8	9.954e+05	1.183e-02	5.641e-02	2.250e-05	1.073e-04
1.0	3.157e+06	6.215e-02	2.536e-01	1.146e-04	4.675e-04
1.5	7.374e+04	3.527e-03	1.112e-02	5.934e-06	1.872e-05
2.0	8.676e+03	7.462e-04	2.025e-03	1.154e-06	3.131e-06
3.0	2.102e+04	3.851e-03	8.716e-03	5.225e-06	1.182e-05
Totals	**1.521e+08**	**1.021e-01**	**5.939e-01**	**1.848e-04**	**1.071e-03**

Results - Dose Point # 2 - (324.4,914.4,137.16) cm					
Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.873e+05	0.000e+00	1.128e-29	0.000e+00	9.674e-31
0.03	1.460e+07	1.073e-73	3.059e-27	1.064e-75	3.032e-29
0.04	1.175e+03	1.266e-38	6.532e-31	5.601e-41	2.889e-33
0.05	2.128e+06	8.736e-21	8.139e-20	2.327e-23	2.168e-22
0.06	1.199e+07	2.235e-13	3.339e-12	4.440e-16	6.631e-15

0.08	1.214e+07	7.874e-08	1.608e-06	1.246e-10	2.545e-09
0.1	2.923e+07	2.496e-05	5.217e-04	3.819e-08	7.982e-07
0.15	1.566e+07	8.483e-04	1.360e-02	1.397e-06	2.239e-05
0.2	6.158e+07	1.383e-02	1.780e-01	2.441e-05	3.141e-04
0.3	8.833e+04	7.303e-05	6.916e-04	1.385e-07	1.312e-06
0.4	3.302e+04	5.732e-05	4.380e-04	1.117e-07	8.535e-07
0.5	5.105e+04	1.512e-04	9.766e-04	2.968e-07	1.917e-06
0.6	1.940e+05	8.755e-04	4.934e-03	1.709e-06	9.631e-06
0.8	9.954e+05	8.598e-03	3.942e-02	1.635e-05	7.499e-05
1.0	3.157e+06	4.469e-02	1.760e-01	8.238e-05	3.244e-04
1.5	7.374e+04	2.491e-03	7.631e-03	4.191e-06	1.284e-05
2.0	8.676e+03	5.215e-04	1.380e-03	8.065e-07	2.133e-06
3.0	2.102e+04	2.661e-03	5.897e-03	3.611e-06	8.000e-06
Totals	**1.521e+08**	**7.482e-02**	**4.295e-01**	**1.354e-04**	**7.734e-04**

MicroShield 7.02
Westinghouse Electric Company (08-MSD-7.02-1424)

Date	By	Checked
2/26/2010		

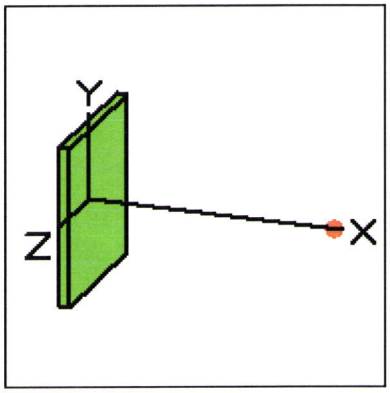
Filename	Run Date	Run Time	Duration
GondolaCleanout r5.ms7	February 17, 2010	5:49:19 PM	00:00:00

Project Info	
Case Title	Case 2
Description	Case 2
Geometry	16 - Infinite Slab

Source Dimensions	
Thickness	1.27 cm (0.5 in)

Dose Points			
A	X	Y	Z
#1	31.27 cm (1 ft 0.3 in)	0.0 cm (0.0 in)	0.0 cm (0.0 in)

Shields			
Shield N	Dimension	Material	Density
Source	Infinite	Concrete	0.64
Air Gap		Air	0.00122



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

Nuclide	µCi/cm³	Bq/cm³
Ac-228	9.6999e-010	3.5890e-005
Bi-212	9.6999e-010	3.5890e-005
Np-237	1.3000e-009	4.8100e-005
Pa-233	1.3000e-009	4.8100e-005
Pa-234	7.7000e-009	2.8490e-004
Pa-234m	4.8000e-006	1.7760e-001
Pb-212	9.6999e-010	3.5890e-005
Po-212	6.2147e-010	2.2995e-005
Po-216	9.6999e-010	3.5890e-005
Ra-224	9.6999e-010	3.5890e-005
Ra-228	9.6999e-010	3.5890e-005
Rn-220	9.6999e-010	3.5890e-005
Th-228	9.6999e-010	3.5890e-005
Th-231	1.6000e-006	5.9200e-002
Th-232	9.7000e-010	3.5890e-005
Th-234	4.8000e-006	1.7760e-001
Tl-208	3.4852e-010	1.2895e-005

U-234	3.0000e-005	1.1100e+000
U-235	1.6000e-006	5.9200e-002
U-238	4.8000e-006	1.7760e-001

Buildup: The material reference is Source
Integration Parameters

Results

Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.114e-04	1.315e-07	1.332e-07	1.128e-08	1.143e-08
0.03	8.681e-03	1.389e-04	1.567e-04	1.377e-06	1.553e-06
0.04	7.157e-07	2.409e-08	3.040e-08	1.066e-10	1.345e-10
0.05	1.310e-03	6.951e-05	9.332e-05	1.852e-07	2.486e-07
0.06	7.233e-03	5.244e-04	8.040e-04	1.042e-06	1.597e-06
0.08	7.220e-03	7.946e-04	1.293e-03	1.257e-06	2.046e-06
0.1	1.756e-02	2.569e-03	4.705e-03	3.931e-06	7.199e-06
0.15	9.312e-03	2.199e-03	4.493e-03	3.621e-06	7.398e-06
0.2	3.661e-02	1.200e-02	2.460e-02	2.119e-05	4.342e-05
0.3	5.413e-05	2.810e-05	5.508e-05	5.331e-08	1.045e-07
0.4	2.003e-05	1.442e-05	2.657e-05	2.809e-08	5.177e-08
0.5	3.096e-05	2.872e-05	5.017e-05	5.637e-08	9.847e-08
0.6	1.176e-04	1.343e-04	2.235e-04	2.621e-07	4.362e-07
0.8	6.016e-04	9.545e-04	1.463e-03	1.816e-06	2.782e-06
1.0	1.906e-03	3.906e-03	5.660e-03	7.200e-06	1.043e-05
1.5	4.468e-05	1.458e-04	1.917e-04	2.454e-07	3.226e-07
2.0	5.253e-06	2.383e-05	2.990e-05	3.685e-08	4.623e-08
3.0	1.287e-05	9.254e-05	1.102e-04	1.256e-07	1.495e-07
Totals	**9.083e-02**	**2.363e-02**	**4.396e-02**	**4.243e-05**	**7.790e-05**

MicroShield 7.02
Westinghouse Electric Company (08-MSD-7.02-1424)

Date	By	Checked
2/26/2010	KW	

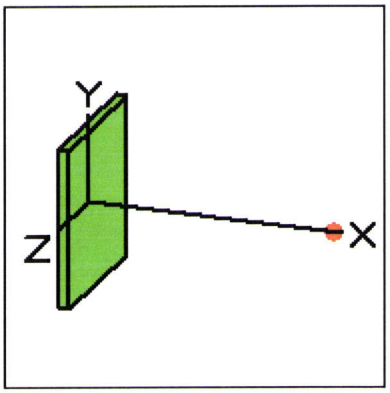
Filename	Run Date	Run Time	Duration
GondolaCleanout_max.ms7	February 10, 2010	12:01:36 PM	00:00:00

Project Info	
Case Title	Case 2
Description	Case 2
Geometry	16 - Infinite Slab

Source Dimensions	
Thickness	1.27 cm (0.5 in)

Dose Points			
A	X	Y	Z
#1	31.27 cm (1 ft 0.3 in)	0.0 cm (0.0 in)	0.0 cm (0.0 in)

Shields			
Shield N	Dimension	Material	Density
Source	Infinite	Concrete	0.64
Air Gap		Air	0.00122



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

Nuclide	µCi/cm³	Bq/cm³
Ac-228	2.5900e-008	9.5829e-004
Bi-212	2.5900e-008	9.5829e-004
Np-237	3.4300e-008	1.2691e-003
Pa-233	3.4300e-008	1.2691e-003
Pa-234	2.0800e-007	7.6960e-003
Pa-234m	1.3000e-004	4.8100e+000
Pb-212	2.5900e-008	9.5829e-004
Po-212	1.6594e-008	6.1398e-004
Po-216	2.5900e-008	9.5829e-004
Ra-224	2.5900e-008	9.5829e-004
Ra-228	2.5900e-008	9.5829e-004
Rn-220	2.5900e-008	9.5829e-004
Th-228	2.5900e-008	9.5829e-004
Th-231	4.4000e-005	1.6280e+000
Th-232	2.5900e-008	9.5830e-004
Th-234	1.3000e-004	4.8100e+000
Tl-208	9.3058e-009	3.4431e-004

U-234	7.9700e-004	2.9489e+001
U-235	4.4000e-005	1.6280e+000
U-238	1.3000e-004	4.8100e+000

Buildup: The material reference is Source
Integration Parameters

Results

Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.062e-03	3.616e-06	3.664e-06	3.101e-07	3.143e-07
0.03	2.387e-01	3.821e-03	4.309e-03	3.787e-05	4.270e-05
0.04	1.922e-05	6.470e-07	8.164e-07	2.862e-09	3.610e-09
0.05	3.480e-02	1.847e-03	2.479e-03	4.920e-06	6.604e-06
0.06	1.960e-01	1.421e-02	2.179e-02	2.823e-05	4.328e-05
0.08	1.984e-01	2.184e-02	3.553e-02	3.456e-05	5.623e-05
0.1	4.778e-01	6.993e-02	1.281e-01	1.070e-04	1.959e-04
0.15	2.560e-01	6.045e-02	1.235e-01	9.955e-05	2.034e-04
0.2	1.007e+00	3.301e-01	6.765e-01	5.826e-04	1.194e-03
0.3	1.444e-03	7.497e-04	1.470e-03	1.422e-06	2.788e-06
0.4	5.398e-04	3.885e-04	7.160e-04	7.569e-07	1.395e-06
0.5	8.347e-04	7.743e-04	1.353e-03	1.520e-06	2.655e-06
0.6	3.172e-03	3.623e-03	6.029e-03	7.071e-06	1.177e-05
0.8	1.627e-02	2.582e-02	3.957e-02	4.911e-05	7.526e-05
1.0	5.161e-02	1.058e-01	1.532e-01	1.949e-04	2.825e-04
1.5	1.206e-03	3.935e-03	5.173e-03	6.620e-06	8.703e-06
2.0	1.419e-04	6.436e-04	8.074e-04	9.952e-07	1.249e-06
3.0	3.436e-04	2.471e-03	2.943e-03	3.352e-06	3.993e-06
Totals	**2.487e+00**	**6.463e-01**	**1.204e+00**	**1.161e-03**	**2.133e-03**

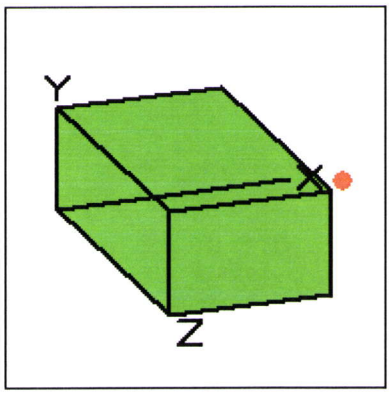
MicroShield 7.02
Westinghouse Electric Company (08-MSD-7.02-1424)

Date	By	Checked
2/26/2010	[signature]	[signature]

Filename	Run Date	Run Time	Duration
TruckSurveyor_r5.ms7	February 17, 2010	5:45:16 PM	00:00:01

Project Info	
Case Title	Case 1
Description	Case 1
Geometry	13 - Rectangular Volume

Source Dimensions	
Length	243.84 cm (8 ft)
Width	457.2 cm (15 ft)
Height	152.4 cm (5 ft 0.0 in)



Dose Points			
A	X	Y	Z
#1	344.48 cm (11 ft 3.6 in)	76.2 cm (2 ft 6.0 in)	228.6 cm (7 ft 6.0 in)
#2	274.48 cm (9 ft 0.1 in)	76.2 cm (2 ft 6.0 in)	228.6 cm (7 ft 6.0 in)

Shields			
Shield N	Dimension	Material	Density
Source	1.70e+07 cm³	Concrete	0.64
Shield 1	.64 cm	Aluminum	2.7
Air Gap		Air	0.00122

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

Nuclide	Ci	Bq	µCi/cm³	Bq/cm³
Ac-228	1.6480e-008	6.0977e+002	9.6999e-010	3.5890e-005
Bi-212	1.6480e-008	6.0977e+002	9.6999e-010	3.5890e-005
Np-237	2.2087e-008	8.1722e+002	1.3000e-009	4.8100e-005
Pa-233	2.2087e-008	8.1722e+002	1.3000e-009	4.8100e-005
Pa-234	1.3082e-007	4.8405e+003	7.7000e-009	2.8490e-004
Pa-234m	8.1553e-005	3.0174e+006	4.8000e-006	1.7760e-001
Pb-212	1.6480e-008	6.0977e+002	9.6999e-010	3.5890e-005
Po-212	1.0559e-008	3.9068e+002	6.2147e-010	2.2995e-005
Po-216	1.6480e-008	6.0977e+002	9.6999e-010	3.5890e-005
Ra-224	1.6480e-008	6.0977e+002	9.6999e-010	3.5890e-005
Ra-228	1.6480e-008	6.0977e+002	9.6999e-010	3.5890e-005
Rn-220	1.6480e-008	6.0977e+002	9.6999e-010	3.5890e-005
Th-228	1.6480e-008	6.0977e+002	9.6999e-010	3.5890e-005

Th-231	2.7184e-005	1.0058e+006	1.6000e-006	5.9200e-002
Th-232	1.6480e-008	6.0977e+002	9.7000e-010	3.5890e-005
Th-234	8.1553e-005	3.0174e+006	4.8000e-006	1.7760e-001
Tl-208	5.9214e-009	2.1909e+002	3.4852e-010	1.2895e-005
U-234	5.0970e-004	1.8859e+007	3.0000e-005	1.1100e+000
U-235	2.7184e-005	1.0058e+006	1.6000e-006	5.9200e-002
U-238	8.1553e-005	3.0174e+006	4.8000e-006	1.7760e-001

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

Results - Dose Point # 1 - (3.44e+02,76.2,228.6) cm					
Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.892e+03	1.742e-15	1.912e-15	1.494e-16	1.640e-16
0.03	1.475e+05	6.331e-06	8.739e-06	6.274e-08	8.661e-08
0.04	1.216e+01	4.357e-09	7.421e-09	1.927e-11	3.282e-11
0.05	2.225e+04	2.319e-05	4.843e-05	6.179e-08	1.290e-07
0.06	1.229e+05	2.434e-04	6.184e-04	4.835e-07	1.228e-06
0.08	1.227e+05	5.113e-04	1.600e-03	8.090e-07	2.533e-06
0.1	2.983e+05	1.929e-03	6.661e-03	2.952e-06	1.019e-05
0.15	1.582e+05	1.975e-03	7.099e-03	3.253e-06	1.169e-05
0.2	6.220e+05	1.189e-02	4.112e-02	2.099e-05	7.257e-05
0.3	9.196e+02	3.165e-05	9.854e-05	6.004e-08	1.869e-07
0.4	3.404e+02	1.780e-05	5.054e-05	3.469e-08	9.848e-08
0.5	5.260e+02	3.816e-05	1.006e-04	7.489e-08	1.975e-07
0.6	1.997e+03	1.896e-04	4.690e-04	3.700e-07	9.155e-07
0.8	1.022e+04	1.487e-03	3.347e-03	2.828e-06	6.366e-06
1.0	3.239e+04	6.580e-03	1.383e-02	1.213e-05	2.550e-05
1.5	7.592e+02	2.840e-04	5.309e-04	4.778e-07	8.933e-07
2.0	8.924e+01	5.126e-05	8.949e-05	7.927e-08	1.384e-07
3.0	2.187e+02	2.268e-04	3.618e-04	3.076e-07	4.909e-07
Totals	**1.543e+06**	**2.549e-02**	**7.604e-02**	**4.497e-05**	**1.332e-04**

Results - Dose Point # 2 - (2.74e+02,76.2,228.6) cm					
Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.892e+03	1.949e-15	2.139e-15	1.671e-16	1.834e-16
0.03	1.475e+05	8.346e-06	1.161e-05	8.272e-08	1.150e-07
0.04	1.216e+01	6.596e-09	1.144e-08	2.917e-11	5.058e-11
0.05	2.225e+04	3.796e-05	8.186e-05	1.011e-07	2.181e-07
0.06	1.229e+05	4.161e-04	1.099e-03	8.265e-07	2.183e-06

0.08	1.227e+05	9.113e-04	3.005e-03	1.442e-06	4.756e-06
0.1	2.983e+05	3.505e-03	1.283e-02	5.362e-06	1.963e-05
0.15	1.582e+05	3.664e-03	1.402e-02	6.033e-06	2.309e-05
0.2	6.220e+05	2.229e-02	8.195e-02	3.934e-05	1.446e-04
0.3	9.196e+02	6.015e-05	1.979e-04	1.141e-07	3.754e-07
0.4	3.404e+02	3.414e-05	1.019e-04	6.653e-08	1.986e-07
0.5	5.260e+02	7.369e-05	2.034e-04	1.446e-07	3.992e-07
0.6	1.997e+03	3.681e-04	9.494e-04	7.186e-07	1.853e-06
0.8	1.022e+04	2.913e-03	6.792e-03	5.540e-06	1.292e-05
1.0	3.239e+04	1.297e-02	2.811e-02	2.391e-05	5.182e-05
1.5	7.592e+02	5.657e-04	1.082e-03	9.518e-07	1.820e-06
2.0	8.924e+01	1.028e-04	1.826e-04	1.589e-07	2.824e-07
3.0	2.187e+02	4.576e-04	7.393e-04	6.208e-07	1.003e-06
Totals	**1.543e+06**	**4.838e-02**	**1.514e-01**	**8.542e-05**	**2.653e-04**

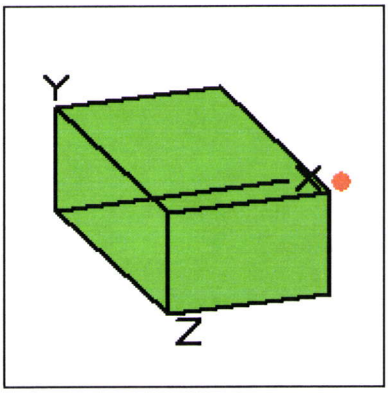
MicroShield 7.02
Westinghouse Electric Company (08-MSD-7.02-1424)

Date	By	Checked
2/24/2010	[illegible]	[illegible]

Filename	Run Date	Run Time	Duration
TruckSurveyor_max.ms7	February 10, 2010	12:03:59 PM	00:00:01

Project Info	
Case Title	Case 1
Description	Case 1
Geometry	13 - Rectangular Volume

Source Dimensions	
Length	243.84 cm (8 ft)
Width	457.2 cm (15 ft)
Height	152.4 cm (5 ft 0.0 in)



Dose Points			
A	X	Y	Z
#1	344.48 cm (11 ft 3.6 in)	76.2 cm (2 ft 6.0 in)	228.6 cm (7 ft 6.0 in)
#2	274.48 cm (9 ft 0.1 in)	76.2 cm (2 ft 6.0 in)	228.6 cm (7 ft 6.0 in)

Shields			
Shield N	Dimension	Material	Density
Source	1.70e+07 cm³	Concrete	0.64
Shield 1	.64 cm	Aluminum	2.7
Air Gap		Air	0.00122

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

Nuclide	Ci	Bq	µCi/cm³	Bq/cm³
Ac-228	4.4004e-007	1.6282e+004	2.5900e-008	9.5829e-004
Bi-212	4.4004e-007	1.6281e+004	2.5900e-008	9.5829e-004
Np-237	5.8276e-007	2.1562e+004	3.4300e-008	1.2691e-003
Pa-233	5.8276e-007	2.1562e+004	3.4300e-008	1.2691e-003
Pa-234	3.5339e-006	1.3076e+005	2.0800e-007	7.6960e-003
Pa-234m	2.2087e-003	8.1722e+007	1.3000e-004	4.8100e+000
Pb-212	4.4004e-007	1.6281e+004	2.5900e-008	9.5829e-004
Po-212	2.8193e-007	1.0432e+004	1.6594e-008	6.1398e-004
Po-216	4.4004e-007	1.6281e+004	2.5900e-008	9.5829e-004
Ra-224	4.4004e-007	1.6281e+004	2.5900e-008	9.5829e-004
Ra-228	4.4004e-007	1.6282e+004	2.5900e-008	9.5829e-004
Rn-220	4.4004e-007	1.6281e+004	2.5900e-008	9.5829e-004
Th-228	4.4004e-007	1.6281e+004	2.5900e-008	9.5829e-004

Th-231	7.4756e-004	2.7660e+007	4.4000e-005	1.6280e+000
Th-232	4.4004e-007	1.6282e+004	2.5900e-008	9.5830e-004
Th-234	2.2087e-003	8.1722e+007	1.3000e-004	4.8100e+000
Tl-208	1.5811e-007	5.8499e+003	9.3058e-009	3.4431e-004
U-234	1.3541e-002	5.0102e+008	7.9700e-004	2.9489e+001
U-235	7.4756e-004	2.7660e+007	4.4000e-005	1.6280e+000
U-238	2.2087e-003	8.1722e+007	1.3000e-004	4.8100e+000

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

Results - Dose Point # 1 - (3.44e+02,76.2,228.6) cm					
Energy (MeV)	**Activity (Photons/sec)**	**Fluence Rate MeV/cm²/sec No Buildup**	**Fluence Rate MeV/cm²/sec With Buildup**	**Exposure Rate mR/hr No Buildup**	**Exposure Rate mR/hr With Buildup**
0.015	5.203e+04	4.791e-14	5.259e-14	4.109e-15	4.511e-15
0.03	4.056e+06	1.741e-04	2.403e-04	1.725e-06	2.382e-06
0.04	3.265e+02	1.170e-07	1.993e-07	5.175e-10	8.813e-10
0.05	5.912e+05	6.162e-04	1.287e-03	1.642e-06	3.427e-06
0.06	3.330e+06	6.597e-03	1.676e-02	1.310e-05	3.329e-05
0.08	3.371e+06	1.405e-02	4.398e-02	2.223e-05	6.960e-05
0.1	8.119e+06	5.251e-02	1.813e-01	8.034e-05	2.773e-04
0.15	4.350e+06	5.431e-02	1.952e-01	8.944e-05	3.214e-04
0.2	1.711e+07	3.270e-01	1.131e+00	5.771e-04	1.996e-03
0.3	2.453e+04	8.445e-04	2.629e-03	1.602e-06	4.987e-06
0.4	9.172e+03	4.798e-04	1.362e-03	9.348e-07	2.654e-06
0.5	1.418e+04	1.029e-03	2.713e-03	2.019e-06	5.326e-06
0.6	5.390e+04	5.115e-03	1.266e-02	9.983e-06	2.470e-05
0.8	2.765e+05	4.022e-02	9.054e-02	7.650e-05	1.722e-04
1.0	8.769e+05	1.782e-01	3.745e-01	3.284e-04	6.903e-04
1.5	2.048e+04	7.661e-03	1.432e-02	1.289e-05	2.410e-05
2.0	2.410e+03	1.384e-03	2.417e-03	2.141e-06	3.737e-06
3.0	5.838e+03	6.054e-03	9.661e-03	8.214e-06	1.311e-05
Totals	**4.226e+07**	**6.962e-01**	**2.080e+00**	**1.228e-03**	**3.644e-03**

Results - Dose Point # 2 - (2.74e+02,76.2,228.6) cm					
Energy (MeV)	**Activity (Photons/sec)**	**Fluence Rate MeV/cm²/sec No Buildup**	**Fluence Rate MeV/cm²/sec With Buildup**	**Exposure Rate mR/hr No Buildup**	**Exposure Rate mR/hr With Buildup**
0.015	5.203e+04	5.359e-14	5.881e-14	4.596e-15	5.044e-15
0.03	4.056e+06	2.295e-04	3.191e-04	2.275e-06	3.163e-06
0.04	3.265e+02	1.771e-07	3.071e-07	7.834e-10	1.358e-09
0.05	5.912e+05	1.008e-03	2.175e-03	2.686e-06	5.793e-06
0.06	3.330e+06	1.128e-02	2.978e-02	2.240e-05	5.915e-05

0.08	3.371e+06	2.505e-02	8.259e-02	3.963e-05	1.307e-04
0.1	8.119e+06	9.539e-02	3.492e-01	1.459e-04	5.343e-04
0.15	4.350e+06	1.007e-01	3.856e-01	1.659e-04	6.349e-04
0.2	1.711e+07	6.129e-01	2.254e+00	1.082e-03	3.978e-03
0.3	2.453e+04	1.605e-03	5.280e-03	3.044e-06	1.002e-05
0.4	9.172e+03	9.201e-04	2.746e-03	1.793e-06	5.350e-06
0.5	1.418e+04	1.987e-03	5.483e-03	3.900e-06	1.076e-05
0.6	5.390e+04	9.933e-03	2.562e-02	1.939e-05	5.000e-05
0.8	2.765e+05	7.879e-02	1.837e-01	1.499e-04	3.494e-04
1.0	8.769e+05	3.512e-01	7.611e-01	6.473e-04	1.403e-03
1.5	2.048e+04	1.526e-02	2.919e-02	2.568e-05	4.911e-05
2.0	2.410e+03	2.775e-03	4.932e-03	4.291e-06	7.627e-06
3.0	5.838e+03	1.222e-02	1.974e-02	1.658e-05	2.678e-05
Totals	**4.226e+07**	**1.321e+00**	**4.141e+00**	**2.333e-03**	**7.258e-03**

MicroShield 7.02
Westinghouse Electric Company (08-MSD-7.02-1424)

Date	By	Checked
2/24/2010	KW	

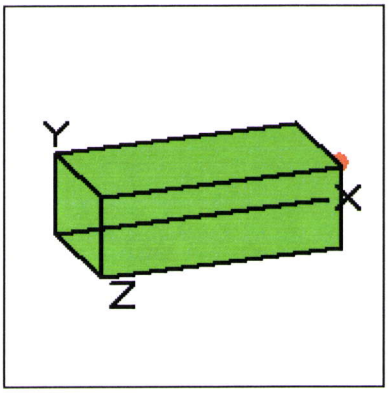
Filename	Run Date	Run Time	Duration
TruckDriver_r5.ms7	February 17, 2010	5:43:12 PM	00:00:01

Project Info	
Case Title	Case 1
Description	Case 1
Geometry	13 - Rectangular Volume

Source Dimensions	
Length	457.2 cm (15 ft)
Width	243.84 cm (8 ft)
Height	152.4 cm (5 ft 0.0 in)

Dose Points			
A	X	Y	Z
#1	518.794 cm (17 ft 0.2 in)	91.44 cm (3 ft)	60.96 cm (2 ft)

Shields			
Shield N	Dimension	Material	Density
Source	1.70e+07 cm³	Concrete	0.64
Shield 1	.64 cm	Aluminum	2.7
Air Gap		Air	0.00122



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

Nuclide	Ci	Bq	µCi/cm³	Bq/cm³
Ac-228	1.6480e-008	6.0977e+002	9.6999e-010	3.5890e-005
Bi-212	1.6480e-008	6.0977e+002	9.6999e-010	3.5890e-005
Np-237	2.2087e-008	8.1722e+002	1.3000e-009	4.8100e-005
Pa-233	2.2087e-008	8.1722e+002	1.3000e-009	4.8100e-005
Pa-234	1.3082e-007	4.8405e+003	7.7000e-009	2.8490e-004
Pa-234m	8.1553e-005	3.0174e+006	4.8000e-006	1.7760e-001
Pb-212	1.6480e-008	6.0977e+002	9.6999e-010	3.5890e-005
Po-212	1.0559e-008	3.9068e+002	6.2147e-010	2.2995e-005
Po-216	1.6480e-008	6.0977e+002	9.6999e-010	3.5890e-005
Ra-224	1.6480e-008	6.0977e+002	9.6999e-010	3.5890e-005
Ra-228	1.6480e-008	6.0977e+002	9.6999e-010	3.5890e-005
Rn-220	1.6480e-008	6.0977e+002	9.6999e-010	3.5890e-005
Th-228	1.6480e-008	6.0977e+002	9.6999e-010	3.5890e-005
Th-231	2.7184e-005	1.0058e+006	1.6000e-006	5.9200e-002

Th-232	1.6480e-008	6.0977e+002	9.7000e-010	3.5890e-005
Th-234	8.1553e-005	3.0174e+006	4.8000e-006	1.7760e-001
Tl-208	5.9214e-009	2.1909e+002	3.4852e-010	1.2895e-005
U-234	5.0970e-004	1.8859e+007	3.0000e-005	1.1100e+000
U-235	2.7184e-005	1.0058e+006	1.6000e-006	5.9200e-002
U-238	8.1553e-005	3.0174e+006	4.8000e-006	1.7760e-001

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

Results

Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.892e+03	6.650e-17	7.316e-17	5.704e-18	6.275e-18
0.03	1.475e+05	6.345e-06	8.928e-06	6.288e-08	8.848e-08
0.04	1.216e+01	4.982e-09	8.548e-09	2.203e-11	3.780e-11
0.05	2.225e+04	2.690e-05	5.636e-05	7.167e-08	1.501e-07
0.06	1.229e+05	2.831e-04	7.180e-04	5.622e-07	1.426e-06
0.08	1.227e+05	5.942e-04	1.850e-03	9.403e-07	2.927e-06
0.1	2.983e+05	2.239e-03	7.671e-03	3.426e-06	1.174e-05
0.15	1.582e+05	2.285e-03	8.089e-03	3.763e-06	1.332e-05
0.2	6.220e+05	1.372e-02	4.652e-02	2.422e-05	8.211e-05
0.3	9.196e+02	3.639e-05	1.105e-04	6.902e-08	2.096e-07
0.4	3.404e+02	2.040e-05	5.637e-05	3.974e-08	1.098e-07
0.5	5.260e+02	4.358e-05	1.118e-04	8.553e-08	2.194e-07
0.6	1.997e+03	2.159e-04	5.192e-04	4.213e-07	1.013e-06
0.8	1.022e+04	1.685e-03	3.684e-03	3.204e-06	7.007e-06
1.0	3.239e+04	7.420e-03	1.515e-02	1.368e-05	2.793e-05
1.5	7.592e+02	3.170e-04	5.754e-04	5.333e-07	9.680e-07
2.0	8.924e+01	5.676e-05	9.622e-05	8.777e-08	1.488e-07
3.0	2.187e+02	2.480e-04	3.850e-04	3.365e-07	5.223e-07
Totals	**1.543e+06**	**2.920e-02**	**8.560e-02**	**5.150e-05**	**1.499e-04**

MicroShield 7.02
Westinghouse Electric Company (08-MSD-7.02-1424)

Date	By	Checked
2/26/2010	[illegible]	[illegible]

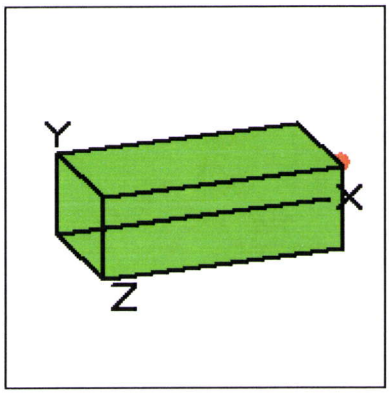
Filename	Run Date	Run Time	Duration
TruckDriver_max.ms7	February 10, 2010	12:08:38 PM	00:00:01

Project Info	
Case Title	Case 1
Description	Case 1
Geometry	13 - Rectangular Volume

Source Dimensions	
Length	457.2 cm (15 ft)
Width	243.84 cm (8 ft)
Height	152.4 cm (5 ft 0.0 in)

Dose Points			
A	X	Y	Z
#1	518.794 cm (17 ft 0.2 in)	91.44 cm (3 ft)	60.96 cm (2 ft)

Shields			
Shield N	Dimension	Material	Density
Source	1.70e+07 cm³	Concrete	0.64
Shield 1	.64 cm	Aluminum	2.7
Air Gap		Air	0.00122



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

Nuclide	Ci	Bq	µCi/cm³	Bq/cm³
Ac-228	4.4004e-007	1.6282e+004	2.5900e-008	9.5829e-004
Bi-212	4.4004e-007	1.6281e+004	2.5900e-008	9.5829e-004
Np-237	5.8276e-007	2.1562e+004	3.4300e-008	1.2691e-003
Pa-233	5.8276e-007	2.1562e+004	3.4300e-008	1.2691e-003
Pa-234	3.5339e-006	1.3076e+005	2.0800e-007	7.6960e-003
Pa-234m	2.2087e-003	8.1722e+007	1.3000e-004	4.8100e+000
Pb-212	4.4004e-007	1.6281e+004	2.5900e-008	9.5829e-004
Po-212	2.8193e-007	1.0432e+004	1.6594e-008	6.1398e-004
Po-216	4.4004e-007	1.6281e+004	2.5900e-008	9.5829e-004
Ra-224	4.4004e-007	1.6281e+004	2.5900e-008	9.5829e-004
Ra-228	4.4004e-007	1.6282e+004	2.5900e-008	9.5829e-004
Rn-220	4.4004e-007	1.6281e+004	2.5900e-008	9.5829e-004
Th-228	4.4004e-007	1.6281e+004	2.5900e-008	9.5829e-004
Th-231	7.4756e-004	2.7660e+007	4.4000e-005	1.6280e+000

Th-232	4.4004e-007	1.6282e+004	2.5900e-008	9.5830e-004
Th-234	2.2087e-003	8.1722e+007	1.3000e-004	4.8100e+000
Tl-208	1.5811e-007	5.8499e+003	9.3058e-009	3.4431e-004
U-234	1.3541e-002	5.0102e+008	7.9700e-004	2.9489e+001
U-235	7.4756e-004	2.7660e+007	4.4000e-005	1.6280e+000
U-238	2.2087e-003	8.1722e+007	1.3000e-004	4.8100e+000

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

Results					
Energy (MeV)	**Activity (Photons/sec)**	**Fluence Rate MeV/cm²/sec No Buildup**	**Fluence Rate MeV/cm²/sec With Buildup**	**Exposure Rate mR/hr No Buildup**	**Exposure Rate mR/hr With Buildup**
0.015	5.203e+04	1.829e-15	2.012e-15	1.569e-16	1.726e-16
0.03	4.056e+06	1.745e-04	2.455e-04	1.729e-06	2.433e-06
0.04	3.265e+02	1.338e-07	2.295e-07	5.917e-10	1.015e-09
0.05	5.912e+05	7.148e-04	1.497e-03	1.904e-06	3.989e-06
0.06	3.330e+06	7.671e-03	1.946e-02	1.524e-05	3.865e-05
0.08	3.371e+06	1.633e-02	5.083e-02	2.584e-05	8.044e-05
0.1	8.119e+06	6.094e-02	2.088e-01	9.323e-05	3.194e-04
0.15	4.350e+06	6.284e-02	2.224e-01	1.035e-04	3.662e-04
0.2	1.711e+07	3.774e-01	1.279e+00	6.660e-04	2.258e-03
0.3	2.453e+04	9.708e-04	2.949e-03	1.841e-06	5.593e-06
0.4	9.172e+03	5.496e-04	1.519e-03	1.071e-06	2.960e-06
0.5	1.418e+04	1.175e-03	3.014e-03	2.306e-06	5.916e-06
0.6	5.390e+04	5.825e-03	1.401e-02	1.137e-05	2.735e-05
0.8	2.765e+05	4.557e-02	9.965e-02	8.667e-05	1.895e-04
1.0	8.769e+05	2.009e-01	4.102e-01	3.703e-04	7.560e-04
1.5	2.048e+04	8.552e-03	1.552e-02	1.439e-05	2.612e-05
2.0	2.410e+03	1.533e-03	2.598e-03	2.370e-06	4.018e-06
3.0	5.838e+03	6.623e-03	1.028e-02	8.985e-06	1.395e-05
Totals	**4.226e+07**	**7.977e-01**	**2.342e+00**	**1.407e-03**	**4.101e-03**

MicroShield 7.02
Westinghouse Electric Company (08-MSD-7.02-1424)

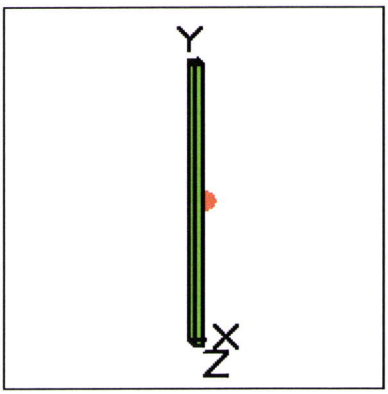
Date	By	Checked
2/26/2010	AW	

Filename	Run Date	Run Time	Duration
CellSurface_r5.ms7	February 17, 2010	5:24:13 PM	00:00:00

Project Info	
Case Title	Case 1
Description	Case 1
Geometry	13 - Rectangular Volume

Source Dimensions	
Length	100.0 cm (3 ft 3.4 in)
Width	200.0 cm (6 ft 6.7 in)
Height	3.5e+3 cm (114 ft 10.0 in)

Dose Points			
A	X	Y	Z
#1	200.6 cm (6 ft 7.0 in)	1.8e+3 cm (57 ft 5.0 in)	100.0 cm (3 ft 3.4 in)



Shields			
Shield N	Dimension	Material	Density
Source	7.00e+07 cm³	Concrete	0.64
Shield 1	.6 cm	Iron	7.86
Air Gap		Air	0.00122

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

Nuclide	Ci	Bq	µCi/cm³	Bq/cm³
Ac-228	6.7902e-008	2.5124e+003	9.6999e-010	3.5890e-005
Bi-212	6.7902e-008	2.5124e+003	9.6999e-010	3.5890e-005
Np-237	9.1003e-008	3.3671e+003	1.3000e-009	4.8100e-005
Pa-233	9.1003e-008	3.3671e+003	1.3000e-009	4.8100e-005
Pa-234	5.3902e-007	1.9944e+004	7.7000e-009	2.8490e-004
Pa-234m	3.3601e-004	1.2432e+007	4.8000e-006	1.7760e-001
Pb-212	6.7902e-008	2.5124e+003	9.6999e-010	3.5890e-005
Po-212	4.3505e-008	1.6097e+003	6.2147e-010	2.2995e-005
Po-216	6.7902e-008	2.5124e+003	9.6999e-010	3.5890e-005
Ra-224	6.7902e-008	2.5124e+003	9.6999e-010	3.5890e-005
Ra-228	6.7902e-008	2.5124e+003	9.6999e-010	3.5890e-005
Rn-220	6.7902e-008	2.5124e+003	9.6999e-010	3.5890e-005
Th-228	6.7902e-008	2.5124e+003	9.6999e-010	3.5890e-005
Th-231	1.1200e-004	4.1441e+006	1.6000e-006	5.9200e-002

Th-232	6.7902e-008	2.5124e+003	9.7000e-010	3.5890e-005
Th-234	3.3601e-004	1.2432e+007	4.8000e-006	1.7760e-001
Tl-208	2.4397e-008	9.0269e+002	3.4852e-010	1.2895e-005
U-234	2.1001e-003	7.7702e+007	3.0000e-005	1.1100e+000
U-235	1.1200e-004	4.1441e+006	1.6000e-006	5.9200e-002
U-238	3.3601e-004	1.2432e+007	4.8000e-006	1.7760e-001

Buildup: The material reference is Source Integration Parameters	
X Direction	10
Y Direction	20
Z Direction	20

Results

Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	7.795e+03	2.436e-129	4.905e-31	2.089e-130	4.208e-32
0.03	6.077e+05	2.585e-22	5.219e-22	2.562e-24	5.173e-24
0.04	5.010e+01	1.910e-16	6.066e-16	8.448e-19	2.683e-18
0.05	9.169e+04	2.284e-09	1.050e-08	6.084e-12	2.796e-11
0.06	5.064e+05	8.241e-07	4.827e-06	1.637e-09	9.588e-09
0.08	5.054e+05	3.469e-05	2.381e-04	5.490e-08	3.768e-07
0.1	1.229e+06	4.118e-04	2.787e-03	6.300e-07	4.264e-06
0.15	6.518e+05	1.048e-03	6.005e-03	1.725e-06	9.889e-06
0.2	2.563e+06	8.131e-03	4.088e-02	1.435e-05	7.215e-05
0.3	3.789e+03	2.574e-05	1.077e-04	4.882e-08	2.043e-07
0.4	1.402e+03	1.558e-05	5.714e-05	3.036e-08	1.113e-07
0.5	2.167e+03	3.495e-05	1.158e-04	6.860e-08	2.273e-07
0.6	8.230e+03	1.794e-04	5.463e-04	3.503e-07	1.066e-06
0.8	4.212e+04	1.476e-03	3.961e-03	2.808e-06	7.534e-06
1.0	1.335e+05	6.760e-03	1.654e-02	1.246e-05	3.048e-05
1.5	3.128e+03	3.078e-04	6.440e-04	5.178e-07	1.083e-06
2.0	3.677e+02	5.714e-05	1.091e-04	8.836e-08	1.687e-07
3.0	9.009e+02	2.591e-04	4.408e-04	3.515e-07	5.980e-07
Totals	**6.358e+06**	**1.874e-02**	**7.243e-02**	**3.349e-05**	**1.282e-04**

MicroShield 7.02
Westinghouse Electric Company (08-MSD-7.02-1424)

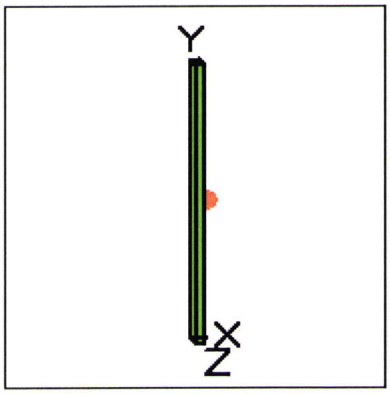
Date	By	Checked
2/24/2010	KW	

Filename	Run Date	Run Time	Duration
CellSurface_max.ms7	February 10, 2010	11:52:50 AM	00:00:00

Project Info	
Case Title	Case 1
Description	Case 1
Geometry	13 - Rectangular Volume

Source Dimensions	
Length	100.0 cm (3 ft 3.4 in)
Width	200.0 cm (6 ft 6.7 in)
Height	3.5e+3 cm (114 ft 10.0 in)

Dose Points			
A	X	Y	Z
#1	200.6 cm (6 ft 7.0 in)	1.8e+3 cm (57 ft 5.0 in)	100.0 cm (3 ft 3.4 in)



Shields			
Shield N	Dimension	Material	Density
Source	7.00e+07 cm³	Concrete	0.64
Shield 1	.6 cm	Iron	7.86
Air Gap		Air	0.00122

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

Nuclide	Ci	Bq	µCi/cm³	Bq/cm³
Ac-228	1.8130e-006	6.7083e+004	2.5900e-008	9.5829e-004
Bi-212	1.8130e-006	6.7083e+004	2.5900e-008	9.5829e-004
Np-237	2.4011e-006	8.8840e+004	3.4300e-008	1.2691e-003
Pa-233	2.4011e-006	8.8840e+004	3.4300e-008	1.2691e-003
Pa-234	1.4560e-005	5.3874e+005	2.0800e-007	7.6960e-003
Pa-234m	9.1003e-003	3.3671e+008	1.3000e-004	4.8100e+000
Pb-212	1.8130e-006	6.7083e+004	2.5900e-008	9.5829e-004
Po-212	1.1616e-006	4.2980e+004	1.6594e-008	6.1398e-004
Po-216	1.8130e-006	6.7083e+004	2.5900e-008	9.5829e-004
Ra-224	1.8130e-006	6.7083e+004	2.5900e-008	9.5829e-004
Ra-228	1.8130e-006	6.7083e+004	2.5900e-008	9.5829e-004
Rn-220	1.8130e-006	6.7083e+004	2.5900e-008	9.5829e-004
Th-228	1.8130e-006	6.7083e+004	2.5900e-008	9.5829e-004
Th-231	3.0801e-003	1.1396e+008	4.4000e-005	1.6280e+000

Th-232	1.8131e-006	6.7083e+004	2.5900e-008	9.5830e-004
Th-234	9.1003e-003	3.3671e+008	1.3000e-004	4.8100e+000
Tl-208	6.5143e-007	2.4103e+004	9.3058e-009	3.4431e-004
U-234	5.5792e-002	2.0643e+009	7.9700e-004	2.9489e+001
U-235	3.0801e-003	1.1396e+008	4.4000e-005	1.6280e+000
U-238	9.1003e-003	3.3671e+008	1.3000e-004	4.8100e+000

Buildup: The material reference is Source Integration Parameters	
X Direction	10
Y Direction	20
Z Direction	20

Results					
Energy (MeV)	**Activity (Photons/sec)**	**Fluence Rate MeV/cm²/sec No Buildup**	**Fluence Rate MeV/cm²/sec With Buildup**	**Exposure Rate mR/hr No Buildup**	**Exposure Rate mR/hr With Buildup**
0.015	2.144e+05	6.699e-128	1.349e-29	5.746e-129	1.157e-30
0.03	1.671e+07	7.108e-21	1.435e-20	7.045e-23	1.422e-22
0.04	1.345e+03	5.129e-15	1.629e-14	2.268e-17	7.204e-17
0.05	2.436e+06	6.068e-08	2.789e-07	1.616e-10	7.429e-10
0.06	1.372e+07	2.233e-05	1.308e-04	4.436e-08	2.598e-07
0.08	1.389e+07	9.534e-04	6.543e-03	1.509e-06	1.035e-05
0.1	3.345e+07	1.121e-02	7.585e-02	1.715e-05	1.160e-04
0.15	1.792e+07	2.881e-02	1.651e-01	4.744e-05	2.719e-04
0.2	7.048e+07	2.236e-01	1.124e+00	3.946e-04	1.984e-03
0.3	1.011e+05	6.866e-04	2.873e-03	1.302e-06	5.450e-06
0.4	3.779e+04	4.198e-04	1.540e-03	8.180e-07	3.000e-06
0.5	5.843e+04	9.423e-04	3.123e-03	1.850e-06	6.130e-06
0.6	2.221e+05	4.842e-03	1.474e-02	9.451e-06	2.877e-05
0.8	1.139e+06	3.994e-02	1.071e-01	7.596e-05	2.038e-04
1.0	3.613e+06	1.830e-01	4.477e-01	3.374e-04	8.253e-04
1.5	8.439e+04	8.303e-03	1.737e-02	1.397e-05	2.923e-05
2.0	9.930e+03	1.543e-03	2.945e-03	2.386e-06	4.555e-06
3.0	2.405e+04	6.918e-03	1.177e-02	9.386e-06	1.597e-05
Totals	**1.741e+08**	**5.112e-01**	**1.981e+00**	**9.132e-04**	**3.505e-03**

Attachment 2

RESRAD, Version 6.5 Cases

Cases:

Summary: EGL Vadose Zone Analysis, $T_{1/2}$ Limit = 180 days, 2/22/10, 22:43, 29 pages,
File: USEI WEC Rubble.RAD

Summary: EGL Vadose Zone Analysis, $T_{1/2}$ Limit = 180 days, 2/22/10, 17:11, 27 pages,
File: USEI_EGL_FINAL_03_25_05.RAD

Summary : EGL Vadose Zone Analysis
File : G:\SHARED\EVANDEUSEN\CUSTOMER FILES - IDAHO\WEC\BLDG 1\USEI WEC RUBBLE.RAD

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Summary : EGL Vadose Zone Analysis
File : G:\SHARED\EVANDEUSEN\CUSTOMER FILES - IDAHO\WEC\BLDG 1\USEI WEC RUBBLE.RAD

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ac-225 (Source: FGR 12)	6.371E-02	6.371E-02	DCF1(1)
A-1	Ac-227 (Source: FGR 12)	4.951E-04	4.951E-04	DCF1(2)
A-1	Ac-228 (Source: FGR 12)	5.978E+00	5.978E+00	DCF1(3)
A-1	At-217 (Source: FGR 12)	1.773E-03	1.773E-03	DCF1(4)
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(5)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(6)
A-1	Bi-211 (Source: FGR 12)	2.559E-01	2.559E-01	DCF1(7)
A-1	Bi-212 (Source: FGR 12)	1.171E+00	1.171E+00	DCF1(8)
A-1	Bi-213 (Source: FGR 12)	7.660E-01	7.660E-01	DCF1(9)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(10)
A-1	Fr-221 (Source: FGR 12)	1.536E-01	1.536E-01	DCF1(11)
A-1	Fr-223 (Source: FGR 12)	1.980E-01	1.980E-01	DCF1(12)
A-1	Np-237 (Source: FGR 12)	7.790E-02	7.790E-02	DCF1(13)
A-1	Pa-231 (Source: FGR 12)	1.906E-01	1.906E-01	DCF1(14)
A-1	Pa-233 (Source: FGR 12)	1.020E+00	1.020E+00	DCF1(15)
A-1	Pa-234 (Source: FGR 12)	1.155E+01	1.155E+01	DCF1(16)
A-1	Pa-234m (Source: FGR 12)	8.967E-02	8.967E-02	DCF1(17)
A-1	Pb-209 (Source: FGR 12)	7.734E-04	7.734E-04	DCF1(18)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(19)
A-1	Pb-211 (Source: FGR 12)	3.064E-01	3.064E-01	DCF1(20)
A-1	Pb-212 (Source: FGR 12)	7.043E-01	7.043E-01	DCF1(21)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(22)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(23)
A-1	Po-211 (Source: FGR 12)	4.764E-02	4.764E-02	DCF1(24)
A-1	Po-212 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(25)
A-1	Po-213 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(26)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(27)
A-1	Po-215 (Source: FGR 12)	1.016E-03	1.016E-03	DCF1(28)
A-1	Po-216 (Source: FGR 12)	1.042E-04	1.042E-04	DCF1(29)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(30)
A-1	Ra-223 (Source: FGR 12)	6.034E-01	6.034E-01	DCF1(31)
A-1	Ra-224 (Source: FGR 12)	5.119E-02	5.119E-02	DCF1(32)
A-1	Ra-225 (Source: FGR 12)	1.102E-02	1.102E-02	DCF1(33)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(34)
A-1	Ra-228 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(35)
A-1	Rn-219 (Source: FGR 12)	3.083E-01	3.083E-01	DCF1(36)
A-1	Rn-220 (Source: FGR 12)	2.298E-03	2.298E-03	DCF1(37)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(38)
A-1	Sr-90 (Source: FGR 12)	7.043E-04	7.043E-04	DCF1(39)
A-1	Tc-99 (Source: FGR 12)	1.255E-04	1.255E-04	DCF1(40)
A-1	Th-227 (Source: FGR 12)	5.212E-01	5.212E-01	DCF1(41)
A-1	Th-228 (Source: FGR 12)	7.940E-03	7.940E-03	DCF1(42)
A-1	Th-229 (Source: FGR 12)	3.213E-01	3.213E-01	DCF1(43)
A-1	Th-230 (Source: FGR 12)	1.209E-03	1.209E-03	DCF1(44)
A-1	Th-231 (Source: FGR 12)	3.643E-02	3.643E-02	DCF1(45)
A-1	Th-232 (Source: FGR 12)	5.212E-04	5.212E-04	DCF1(46)
A-1	Th-234 (Source: FGR 12)	2.410E-02	2.410E-02	DCF1(47)
A-1	Tl-207 (Source: FGR 12)	1.980E-02	1.980E-02	DCF1(48)
A-1	Tl-208 (Source: FGR 12)	2.298E+01	2.298E+01	DCF1(49)

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	Tl-209 (Source: FGR 12)	1.293E+01	1.293E+01	DCF1(50)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(51)
A-1	U-233 (Source: FGR 12)	1.397E-03	1.397E-03	DCF1(52)
A-1	U-234 (Source: FGR 12)	4.017E-04	4.017E-04	DCF1(53)
A-1	U-235 (Source: FGR 12)	7.211E-01	7.211E-01	DCF1(54)
A-1	U-238 (Source: FGR 12)	1.031E-04	1.031E-04	DCF1(55)
A-1	Y-90 (Source: FGR 12)	2.391E-02	2.391E-02	DCF1(56)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.724E+00	6.700E+00	DCF2(1)
B-1	Np-237+D	5.400E-01	5.400E-01	DCF2(2)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(3)
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(4)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(5)
B-1	Ra-228+D	5.078E-03	4.770E-03	DCF2(6)
B-1	Sr-90+D	1.308E-03	1.300E-03	DCF2(7)
B-1	Tc-99	8.320E-06	8.320E-06	DCF2(8)
B-1	Th-228+D	3.454E-01	3.420E-01	DCF2(9)
B-1	Th-229+D	2.169E+00	2.150E+00	DCF2(10)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(11)
B-1	Th-232	1.640E+00	1.640E+00	DCF2(12)
B-1	U-233	1.350E-01	1.350E-01	DCF2(13)
B-1	U-234	1.320E-01	1.320E-01	DCF2(14)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(15)
B-1	U-238	1.180E-01	1.180E-01	DCF2(16)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(17)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.410E-02	DCF3(1)
D-1	Np-237+D	4.444E-03	4.440E-03	DCF3(2)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(3)
D-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(4)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(5)
D-1	Ra-228+D	1.442E-03	1.440E-03	DCF3(6)
D-1	Sr-90+D	1.528E-04	1.420E-04	DCF3(7)
D-1	Tc-99	1.460E-06	1.460E-06	DCF3(8)
D-1	Th-228+D	8.086E-04	3.960E-04	DCF3(9)
D-1	Th-229+D	4.027E-03	3.530E-03	DCF3(10)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(11)
D-1	Th-232	2.730E-03	2.730E-03	DCF3(12)
D-1	U-233	2.890E-04	2.890E-04	DCF3(13)
D-1	U-234	2.830E-04	2.830E-04	DCF3(14)
D-1	U-235+D	2.673E-04	2.660E-04	DCF3(15)
D-1	U-238	2.550E-04	2.550E-04	DCF3(16)
D-1	U-238+D	2.687E-04	2.550E-04	DCF3(17)
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Np-237+D , plant/soil concentration ratio, dimensionless	2.000E-02	2.000E-02	RTF(2,1)
D-34	Np-237+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(2,2)
D-34	Np-237+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(2,3)
D-34				
D-34	Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(3,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(3,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(3,3)
D-34				
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(4,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(4,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(4,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(5,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(6,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(6,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(6,3)
D-34				
D-34	Sr-90+D , plant/soil concentration ratio, dimensionless	3.000E-01	3.000E-01	RTF(7,1)
D-34	Sr-90+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-03	8.000E-03	RTF(7,2)
D-34	Sr-90+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(7,3)
D-34				
D-34	Tc-99 , plant/soil concentration ratio, dimensionless	5.000E+00	5.000E+00	RTF(8,1)
D-34	Tc-99 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(8,2)
D-34	Tc-99 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(8,3)
D-34				
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(9,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(9,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(9,3)
D-34				
D-34	Th-229+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(10,1)
D-34	Th-229+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(10,2)
D-34	Th-229+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(10,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(11,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(11,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(11,3)
D-34				
D-34	Th-232 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(12,1)
D-34	Th-232 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(12,2)
D-34	Th-232 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(12,3)
D-34				
D-34	U-233 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(13,1)
D-34	U-233 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(13,2)
D-34	U-233 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(13,3)
D-34				

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(14,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(14,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(14,3)
D-34				
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(15,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(15,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(15,3)
D-34				
D-34	U-238 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(16,1)
D-34	U-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(16,2)
D-34	U-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(16,3)
D-34				
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(17,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(17,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(17,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
D-5				
D-5	Np-237+D , fish	3.000E+01	3.000E+01	BIOFAC(2,1)
D-5	Np-237+D , crustacea and mollusks	4.000E+02	4.000E+02	BIOFAC(2,2)
D-5				
D-5	Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(3,1)
D-5	Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(3,2)
D-5				
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(4,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(4,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(5,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(5,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(6,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(6,2)
D-5				
D-5	Sr-90+D , fish	6.000E+01	6.000E+01	BIOFAC(7,1)
D-5	Sr-90+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(7,2)
D-5				
D-5	Tc-99 , fish	2.000E+01	2.000E+01	BIOFAC(8,1)
D-5	Tc-99 , crustacea and mollusks	5.000E+00	5.000E+00	BIOFAC(8,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(9,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(9,2)
D-5				
D-5	Th-229+D , fish	1.000E+02	1.000E+02	BIOFAC(10,1)
D-5	Th-229+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(10,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(11,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(11,2)
D-5				

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-5	Th-232 , fish	1.000E+02	1.000E+02	BIOFAC(12,1)
D-5	Th-232 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(12,2)
D-5				
D-5	U-233 , fish	1.000E+01	1.000E+01	BIOFAC(13,1)
D-5	U-233 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(13,2)
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(14,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(14,2)
D-5				
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(15,1)
D-5	U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(15,2)
D-5				
D-5	U-238 , fish	1.000E+01	1.000E+01	BIOFAC(16,1)
D-5	U-238 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(16,2)
D-5				
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(17,1)
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(17,2)

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

Summary : EGL Vadose Zone Analysis
File : G:\SHARED\EVANDEUSEN\CUSTOMER FILES - IDAHO\WEC\BLDG 1\USEI WEC RUBBLE.RAD

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	4.047E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	1.062E+01	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	5.820E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Np-237	4.600E-04	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Ra-228	3.700E-04	0.000E+00	---	S1(6)
R012	Initial principal radionuclide (pCi/g): Sr-90	9.190E-03	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): Tc-99	5.060E-02	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): Th-228	3.700E-04	0.000E+00	---	S1(9)
R012	Initial principal radionuclide (pCi/g): Th-230	3.220E-03	0.000E+00	---	S1(11)
R012	Initial principal radionuclide (pCi/g): Th-232	3.700E-04	0.000E+00	---	S1(12)
R012	Initial principal radionuclide (pCi/g): U-234	1.140E+01	0.000E+00	---	S1(14)
R012	Initial principal radionuclide (pCi/g): U-235	6.340E-01	0.000E+00	---	S1(15)
R012	Initial principal radionuclide (pCi/g): U-238	1.870E+00	0.000E+00	---	S1(16)
R012	Concentration in groundwater (pCi/L): Np-237	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Ra-228	not used	0.000E+00	---	W1(6)
R012	Concentration in groundwater (pCi/L): Sr-90	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): Tc-99	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): Th-228	not used	0.000E+00	---	W1(9)
R012	Concentration in groundwater (pCi/L): Th-230	not used	0.000E+00	---	W1(11)
R012	Concentration in groundwater (pCi/L): Th-232	not used	0.000E+00	---	W1(12)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(14)
R012	Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	---	W1(15)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(16)
R013	Cover depth (m)	3.600E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	1.780E+00	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	1.000E-04	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	5.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	7.500E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.840E-01	1.000E+00	---	PRECIP

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.300E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	4.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	4.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.500E+01	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	1.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.000E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.000E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	5	1	---	NS
R015	Unsat. zone 1, thickness (m)	1.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.630E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	5.200E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	1.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	4.500E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	1.100E+01	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.500E-02	1.000E+01	---	HCUZ(1)
R015	Unsat. zone 2, thickness (m)	4.600E+00	0.000E+00	---	H(2)
R015	Unsat. zone 2, soil density (g/cm**3)	1.690E+00	1.500E+00	---	DENSUZ(2)
R015	Unsat. zone 2, total porosity	3.400E-01	4.000E-01	---	TPUZ(2)
R015	Unsat. zone 2, effective porosity	3.300E-01	2.000E-01	---	EPUZ(2)
R015	Unsat. zone 2, field capacity	7.000E-02	2.000E-01	---	FCUZ(2)
R015	Unsat. zone 2, soil-specific b parameter	2.000E+00	5.300E+00	---	BUZ(2)
R015	Unsat. zone 2, hydraulic conductivity (m/yr)	2.200E+03	1.000E+01	---	HCUZ(2)
R015	Unsat. zone 3, thickness (m)	2.130E+01	0.000E+00	---	H(3)
R015	Unsat. zone 3, soil density (g/cm**3)	1.300E+00	1.500E+00	---	DENSUZ(3)
R015	Unsat. zone 3, total porosity	5.200E-01	4.000E-01	---	TPUZ(3)
R015	Unsat. zone 3, effective porosity	4.000E-01	2.000E-01	---	EPUZ(3)
R015	Unsat. zone 3, field capacity	4.900E-01	2.000E-01	---	FCUZ(3)
R015	Unsat. zone 3, soil-specific b parameter	3.000E+00	5.300E+00	---	BUZ(3)
R015	Unsat. zone 3, hydraulic conductivity (m/yr)	9.000E+02	1.000E+01	---	HCUZ(3)
R015	Unsat. zone 4, thickness (m)	1.680E+01	0.000E+00	---	H(4)
R015	Unsat. zone 4, soil density (g/cm**3)	1.310E+00	1.500E+00	---	DENSUZ(4)
R015	Unsat. zone 4, total porosity	4.900E-01	4.000E-01	---	TPUZ(4)
R015	Unsat. zone 4, effective porosity	4.300E-01	2.000E-01	---	EPUZ(4)
R015	Unsat. zone 4, field capacity	4.800E-01	2.000E-01	---	FCUZ(4)
R015	Unsat. zone 4, soil-specific b parameter	5.000E+00	5.300E+00	---	BUZ(4)
R015	Unsat. zone 4, hydraulic conductivity (m/yr)	6.000E+01	1.000E+01	---	HCUZ(4)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R015	Unsat. zone 5, thickness (m)	1.220E+01	0.000E+00	---	H(5)
R015	Unsat. zone 5, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(5)
R015	Unsat. zone 5, total porosity	5.200E-01	4.000E-01	---	TPUZ(5)
R015	Unsat. zone 5, effective porosity	1.500E-01	2.000E-01	---	EPUZ(5)
R015	Unsat. zone 5, field capacity	3.200E-01	2.000E-01	---	FCUZ(5)
R015	Unsat. zone 5, soil-specific b parameter	8.000E+00	5.300E+00	---	BUZ(5)
R015	Unsat. zone 5, hydraulic conductivity (m/yr)	1.000E-01	1.000E+01	---	HCUZ(5)
R016	Distribution coefficients for Np-237				
R016	Contaminated zone (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCU(2,1)
R016	Unsaturated zone 2 (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCU(2,2)
R016	Unsaturated zone 3 (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCU(2,3)
R016	Unsaturated zone 4 (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCU(2,4)
R016	Unsaturated zone 5 (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCU(2,5)
R016	Saturated zone (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.115E-05	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Ra-228				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(6,1)
R016	Unsaturated zone 2 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(6,2)
R016	Unsaturated zone 3 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(6,3)
R016	Unsaturated zone 4 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(6,4)
R016	Unsaturated zone 5 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(6,5)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.766E-05	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for Sr-90				
R016	Contaminated zone (cm**3/g)	1.500E+01	3.000E+01	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	1.100E+02	3.000E+01	---	DCNUCU(7,1)
R016	Unsaturated zone 2 (cm**3/g)	1.500E+01	3.000E+01	---	DCNUCU(7,2)
R016	Unsaturated zone 3 (cm**3/g)	1.500E+01	3.000E+01	---	DCNUCU(7,3)
R016	Unsaturated zone 4 (cm**3/g)	1.500E+01	3.000E+01	---	DCNUCU(7,4)
R016	Unsaturated zone 5 (cm**3/g)	1.500E+01	3.000E+01	---	DCNUCU(7,5)
R016	Saturated zone (cm**3/g)	1.500E+01	3.000E+01	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.593E-04	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for Tc-99				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(8,1)
R016	Unsaturated zone 2 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(8,2)
R016	Unsaturated zone 3 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(8,3)
R016	Unsaturated zone 4 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(8,4)
R016	Unsaturated zone 5 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(8,5)
R016	Saturated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.261E-02	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Th-228				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(9)
R016	Unsaturated zone 1 (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCU(9,1)
R016	Unsaturated zone 2 (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCU(9,2)
R016	Unsaturated zone 3 (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCU(9,3)
R016	Unsaturated zone 4 (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCU(9,4)
R016	Unsaturated zone 5 (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCU(9,5)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.703E-06	ALEACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)
R016	Distribution coefficients for Th-230				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(11)
R016	Unsaturated zone 1 (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCU(11,1)
R016	Unsaturated zone 2 (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCU(11,2)
R016	Unsaturated zone 3 (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCU(11,3)
R016	Unsaturated zone 4 (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCU(11,4)
R016	Unsaturated zone 5 (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCU(11,5)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(11)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.703E-06	ALEACH(11)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(11)
R016	Distribution coefficients for Th-232				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(12)
R016	Unsaturated zone 1 (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCU(12,1)
R016	Unsaturated zone 2 (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCU(12,2)
R016	Unsaturated zone 3 (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCU(12,3)
R016	Unsaturated zone 4 (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCU(12,4)
R016	Unsaturated zone 5 (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCU(12,5)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(12)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.703E-06	ALEACH(12)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(12)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCC(14)
R016	Unsaturated zone 1 (cm**3/g)	1.600E+03	5.000E+01	---	DCNUCU(14,1)
R016	Unsaturated zone 2 (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCU(14,2)
R016	Unsaturated zone 3 (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCU(14,3)
R016	Unsaturated zone 4 (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCU(14,4)
R016	Unsaturated zone 5 (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCU(14,5)
R016	Saturated zone (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCS(14)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.549E-04	ALEACH(14)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(14)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for U-235				
R016	Contaminated zone (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCC(15)
R016	Unsaturated zone 1 (cm**3/g)	1.600E+03	5.000E+01	---	DCNUCU(15,1)
R016	Unsaturated zone 2 (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCU(15,2)
R016	Unsaturated zone 3 (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCU(15,3)
R016	Unsaturated zone 4 (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCU(15,4)
R016	Unsaturated zone 5 (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCU(15,5)
R016	Saturated zone (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCS(15)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.549E-04	ALEACH(15)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(15)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCC(16)
R016	Unsaturated zone 1 (cm**3/g)	1.600E+03	5.000E+01	---	DCNUCU(16,1)
R016	Unsaturated zone 2 (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCU(16,2)
R016	Unsaturated zone 3 (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCU(16,3)
R016	Unsaturated zone 4 (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCU(16,4)
R016	Unsaturated zone 5 (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCU(16,5)
R016	Saturated zone (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCS(16)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.549E-04	ALEACH(16)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(16)
R016	Distribution coefficients for daughter Ac-227				
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,1)
R016	Unsaturated zone 2 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,2)
R016	Unsaturated zone 3 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,3)
R016	Unsaturated zone 4 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,4)
R016	Unsaturated zone 5 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,5)
R016	Saturated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.702E-04	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for daughter Pa-231				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(3,1)
R016	Unsaturated zone 2 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(3,2)
R016	Unsaturated zone 3 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(3,3)
R016	Unsaturated zone 4 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(3,4)
R016	Unsaturated zone 5 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(3,5)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.086E-04	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(4,1)
R016	Unsaturated zone 2 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(4,2)
R016	Unsaturated zone 3 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(4,3)
R016	Unsaturated zone 4 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(4,4)
R016	Unsaturated zone 5 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(4,5)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.440E-05	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for daughter Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(5,1)
R016	Unsaturated zone 2 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(5,2)
R016	Unsaturated zone 3 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(5,3)
R016	Unsaturated zone 4 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(5,4)
R016	Unsaturated zone 5 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(5,5)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.766E-05	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for daughter Th-229				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(10)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(10,1)
R016	Unsaturated zone 2 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(10,2)
R016	Unsaturated zone 3 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(10,3)
R016	Unsaturated zone 4 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(10,4)
R016	Unsaturated zone 5 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(10,5)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(10)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.081E-08	ALEACH(10)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(10)
R016	Distribution coefficients for daughter U-233				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(13)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(13,1)
R016	Unsaturated zone 2 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(13,2)
R016	Unsaturated zone 3 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(13,3)
R016	Unsaturated zone 4 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(13,4)
R016	Unsaturated zone 5 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(13,5)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(13)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.086E-04	ALEACH(13)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(13)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	5.000E-01	5.000E-01	---	FIND

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fraction of time spent outdoors (on site)	2.500E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	1.600E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	1.400E+01	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	9.200E+01	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	6.300E+01	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	5.100E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	1.000E+00	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	1.000E+00	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.500E+00	FPLANT
R018	Contamination fraction of meat	-1	-1	0.100E+01	FMEAT
R018	Contamination fraction of milk	-1	-1	0.100E+01	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	1.000E+00	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.100E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.000E-02	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	1.000E+00	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	2.000E+01	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	1.500E-01	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	2.400E+00	2.400E+00	---	DENSFL

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R021	Total porosity of the cover material	4.130E-01	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	1.000E-01	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	2.650E-02	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	3.000E-02	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	7.233E-07	2.000E-06	---	DIFCV
R021	in foundation material	3.000E-07	3.000E-07	---	DIFFL
R021	in contaminated zone soil	3.000E-07	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	2.000E+00	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	1.500E+00	5.000E-01	---	REXG
R021	Height of the building (room) (m)	2.500E+00	2.500E+00	---	HRM
R021	Building interior area factor	1.000E+00	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	0.000E+00	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	2.500E-01	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	1.500E-01	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	512	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	1	---	---	KYMAX

Summary of Pathway Selections

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

Summary : EGL Vadose Zone Analysis
File : G:\SHARED\EVANDEUSEN\CUSTOMER FILES - IDAHO\WEC\BLDG 1\USEI WEC RUBBLE.RAD

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	40468.60 square meters	Np-237	4.600E-04
Thickness:	10.62 meters	Ra-228	3.700E-04
Cover Depth:	3.60 meters	Sr-90	9.190E-03
		Tc-99	5.060E-02
		Th-228	3.700E-04
		Th-230	3.220E-03
		Th-232	3.700E-04
		U-234	1.140E+01
		U-235	6.340E-01
		U-238	1.870E+00

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

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	1.313E-08	3.994E-08	9.602E-08	3.182E-07	1.175E-06	6.747E-06	1.778E-02	4.184E-04
M(t):	5.252E-10	1.597E-09	3.841E-09	1.273E-08	4.699E-08	2.699E-07	7.113E-04	1.674E-05

Maximum TDOSE(t): 9.925E-02 mrem/yr at t = 246.7 ± 0.5 years

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.467E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	1.287E-31	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	1.082E-33	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	3.245E-24	0.0000	0.000E+00	0.0000	6.284E-06	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	6.406E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	1.289E-23	0.0000	0.000E+00	0.0000	2.496E-05	0.0003	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	1.464E-30	0.0000	0.000E+00	0.0000	0.000E+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	2.468E-26	0.0000	0.000E+00	0.0000	9.603E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	6.423E-21	0.0000	0.000E+00	0.0000	3.124E-05	0.0003	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 = 2.467E+02 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.287E-31	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.082E-33	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	8.074E-02	0.8135	0.000E+00	0.0000	0.000E+00	0.0000	1.429E-02	0.1440	1.910E-04	0.0019	3.997E-03	0.0403	9.922E-02	0.9997
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.284E-06	0.0001
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.406E-21	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.496E-05	0.0003
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.464E-30	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	9.603E-10	0.0000
Total	8.074E-02	0.8135	0.000E+00	0.0000	0.000E+00	0.0000	1.429E-02	0.1440	1.910E-04	0.0019	3.997E-03	0.0403	9.925E-02	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	7.523E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	4.080E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	5.033E-27	0.0000	0.000E+00	0.0000	1.299E-08	0.9895	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	3.145E-23	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	5.348E-29	0.0000	0.000E+00	0.0000	1.380E-10	0.0105	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	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	1.701E-26	0.0000	0.000E+00	0.0000	1.604E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	4.863E-21	0.0000	0.000E+00	0.0000	1.313E-08	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.523E-22	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.080E-21	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.299E-08	0.9895
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.145E-23	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.380E-10	0.0105
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	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	1.604E-17	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.313E-08	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	1.833E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	2.843E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	1.511E-26	0.0000	0.000E+00	0.0000	3.897E-08	0.9758	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	1.932E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	3.747E-28	0.0000	0.000E+00	0.0000	9.660E-10	0.0242	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	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	1.704E-26	0.0000	0.000E+00	0.0000	2.407E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	4.869E-21	0.0000	0.000E+00	0.0000	3.994E-08	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.833E-21	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.843E-21	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.897E-08	0.9758
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.932E-22	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.660E-10	0.0242
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	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	2.407E-16	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.994E-08	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	2.729E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	1.380E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	3.534E-26	0.0000	0.000E+00	0.0000	9.091E-08	0.9468	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	7.695E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	1.985E-27	0.0000	0.000E+00	0.0000	5.106E-09	0.0532	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	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	1.709E-26	0.0000	0.000E+00	0.0000	2.807E-15	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	4.879E-21	0.0000	0.000E+00	0.0000	9.602E-08	1.0000	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 = 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.729E-21	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.380E-21	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.091E-08	0.9468
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.695E-22	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.106E-09	0.0532
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	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	2.807E-15	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.602E-08	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	1.914E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	1.101E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	1.068E-25	0.0000	0.000E+00	0.0000	2.726E-07	0.8565	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	2.892E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	1.789E-26	0.0000	0.000E+00	0.0000	4.566E-08	0.1435	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	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	1.726E-26	0.0000	0.000E+00	0.0000	7.443E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	4.916E-21	0.0000	0.000E+00	0.0000	3.182E-07	1.0000	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+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.914E-21	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.101E-22	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.726E-07	0.8565
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.892E-21	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.566E-08	0.1435
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	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	7.443E-14	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.182E-07	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	1.469E-33	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	1.904E-22	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	8.029E-26	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	3.170E-25	0.0000	0.000E+00	0.0000	7.903E-07	0.6727	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	4.836E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	1.543E-25	0.0000	0.000E+00	0.0000	3.845E-07	0.3273	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	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	1.776E-26	0.0000	0.000E+00	0.0000	1.819E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	5.027E-21	0.0000	0.000E+00	0.0000	1.175E-06	1.0000	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 = 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.469E-33	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.904E-22	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.029E-26	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.903E-07	0.6727
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.836E-21	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.845E-07	0.3273
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	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	1.819E-12	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.175E-06	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	1.750E-32	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	4.435E-26	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	1.126E-24	0.0000	0.000E+00	0.0000	2.588E-06	0.3836	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	5.436E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	1.810E-24	0.0000	0.000E+00	0.0000	4.159E-06	0.6164	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	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	1.965E-26	0.0000	0.000E+00	0.0000	6.490E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	5.439E-21	0.0000	0.000E+00	0.0000	6.747E-06	1.0000	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 Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.750E-32	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.435E-26	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.588E-06	0.3836
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.436E-21	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.159E-06	0.6164
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	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	6.490E-11	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.747E-06	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	2.042E-31	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	4.178E-24	0.0000	0.000E+00	0.0000	7.605E-06	0.0004	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	6.801E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	2.021E-23	0.0000	0.000E+00	0.0000	3.678E-05	0.0021	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	1.984E-30	0.0000	0.000E+00	0.0000	0.000E+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	2.704E-26	0.0000	0.000E+00	0.0000	1.722E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	6.825E-21	0.0000	0.000E+00	0.0000	4.439E-05	0.0025	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 = 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.042E-31	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	1.443E-02	0.8116	0.000E+00	0.0000	0.000E+00	0.0000	2.556E-03	0.1437	3.429E-05	0.0019	7.157E-04	0.0402	1.774E-02	0.9975
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.605E-06	0.0004
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.801E-21	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.678E-05	0.0021
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	1.984E-30	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.722E-09	0.0000
Total	1.443E-02	0.8116	0.000E+00	0.0000	0.000E+00	0.0000	2.556E-03	0.1437	3.429E-05	0.0019	7.157E-04	0.0402	1.778E-02	1.0000

*Sum of all water independent and dependent pathways.

Summary : EGL Vadose Zone Analysis
File : G:\SHARED\EVANDEUSEN\CUSTOMER FILES - IDAHO\WEC\BLDG 1\USEI WEC RUBBLE.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+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	5.743E-30	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	2.979E-23	0.0000	0.000E+00	0.0000	2.402E-05	0.0574	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	1.489E-20	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	4.891E-22	0.0000	0.000E+00	0.0000	3.943E-04	0.9424	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	2.137E-29	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	1.478E-25	0.0000	0.000E+00	0.0000	6.212E-08	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.541E-20	0.0000	0.000E+00	0.0000	4.184E-04	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.743E-30	0.0000
Ra-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	1.941E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.438E-13	0.0000	4.613E-15	0.0000	9.627E-14	0.0000	2.386E-12	0.0000
Th-228	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-230	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.402E-05	0.0574
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.489E-20	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.943E-04	0.9424
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	2.137E-29	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	6.212E-08	0.0001
Total	1.941E-12	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.438E-13	0.0000	4.613E-15	0.0000	9.627E-14	0.0000	4.184E-04	1.0000

*Sum of all water independent and dependent pathways.

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Np-237+D	Np-237+D	1.000E+00	8.212E-34	8.229E-34	8.263E-34	8.384E-34	8.740E-34	1.011E-33	1.532E-33	6.566E-33
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.401E-45	4.204E-45	7.567E-44
Np-237+D	Th-229+D	1.000E+00	1.100E-33	7.707E-33	4.084E-32	3.688E-31	3.193E-30	3.805E-29	4.439E-28	1.248E-26
Np-237+D	∑DSR(j)		1.921E-33	8.530E-33	4.167E-32	3.696E-31	3.194E-30	3.805E-29	4.439E-28	1.248E-26
Ra-228+D	Ra-228+D	1.000E+00	2.452E-23	2.177E-23	1.715E-23	7.449E-24	6.874E-25	1.641E-28	7.346E-39	0.000E+00
Ra-228+D	Th-228+D	1.000E+00	2.033E-18	4.953E-18	7.376E-18	5.172E-18	5.145E-19	1.199E-22	4.997E-33	0.000E+00
Ra-228+D	∑DSR(j)		2.033E-18	4.953E-18	7.376E-18	5.172E-18	5.145E-19	1.199E-22	4.997E-33	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	1.865E-35	1.824E-35	1.745E-35	1.496E-35	9.621E-36	2.054E-36	2.490E-38	5.605E-45
Tc-99	Tc-99	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.505E-01	4.716E-11
Th-228+D	Th-228+D	1.000E+00	1.103E-17	7.683E-18	3.731E-18	2.977E-19	2.170E-22	2.269E-33	0.000E+00	0.000E+00
Th-230	Th-230	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	Ra-226+D	1.000E+00	4.034E-06	1.210E-05	2.823E-05	8.465E-05	2.454E-04	8.037E-04	2.362E-03	7.458E-03
Th-230	Pb-210+D	1.000E+00	5.826E-36	4.047E-35	2.103E-34	1.772E-33	1.275E-32	9.073E-32	4.576E-31	4.263E-30
Th-230	∑DSR(j)		4.034E-06	1.210E-05	2.823E-05	8.465E-05	2.454E-04	8.037E-04	2.362E-03	7.458E-03
Th-232	Th-232	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-232	Ra-228+D	1.000E+00	1.508E-24	4.299E-24	8.989E-24	1.896E-23	2.651E-23	3.015E-23	4.050E-23	1.138E-22
Th-232	Th-228+D	1.000E+00	8.501E-20	5.220E-19	2.080E-18	7.817E-18	1.307E-17	1.469E-17	1.838E-17	4.025E-17
Th-232	∑DSR(j)		8.501E-20	5.220E-19	2.080E-18	7.817E-18	1.307E-17	1.469E-17	1.838E-17	4.025E-17
U-234	U-234	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	Th-230	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	Ra-226+D	1.000E+00	1.211E-11	8.474E-11	4.479E-10	4.005E-09	3.373E-08	3.648E-07	3.226E-06	3.459E-05
U-234	Pb-210+D	1.000E+00	1.313E-41	1.959E-40	2.259E-39	5.741E-38	1.254E-36	3.293E-35	5.654E-34	1.914E-32
U-234	∑DSR(j)		1.211E-11	8.474E-11	4.479E-10	4.005E-09	3.373E-08	3.648E-07	3.226E-06	3.459E-05
U-235+D	U-235+D	1.000E+00	1.591E-39	1.595E-39	1.602E-39	1.628E-39	1.705E-39	2.003E-39	3.174E-39	1.589E-38
U-235+D	Pa-231	1.000E+00	5.881E-39	1.767E-38	4.139E-38	1.259E-37	3.799E-37	1.432E-36	6.290E-36	8.044E-35
U-235+D	Ac-227+D	1.000E+00	3.843E-35	2.670E-34	1.387E-33	1.168E-32	8.394E-32	5.991E-31	3.130E-30	3.370E-29
U-235+D	∑DSR(j)		3.844E-35	2.670E-34	1.387E-33	1.168E-32	8.394E-32	5.991E-31	3.130E-30	3.370E-29
U-238	U-238	5.400E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-238+D	U-238+D	9.999E-01	9.099E-27	9.112E-27	9.138E-27	9.229E-27	9.496E-27	1.049E-26	1.395E-26	3.785E-26
U-238+D	U-234	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-238+D	Th-230	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-238+D	Ra-226+D	9.999E-01	8.580E-18	1.287E-16	1.501E-15	3.980E-14	9.729E-13	3.471E-11	9.208E-10	3.322E-08
U-238+D	Pb-210+D	9.999E-01	0.000E+00	0.000E+00	5.605E-45	4.344E-43	2.831E-41	2.628E-39	1.476E-37	1.782E-35
U-238+D	∑DSR(j)		8.580E-18	1.287E-16	1.501E-15	3.980E-14	9.729E-13	3.471E-11	9.208E-10	3.322E-08

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

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

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Np-237	*7.047E+08	*7.047E+08	*7.047E+08	*7.047E+08	*7.047E+08	*7.047E+08	*7.047E+08	*7.047E+08
Ra-228	*2.726E+14	*2.726E+14	*2.726E+14	*2.726E+14	*2.726E+14	*2.726E+14	*2.726E+14	*2.726E+14
Sr-90	*1.365E+14	*1.365E+14	*1.365E+14	*1.365E+14	*1.365E+14	*1.365E+14	*1.365E+14	*1.365E+14
Tc-99	*1.697E+10	*1.697E+10	*1.697E+10	*1.697E+10	*1.697E+10	*1.697E+10	7.132E+01	*1.697E+10
Th-228	*8.195E+14	*8.195E+14	*8.195E+14	*8.195E+14	*8.195E+14	*8.195E+14	*8.195E+14	*8.195E+14
Th-230	6.197E+06	2.066E+06	8.855E+05	2.953E+05	1.019E+05	3.111E+04	1.058E+04	3.352E+03
Th-232	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05
U-234	*6.247E+09	*6.247E+09	*6.247E+09	6.242E+09	7.411E+08	6.853E+07	7.749E+06	7.228E+05
U-235	*2.161E+06	*2.161E+06	*2.161E+06	*2.161E+06	*2.161E+06	*2.161E+06	*2.161E+06	*2.161E+06
U-238	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 246.7 ± 0.5 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Np-237	4.600E-04	1.000E+03	1.248E-26	*7.047E+08	2.798E-28	*7.047E+08
Ra-228	3.700E-04	4.097 ± 0.008	7.613E-18	*2.726E+14	2.924E-30	*2.726E+14
Sr-90	9.190E-03	0.000E+00	0.000E+00	*1.365E+14	0.000E+00	*1.365E+14
Tc-99	5.060E-02	246.7 ± 0.5	1.961E+00	1.275E+01	1.961E+00	1.275E+01
Th-228	3.700E-04	0.000E+00	1.103E-17	*8.195E+14	0.000E+00	*8.195E+14
Th-230	3.220E-03	1.000E+03	7.458E-03	3.352E+03	1.952E-03	1.281E+04
Th-232	3.700E-04	1.000E+03	4.025E-17	*1.097E+05	1.731E-17	*1.097E+05
U-234	1.140E+01	1.000E+03	3.459E-05	7.228E+05	2.189E-06	1.142E+07
U-235	6.340E-01	1.000E+03	3.370E-29	*2.161E+06	2.309E-30	*2.161E+06
U-238	1.870E+00	1.000E+03	3.322E-08	*3.361E+05	5.135E-10	*3.361E+05

*At specific activity limit

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Np-237	Np-237	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-233	Np-237	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-229	Np-237	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.469E-33	1.750E-32	2.042E-31	5.743E-30
Ra-228	Ra-228	1.000E+00	9.074E-27	8.054E-27	6.347E-27	2.756E-27	2.543E-28	6.071E-32	0.000E+00	0.000E+00
Ra-228	Th-232	1.000E+00	5.580E-28	1.591E-27	3.326E-27	7.014E-27	9.807E-27	1.116E-26	1.499E-26	4.210E-26
Ra-228	∑DOSE(j)		9.632E-27	9.645E-27	9.673E-27	9.771E-27	1.006E-26	1.116E-26	1.499E-26	4.210E-26
Th-228	Ra-228	1.000E+00	7.523E-22	1.833E-21	2.729E-21	1.914E-21	1.903E-22	4.434E-26	0.000E+00	0.000E+00
Th-228	Th-228	1.000E+00	4.080E-21	2.843E-21	1.380E-21	1.101E-22	8.029E-26	0.000E+00	0.000E+00	0.000E+00
Th-228	Th-232	1.000E+00	3.145E-23	1.932E-22	7.695E-22	2.892E-21	4.836E-21	5.436E-21	6.800E-21	1.489E-20
Th-228	∑DOSE(j)		4.863E-21	4.869E-21	4.879E-21	4.916E-21	5.026E-21	5.436E-21	6.800E-21	1.489E-20
Sr-90	Sr-90	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Tc-99	Tc-99	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.774E-02	2.386E-12
Th-230	Th-230	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	U-234	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	U-238	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	∑DOSE(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	Th-230	1.000E+00	1.299E-08	3.897E-08	9.091E-08	2.726E-07	7.903E-07	2.588E-06	7.605E-06	2.402E-05
Ra-226	U-234	1.000E+00	1.380E-10	9.660E-10	5.106E-09	4.566E-08	3.845E-07	4.159E-06	3.678E-05	3.943E-04
Ra-226	U-238	9.999E-01	1.604E-17	2.407E-16	2.807E-15	7.443E-14	1.819E-12	6.490E-11	1.722E-09	6.212E-08
Ra-226	∑DOSE(j)		1.313E-08	3.994E-08	9.602E-08	3.182E-07	1.175E-06	6.747E-06	4.439E-05	4.184E-04
Pb-210	Th-230	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.373E-32
Pb-210	U-234	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210	U-238	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210	∑DOSE(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.373E-32
Th-232	Th-232	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	U-234	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	U-238	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	∑DOSE(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-235	U-235	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pa-231	U-235	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ac-227	U-235	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.984E-30	2.137E-29
U-238	U-238	5.400E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-238	U-238	9.999E-01	1.701E-26	1.704E-26	1.709E-26	1.726E-26	1.776E-26	1.962E-26	2.609E-26	7.077E-26
U-238	∑DOSE(j)		1.701E-26	1.704E-26	1.709E-26	1.726E-26	1.776E-26	1.962E-26	2.609E-26	7.077E-26

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

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Np-237	Np-237	1.000E+00	4.600E-04	4.600E-04	4.600E-04	4.599E-04	4.597E-04	4.590E-04	4.570E-04	4.502E-04
U-233	Np-237	1.000E+00	0.000E+00	2.012E-09	6.034E-09	2.010E-08	6.023E-08	1.998E-07	5.915E-07	1.882E-06
Th-229	Np-237	1.000E+00	0.000E+00	9.498E-14	8.547E-13	9.491E-12	8.529E-11	9.426E-10	8.355E-09	8.802E-08
Ra-228	Ra-228	1.000E+00	3.700E-04	3.280E-04	2.577E-04	1.107E-04	9.922E-06	2.136E-09	7.115E-20	0.000E+00
Ra-228	Th-232	1.000E+00	0.000E+00	4.202E-05	1.123E-04	2.591E-04	3.598E-04	3.697E-04	3.696E-04	3.691E-04
Ra-228	∑S(j):		3.700E-04	3.700E-04	3.699E-04	3.698E-04	3.698E-04	3.697E-04	3.696E-04	3.691E-04
Th-228	Ra-228	1.000E+00	0.000E+00	1.056E-04	1.992E-04	1.512E-04	1.486E-05	3.201E-09	1.067E-19	0.000E+00
Th-228	Th-228	1.000E+00	3.700E-04	2.575E-04	1.248E-04	9.878E-06	7.041E-09	6.807E-20	0.000E+00	0.000E+00
Th-228	Th-232	1.000E+00	0.000E+00	6.898E-06	4.600E-05	2.088E-04	3.549E-04	3.697E-04	3.696E-04	3.691E-04
Th-228	∑S(j):		3.700E-04	3.700E-04	3.700E-04	3.699E-04	3.698E-04	3.697E-04	3.696E-04	3.691E-04
Sr-90	Sr-90	1.000E+00	9.190E-03	8.971E-03	8.547E-03	7.217E-03	4.452E-03	8.203E-04	6.535E-06	2.949E-13
Tc-99	Tc-99	1.000E+00	5.060E-02	4.898E-02	4.588E-02	3.652E-02	1.902E-02	1.940E-03	2.854E-06	3.481E-16
Th-230	Th-230	1.000E+00	3.220E-03	3.220E-03	3.220E-03	3.220E-03	3.219E-03	3.217E-03	3.210E-03	3.186E-03
Th-230	U-234	1.000E+00	0.000E+00	1.026E-04	3.078E-04	1.025E-03	3.071E-03	1.018E-02	3.002E-02	9.442E-02
Th-230	U-238	9.999E-01	0.000E+00	2.386E-11	2.147E-10	2.383E-09	2.140E-08	2.360E-07	2.079E-06	2.143E-05
Th-230	∑S(j):		3.220E-03	3.323E-03	3.528E-03	4.245E-03	6.290E-03	1.339E-02	3.323E-02	9.762E-02
Ra-226	Th-230	1.000E+00	0.000E+00	1.395E-06	4.182E-06	1.391E-05	4.152E-05	1.359E-04	3.874E-04	1.086E-03
Ra-226	U-234	1.000E+00	0.000E+00	2.222E-08	1.999E-07	2.218E-06	1.987E-05	2.173E-04	1.870E-03	1.782E-02
Ra-226	U-238	9.999E-01	0.000E+00	3.445E-15	9.297E-14	3.438E-12	9.245E-11	3.375E-09	8.741E-08	2.806E-06
Ra-226	∑S(j):		0.000E+00	1.417E-06	4.382E-06	1.613E-05	6.139E-05	3.532E-04	2.258E-03	1.891E-02
Pb-210	Th-230	1.000E+00	0.000E+00	2.145E-08	1.891E-07	1.956E-06	1.454E-05	9.453E-05	3.478E-04	1.057E-03
Pb-210	U-234	1.000E+00	0.000E+00	2.285E-10	6.073E-09	2.131E-07	4.974E-06	1.208E-04	1.519E-03	1.679E-02
Pb-210	U-238	9.999E-01	0.000E+00	2.660E-17	2.128E-15	2.515E-13	1.810E-11	1.572E-09	6.490E-08	2.563E-06
Pb-210	∑S(j):		0.000E+00	2.168E-08	1.952E-07	2.169E-06	1.952E-05	2.153E-04	1.866E-03	1.785E-02
Th-232	Th-232	1.000E+00	3.700E-04	3.700E-04	3.700E-04	3.700E-04	3.700E-04	3.699E-04	3.698E-04	3.694E-04
U-234	U-234	1.000E+00	1.140E+01	1.140E+01	1.139E+01	1.138E+01	1.135E+01	1.122E+01	1.087E+01	9.736E+00
U-234	U-238	9.999E-01	0.000E+00	5.300E-06	1.590E-05	5.293E-05	1.583E-04	5.219E-04	1.517E-03	4.534E-03
U-234	∑S(j):		1.140E+01	1.140E+01	1.139E+01	1.138E+01	1.135E+01	1.122E+01	1.087E+01	9.741E+00
U-235	U-235	1.000E+00	6.340E-01	6.339E-01	6.337E-01	6.330E-01	6.311E-01	6.243E-01	6.052E-01	5.430E-01
Pa-231	U-235	1.000E+00	0.000E+00	1.341E-05	4.023E-05	1.340E-04	4.007E-04	1.322E-03	3.856E-03	1.163E-02
Ac-227	U-235	1.000E+00	0.000E+00	2.112E-07	1.861E-06	1.922E-05	1.424E-04	9.220E-04	3.440E-03	1.123E-02
U-238	U-238	5.400E-05	1.010E-04	1.010E-04	1.009E-04	1.008E-04	1.005E-04	9.943E-05	9.639E-05	8.649E-05
U-238	U-238	9.999E-01	1.870E+00	1.870E+00	1.869E+00	1.867E+00	1.861E+00	1.841E+00	1.785E+00	1.602E+00
U-238	∑S(j):		1.870E+00	1.870E+00	1.869E+00	1.867E+00	1.861E+00	1.841E+00	1.785E+00	1.602E+00

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

RESCALC.EXE execution time = 20.16 seconds

Summary : EGL Vadose Zone Analysis
File : G:\SHARED\EVANDEUSEN\CUSTOMER FILES - IDAHO\WEC\USEI_EGL_FINAL_03_25_05.RAD

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Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ac-227 (Source: FGR 12)	4.951E-04	4.951E-04	DCF1(1)
A-1	Ac-228 (Source: FGR 12)	5.978E+00	5.978E+00	DCF1(2)
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(3)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(4)
A-1	Bi-211 (Source: FGR 12)	2.559E-01	2.559E-01	DCF1(5)
A-1	Bi-212 (Source: FGR 12)	1.171E+00	1.171E+00	DCF1(6)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(7)
A-1	Fr-223 (Source: FGR 12)	1.980E-01	1.980E-01	DCF1(8)
A-1	Pa-231 (Source: FGR 12)	1.906E-01	1.906E-01	DCF1(9)
A-1	Pa-234 (Source: FGR 12)	1.155E+01	1.155E+01	DCF1(10)
A-1	Pa-234m (Source: FGR 12)	8.967E-02	8.967E-02	DCF1(11)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(12)
A-1	Pb-211 (Source: FGR 12)	3.064E-01	3.064E-01	DCF1(13)
A-1	Pb-212 (Source: FGR 12)	7.043E-01	7.043E-01	DCF1(14)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(15)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(16)
A-1	Po-211 (Source: FGR 12)	4.764E-02	4.764E-02	DCF1(17)
A-1	Po-212 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(18)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(19)
A-1	Po-215 (Source: FGR 12)	1.016E-03	1.016E-03	DCF1(20)
A-1	Po-216 (Source: FGR 12)	1.042E-04	1.042E-04	DCF1(21)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(22)
A-1	Ra-223 (Source: FGR 12)	6.034E-01	6.034E-01	DCF1(23)
A-1	Ra-224 (Source: FGR 12)	5.119E-02	5.119E-02	DCF1(24)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(25)
A-1	Ra-228 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(26)
A-1	Rn-219 (Source: FGR 12)	3.083E-01	3.083E-01	DCF1(27)
A-1	Rn-220 (Source: FGR 12)	2.298E-03	2.298E-03	DCF1(28)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(29)
A-1	Tc-99 (Source: FGR 12)	1.255E-04	1.255E-04	DCF1(30)
A-1	Th-227 (Source: FGR 12)	5.212E-01	5.212E-01	DCF1(31)
A-1	Th-228 (Source: FGR 12)	7.940E-03	7.940E-03	DCF1(32)
A-1	Th-230 (Source: FGR 12)	1.209E-03	1.209E-03	DCF1(33)
A-1	Th-231 (Source: FGR 12)	3.643E-02	3.643E-02	DCF1(34)
A-1	Th-232 (Source: FGR 12)	5.212E-04	5.212E-04	DCF1(35)
A-1	Th-234 (Source: FGR 12)	2.410E-02	2.410E-02	DCF1(36)
A-1	Tl-207 (Source: FGR 12)	1.980E-02	1.980E-02	DCF1(37)
A-1	Tl-208 (Source: FGR 12)	2.298E+01	2.298E+01	DCF1(38)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(39)
A-1	U-234 (Source: FGR 12)	4.017E-04	4.017E-04	DCF1(40)
A-1	U-235 (Source: FGR 12)	7.211E-01	7.211E-01	DCF1(41)
A-1	U-238 (Source: FGR 12)	1.031E-04	1.031E-04	DCF1(42)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.724E+00	6.700E+00	DCF2(1)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(2)
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(3)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(4)
B-1	Ra-228+D	5.078E-03	4.770E-03	DCF2(5)

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
B-1	Tc-99	8.320E-06	8.320E-06	DCF2(6)
B-1	Th-228+D	3.454E-01	3.420E-01	DCF2(7)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(8)
B-1	Th-232	1.640E+00	1.640E+00	DCF2(9)
B-1	U-234	1.320E-01	1.320E-01	DCF2(10)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(11)
B-1	U-238	1.180E-01	1.180E-01	DCF2(12)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(13)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.410E-02	DCF3(1)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(2)
D-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(3)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(4)
D-1	Ra-228+D	1.442E-03	1.440E-03	DCF3(5)
D-1	Tc-99	1.460E-06	1.460E-06	DCF3(6)
D-1	Th-228+D	8.086E-04	3.960E-04	DCF3(7)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(8)
D-1	Th-232	2.730E-03	2.730E-03	DCF3(9)
D-1	U-234	2.830E-04	2.830E-04	DCF3(10)
D-1	U-235+D	2.673E-04	2.660E-04	DCF3(11)
D-1	U-238	2.550E-04	2.550E-04	DCF3(12)
D-1	U-238+D	2.687E-04	2.550E-04	DCF3(13)
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
D-34				
D-34	Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(2,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(2,3)
D-34				
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(3,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(3,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(3,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(4,3)
D-34				
D-34	Ra-228+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(5,1)
D-34	Ra-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,2)
D-34	Ra-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,3)
D-34				
D-34	Tc-99 , plant/soil concentration ratio, dimensionless	5.000E+00	5.000E+00	RTF(6,1)
D-34	Tc-99 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(6,2)
D-34	Tc-99 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(6,3)
D-34				

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Th-228+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(7,1)
D-34	Th-228+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(7,2)
D-34	Th-228+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(7,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(8,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(8,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(8,3)
D-34				
D-34	Th-232 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(9,1)
D-34	Th-232 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(9,2)
D-34	Th-232 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(9,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(10,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(10,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(10,3)
D-34				
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(11,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(11,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(11,3)
D-34				
D-34	U-238 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(12,1)
D-34	U-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(12,2)
D-34	U-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(12,3)
D-34				
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(13,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(13,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(13,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
D-5				
D-5	Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(2,1)
D-5	Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(2,2)
D-5				
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(3,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(4,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(4,2)
D-5				
D-5	Ra-228+D , fish	5.000E+01	5.000E+01	BIOFAC(5,1)
D-5	Ra-228+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(5,2)
D-5				
D-5	Tc-99 , fish	2.000E+01	2.000E+01	BIOFAC(6,1)
D-5	Tc-99 , crustacea and mollusks	5.000E+00	5.000E+00	BIOFAC(6,2)
D-5				
D-5	Th-228+D , fish	1.000E+02	1.000E+02	BIOFAC(7,1)
D-5	Th-228+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(7,2)
D-5				

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(8,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(8,2)
D-5				
D-5	Th-232 , fish	1.000E+02	1.000E+02	BIOFAC(9,1)
D-5	Th-232 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(9,2)
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(10,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(10,2)
D-5				
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(11,1)
D-5	U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(11,2)
D-5				
D-5	U-238 , fish	1.000E+01	1.000E+01	BIOFAC(12,1)
D-5	U-238 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(12,2)
D-5				
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(13,1)
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(13,2)

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

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	8.094E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	1.493E+01	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	5.820E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Ra-226	2.120E-02	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): Tc-99	5.730E-01	0.000E+00	---	S1(6)
R012	Initial principal radionuclide (pCi/g): Th-232	2.550E-02	0.000E+00	---	S1(9)
R012	Initial principal radionuclide (pCi/g): U-234	2.400E+00	0.000E+00	---	S1(10)
R012	Initial principal radionuclide (pCi/g): U-235	1.170E-01	0.000E+00	---	S1(11)
R012	Initial principal radionuclide (pCi/g): U-238	3.820E-01	0.000E+00	---	S1(12)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): Tc-99	not used	0.000E+00	---	W1(6)
R012	Concentration in groundwater (pCi/L): Th-232	not used	0.000E+00	---	W1(9)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(10)
R012	Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	---	W1(11)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(12)
R013	Cover depth (m)	3.600E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	1.780E+00	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	1.000E-04	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	5.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	7.500E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.840E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.300E-01	4.000E-01	---	TPSZ

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R014	Saturated zone effective porosity	4.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	4.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.500E+01	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	1.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.000E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.000E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	5	1	---	NS
R015	Unsat. zone 1, thickness (m)	1.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.630E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	5.200E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	1.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	4.500E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	1.100E+01	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.500E-02	1.000E+01	---	HCUZ(1)
R015	Unsat. zone 2, thickness (m)	4.600E+00	0.000E+00	---	H(2)
R015	Unsat. zone 2, soil density (g/cm**3)	1.690E+00	1.500E+00	---	DENSUZ(2)
R015	Unsat. zone 2, total porosity	3.400E-01	4.000E-01	---	TPUZ(2)
R015	Unsat. zone 2, effective porosity	3.300E-01	2.000E-01	---	EPUZ(2)
R015	Unsat. zone 2, field capacity	7.000E-02	2.000E-01	---	FCUZ(2)
R015	Unsat. zone 2, soil-specific b parameter	2.000E+00	5.300E+00	---	BUZ(2)
R015	Unsat. zone 2, hydraulic conductivity (m/yr)	2.200E+03	1.000E+01	---	HCUZ(2)
R015	Unsat. zone 3, thickness (m)	2.130E+01	0.000E+00	---	H(3)
R015	Unsat. zone 3, soil density (g/cm**3)	1.300E+00	1.500E+00	---	DENSUZ(3)
R015	Unsat. zone 3, total porosity	5.200E-01	4.000E-01	---	TPUZ(3)
R015	Unsat. zone 3, effective porosity	4.000E-01	2.000E-01	---	EPUZ(3)
R015	Unsat. zone 3, field capacity	4.900E-01	2.000E-01	---	FCUZ(3)
R015	Unsat. zone 3, soil-specific b parameter	3.000E+00	5.300E+00	---	BUZ(3)
R015	Unsat. zone 3, hydraulic conductivity (m/yr)	9.000E+02	1.000E+01	---	HCUZ(3)
R015	Unsat. zone 4, thickness (m)	1.680E+01	0.000E+00	---	H(4)
R015	Unsat. zone 4, soil density (g/cm**3)	1.310E+00	1.500E+00	---	DENSUZ(4)
R015	Unsat. zone 4, total porosity	4.900E-01	4.000E-01	---	TPUZ(4)
R015	Unsat. zone 4, effective porosity	4.300E-01	2.000E-01	---	EPUZ(4)
R015	Unsat. zone 4, field capacity	4.800E-01	2.000E-01	---	FCUZ(4)
R015	Unsat. zone 4, soil-specific b parameter	5.000E+00	5.300E+00	---	BUZ(4)
R015	Unsat. zone 4, hydraulic conductivity (m/yr)	6.000E+01	1.000E+01	---	HCUZ(4)
R015	Unsat. zone 5, thickness (m)	1.220E+01	0.000E+00	---	H(5)
R015	Unsat. zone 5, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(5)
R015	Unsat. zone 5, total porosity	5.200E-01	4.000E-01	---	TPUZ(5)
R015	Unsat. zone 5, effective porosity	1.500E-01	2.000E-01	---	EPUZ(5)
R015	Unsat. zone 5, field capacity	3.200E-01	2.000E-01	---	FCUZ(5)
R015	Unsat. zone 5, soil-specific b parameter	8.000E+00	5.300E+00	---	BUZ(5)
R015	Unsat. zone 5, hydraulic conductivity (m/yr)	1.000E-01	1.000E+01	---	HCUZ(5)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(4,1)
R016	Unsaturated zone 2 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(4,2)
R016	Unsaturated zone 3 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(4,3)
R016	Unsaturated zone 4 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(4,4)
R016	Unsaturated zone 5 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(4,5)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.524E-05	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for Tc-99				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(6,1)
R016	Unsaturated zone 2 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(6,2)
R016	Unsaturated zone 3 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(6,3)
R016	Unsaturated zone 4 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(6,4)
R016	Unsaturated zone 5 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(6,5)
R016	Saturated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.319E-02	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for Th-232				
R016	Contaminated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCC(9)
R016	Unsaturated zone 1 (cm**3/g)	5.800E+03	6.000E+04	---	DCNUCU(9,1)
R016	Unsaturated zone 2 (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCU(9,2)
R016	Unsaturated zone 3 (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCU(9,3)
R016	Unsaturated zone 4 (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCU(9,4)
R016	Unsaturated zone 5 (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCU(9,5)
R016	Saturated zone (cm**3/g)	3.200E+03	6.000E+04	---	DCNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.211E-06	ALEACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCC(10)
R016	Unsaturated zone 1 (cm**3/g)	1.600E+03	5.000E+01	---	DCNUCU(10,1)
R016	Unsaturated zone 2 (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCU(10,2)
R016	Unsaturated zone 3 (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCU(10,3)
R016	Unsaturated zone 4 (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCU(10,4)
R016	Unsaturated zone 5 (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCU(10,5)
R016	Saturated zone (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCS(10)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.102E-04	ALEACH(10)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(10)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for U-235				
R016	Contaminated zone (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCC(11)
R016	Unsaturated zone 1 (cm**3/g)	1.600E+03	5.000E+01	---	DCNUCU(11,1)
R016	Unsaturated zone 2 (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCU(11,2)
R016	Unsaturated zone 3 (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCU(11,3)
R016	Unsaturated zone 4 (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCU(11,4)
R016	Unsaturated zone 5 (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCU(11,5)
R016	Saturated zone (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCS(11)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.102E-04	ALEACH(11)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(11)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCC(12)
R016	Unsaturated zone 1 (cm**3/g)	1.600E+03	5.000E+01	---	DCNUCU(12,1)
R016	Unsaturated zone 2 (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCU(12,2)
R016	Unsaturated zone 3 (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCU(12,3)
R016	Unsaturated zone 4 (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCU(12,4)
R016	Unsaturated zone 5 (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCU(12,5)
R016	Saturated zone (cm**3/g)	3.500E+01	5.000E+01	---	DCNUCS(12)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.102E-04	ALEACH(12)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(12)
R016	Distribution coefficients for daughter Ac-227				
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,1)
R016	Unsaturated zone 2 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,2)
R016	Unsaturated zone 3 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,3)
R016	Unsaturated zone 4 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,4)
R016	Unsaturated zone 5 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,5)
R016	Saturated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.922E-04	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for daughter Pa-231				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(2,1)
R016	Unsaturated zone 2 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(2,2)
R016	Unsaturated zone 3 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(2,3)
R016	Unsaturated zone 4 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(2,4)
R016	Unsaturated zone 5 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(2,5)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.726E-05	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(3,1)
R016	Unsaturated zone 2 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(3,2)
R016	Unsaturated zone 3 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(3,3)
R016	Unsaturated zone 4 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(3,4)
R016	Unsaturated zone 5 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(3,5)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.869E-05	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for daughter Ra-228				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(5,1)
R016	Unsaturated zone 2 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(5,2)
R016	Unsaturated zone 3 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(5,3)
R016	Unsaturated zone 4 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(5,4)
R016	Unsaturated zone 5 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(5,5)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	5.524E-05	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for daughter Th-228				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(7,1)
R016	Unsaturated zone 2 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(7,2)
R016	Unsaturated zone 3 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(7,3)
R016	Unsaturated zone 4 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(7,4)
R016	Unsaturated zone 5 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(7,5)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.460E-08	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for daughter Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(8,1)
R016	Unsaturated zone 2 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(8,2)
R016	Unsaturated zone 3 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(8,3)
R016	Unsaturated zone 4 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(8,4)
R016	Unsaturated zone 5 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(8,5)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.460E-08	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	5.000E-01	5.000E-01	---	FIND

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fraction of time spent outdoors (on site)	2.500E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	1.600E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	1.400E+01	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	9.200E+01	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	6.300E+01	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	5.100E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	1.000E+00	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	1.000E+00	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.500E+00	FPLANT
R018	Contamination fraction of meat	-1	-1	0.100E+01	FMEAT
R018	Contamination fraction of milk	-1	-1	0.100E+01	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	1.000E+00	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.100E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.000E-02	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	1.000E+00	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	2.000E+01	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	1.500E-01	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	2.400E+00	2.400E+00	---	DENSFL

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R021	Total porosity of the cover material	4.130E-01	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	1.000E-01	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	2.650E-02	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	3.000E-02	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	7.233E-07	2.000E-06	---	DIFCV
R021	in foundation material	3.000E-07	3.000E-07	---	DIFFL
R021	in contaminated zone soil	3.000E-07	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	2.000E+00	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	1.500E+00	5.000E-01	---	REXG
R021	Height of the building (room) (m)	2.500E+00	2.500E+00	---	HRM
R021	Building interior area factor	1.000E+00	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	0.000E+00	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	2.500E-01	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	1.500E-01	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	512	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	1	---	---	KYMAX

Summary of Pathway Selections

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

Summary : EGL Vadose Zone Analysis
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Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	80937.20 square meters	Ra-226	2.120E-02
Thickness:	14.93 meters	Tc-99	5.730E-01
Cover Depth:	3.60 meters	Th-232	2.550E-02
		U-234	2.400E+00
		U-235	1.170E-01
		U-238	3.820E-01

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

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	4.104E-04	4.103E-04	4.100E-04	4.091E-04	4.066E-04	3.985E-04	5.648E-01	3.872E-04
M(t):	1.642E-05	1.641E-05	1.640E-05	1.636E-05	1.626E-05	1.594E-05	2.259E-02	1.549E-05

Maximum TDOSE(t): 1.919E+00 mrem/yr at t = 246.7 ± 0.5 years

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 2.467E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.885E-22	0.0000	0.000E+00	0.0000	3.794E-04	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	4.417E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	2.729E-24	0.0000	0.000E+00	0.0000	5.493E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	2.730E-31	0.0000	0.000E+00	0.0000	0.000E+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	5.097E-27	0.0000	0.000E+00	0.0000	2.054E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	4.419E-19	0.0000	0.000E+00	0.0000	3.849E-04	0.0002	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Summary : EGL Vadose Zone 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 = 2.467E+02 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.794E-04	0.0002
Tc-99	1.561E+00	0.8136	0.000E+00	0.0000	0.000E+00	0.0000	2.763E-01	0.1440	3.690E-03	0.0019	7.727E-02	0.0403	1.918E+00	0.9998
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.417E-19	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.493E-06	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	2.730E-31	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	2.054E-10	0.0000
Total	1.561E+00	0.8136	0.000E+00	0.0000	0.000E+00	0.0000	2.763E-01	0.1440	3.690E-03	0.0019	7.727E-02	0.0403	1.919E+00	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.529E-22	0.0000	0.000E+00	0.0000	4.104E-04	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	2.168E-21	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	1.126E-29	0.0000	0.000E+00	0.0000	3.020E-11	0.0000	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	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	3.476E-27	0.0000	0.000E+00	0.0000	3.407E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	2.321E-21	0.0000	0.000E+00	0.0000	4.104E-04	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.104E-04	1.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.168E-21	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.020E-11	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	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	3.407E-18	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.104E-04	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.531E-22	0.0000	0.000E+00	0.0000	4.103E-04	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	1.331E-20	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	7.889E-29	0.0000	0.000E+00	0.0000	2.114E-10	0.0000	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	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	3.481E-27	0.0000	0.000E+00	0.0000	5.110E-17	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.347E-20	0.0000	0.000E+00	0.0000	4.103E-04	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.103E-04	1.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.331E-20	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.114E-10	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	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	5.110E-17	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.103E-04	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.533E-22	0.0000	0.000E+00	0.0000	4.100E-04	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	5.303E-20	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	4.179E-28	0.0000	0.000E+00	0.0000	1.117E-09	0.0000	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	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	3.491E-27	0.0000	0.000E+00	0.0000	5.962E-16	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	5.318E-20	0.0000	0.000E+00	0.0000	4.100E-04	1.0000	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 = 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.100E-04	1.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.303E-20	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.117E-09	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	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	5.962E-16	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.100E-04	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.542E-22	0.0000	0.000E+00	0.0000	4.091E-04	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	1.994E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	3.768E-27	0.0000	0.000E+00	0.0000	9.993E-09	0.0000	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	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	3.527E-27	0.0000	0.000E+00	0.0000	1.581E-14	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.995E-19	0.0000	0.000E+00	0.0000	4.091E-04	1.0000	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+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.091E-04	1.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.994E-19	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.993E-09	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	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	1.581E-14	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.091E-04	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.569E-22	0.0000	0.000E+00	0.0000	4.065E-04	0.9998	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	3.333E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	3.250E-26	0.0000	0.000E+00	0.0000	8.421E-08	0.0002	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	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	3.633E-27	0.0000	0.000E+00	0.0000	3.866E-13	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	3.335E-19	0.0000	0.000E+00	0.0000	4.066E-04	1.0000	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 = 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.065E-04	0.9998
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.333E-19	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.421E-08	0.0002
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	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	3.866E-13	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.066E-04	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.665E-22	0.0000	0.000E+00	0.0000	3.976E-04	0.9977	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	3.747E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	3.819E-25	0.0000	0.000E+00	0.0000	9.122E-07	0.0023	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	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	4.032E-27	0.0000	0.000E+00	0.0000	1.382E-11	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	3.749E-19	0.0000	0.000E+00	0.0000	3.985E-04	1.0000	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 Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.976E-04	0.9977
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.747E-19	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.122E-07	0.0023
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	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	1.382E-11	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.985E-04	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	1.972E-22	0.0000	0.000E+00	0.0000	3.730E-04	0.0007	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	4.688E-19	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	4.283E-24	0.0000	0.000E+00	0.0000	8.103E-06	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	3.708E-31	0.0000	0.000E+00	0.0000	0.000E+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	5.597E-27	0.0000	0.000E+00	0.0000	3.688E-10	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	4.690E-19	0.0000	0.000E+00	0.0000	3.811E-04	0.0007	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 = 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.730E-04	0.0007
Tc-99	4.592E-01	0.8131	0.000E+00	0.0000	0.000E+00	0.0000	8.134E-02	0.1440	1.090E-03	0.0019	2.276E-02	0.0403	5.644E-01	0.9993
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.688E-19	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.103E-06	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	3.708E-31	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	3.688E-10	0.0000
Total	4.592E-01	0.8131	0.000E+00	0.0000	0.000E+00	0.0000	8.134E-02	0.1440	1.090E-03	0.0019	2.276E-02	0.0403	5.648E-01	1.0000

*Sum of all water independent and dependent pathways.

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

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	3.566E-22	0.0000	0.000E+00	0.0000	2.988E-04	0.7718	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Tc-99	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Th-232	1.027E-18	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-234	1.053E-22	0.0000	0.000E+00	0.0000	8.827E-05	0.2280	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	4.101E-30	0.0000	0.000E+00	0.0000	0.000E+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	3.131E-26	0.0000	0.000E+00	0.0000	1.357E-08	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.027E-18	0.0000	0.000E+00	0.0000	3.871E-04	0.9999	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

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

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.988E-04	0.7718
Tc-99	4.367E-08	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	7.734E-09	0.0000	1.036E-10	0.0000	2.164E-09	0.0000	5.367E-08	0.0001
Th-232	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.027E-18	0.0000
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.827E-05	0.2280
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	4.101E-30	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.357E-08	0.0000
Total	4.367E-08	0.0001	0.000E+00	0.0000	0.000E+00	0.0000	7.734E-09	0.0000	1.036E-10	0.0000	2.164E-09	0.0000	3.872E-04	1.0000

*Sum of all water independent and dependent pathways.

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

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226+D	Ra-226+D	1.000E+00	1.936E-02	1.935E-02	1.934E-02	1.930E-02	1.918E-02	1.875E-02	1.759E-02	1.410E-02
Ra-226+D	Pb-210+D	1.000E+00	4.023E-32	1.192E-31	2.706E-31	7.378E-31	1.666E-30	2.829E-30	3.705E-30	8.079E-30
Ra-226+D	∑DSR(j)		1.936E-02	1.935E-02	1.934E-02	1.930E-02	1.918E-02	1.875E-02	1.759E-02	1.410E-02
Tc-99	Tc-99	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.850E-01	9.366E-08
Th-232	Th-232	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-232	Ra-228+D	1.000E+00	1.508E-24	4.299E-24	8.989E-24	1.896E-23	2.651E-23	3.016E-23	4.052E-23	1.139E-22
Th-232	Th-228+D	1.000E+00	8.501E-20	5.220E-19	2.080E-18	7.818E-18	1.307E-17	1.470E-17	1.839E-17	4.027E-17
Th-232	∑DSR(j)		8.501E-20	5.220E-19	2.080E-18	7.818E-18	1.307E-17	1.470E-17	1.839E-17	4.027E-17
U-234	U-234	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	Th-230	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	Ra-226+D	1.000E+00	1.258E-11	8.809E-11	4.656E-10	4.164E-09	3.509E-08	3.801E-07	3.376E-06	3.678E-05
U-234	Pb-210+D	1.000E+00	1.313E-41	1.959E-40	2.259E-39	5.742E-38	1.255E-36	3.301E-35	5.692E-34	1.957E-32
U-234	∑DSR(j)		1.258E-11	8.809E-11	4.656E-10	4.164E-09	3.509E-08	3.801E-07	3.376E-06	3.678E-05
U-235+D	U-235+D	1.000E+00	1.591E-39	1.595E-39	1.602E-39	1.629E-39	1.707E-39	2.012E-39	3.217E-39	1.662E-38
U-235+D	Pa-231	1.000E+00	5.881E-39	1.767E-38	4.140E-38	1.259E-37	3.804E-37	1.438E-36	6.362E-36	8.356E-35
U-235+D	Ac-227+D	1.000E+00	3.844E-35	2.670E-34	1.387E-33	1.168E-32	8.407E-32	6.019E-31	3.169E-30	3.505E-29
U-235+D	∑DSR(j)		3.844E-35	2.670E-34	1.387E-33	1.168E-32	8.407E-32	6.019E-31	3.169E-30	3.505E-29
U-238	U-238	5.400E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-238+D	U-238+D	9.999E-01	9.099E-27	9.112E-27	9.139E-27	9.234E-27	9.509E-27	1.054E-26	1.414E-26	3.958E-26
U-238+D	U-234	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-238+D	Th-230	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-238+D	Ra-226+D	9.999E-01	8.918E-18	1.338E-16	1.561E-15	4.138E-14	1.012E-12	3.618E-11	9.653E-10	3.552E-08
U-238+D	Pb-210+D	9.999E-01	0.000E+00	0.000E+00	5.605E-45	4.358E-43	2.833E-41	2.635E-39	1.488E-37	1.832E-35
U-238+D	∑DSR(j)		8.918E-18	1.338E-16	1.561E-15	4.138E-14	1.012E-12	3.618E-11	9.653E-10	3.552E-08

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

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

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	1.291E+03	1.292E+03	1.293E+03	1.296E+03	1.304E+03	1.333E+03	1.421E+03	1.774E+03
Tc-99	*1.697E+10	*1.697E+10	*1.697E+10	*1.697E+10	*1.697E+10	*1.697E+10	2.538E+01	2.669E+08
Th-232	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05	*1.097E+05
U-234	*6.247E+09	*6.247E+09	*6.247E+09	6.004E+09	7.125E+08	6.577E+07	7.404E+06	6.798E+05
U-235	*2.161E+06	*2.161E+06	*2.161E+06	*2.161E+06	*2.161E+06	*2.161E+06	*2.161E+06	*2.161E+06
U-238	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05

*At specific activity limit

Summary : EGL Vadose Zone Analysis
File : G:\SHARED\EVANDEUSEN\CUSTOMER FILES - IDAHO\WEC\USEI_EGL_FINAL_03_25_05.RAD

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 246.7 ± 0.5 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ra-226	2.120E-02	0.000E+00	1.936E-02	1.291E+03	1.790E-02	1.397E+03
Tc-99	5.730E-01	246.7 ± 0.5	3.348E+00	7.468E+00	3.348E+00	7.468E+00
Th-232	2.550E-02	1.000E+03	4.027E-17	*1.097E+05	1.732E-17	*1.097E+05
U-234	2.400E+00	1.000E+03	3.678E-05	6.798E+05	2.289E-06	1.092E+07
U-235	1.170E-01	1.000E+03	3.505E-29	*2.161E+06	2.334E-30	*2.161E+06
U-238	3.820E-01	1.000E+03	3.552E-08	*3.361E+05	5.376E-10	*3.361E+05

*At specific activity limit

Summary : EGL Vadose Zone Analysis
File : G:\SHARED\EVANDEUSEN\CUSTOMER FILES - IDAHO\WEC\USEI_EGL_FINAL_03_25_05.RAD

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

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	4.104E-04	4.103E-04	4.100E-04	4.091E-04	4.065E-04	3.976E-04	3.730E-04	2.988E-04
Ra-226	U-234	1.000E+00	3.020E-11	2.114E-10	1.117E-09	9.993E-09	8.421E-08	9.122E-07	8.103E-06	8.827E-05
Ra-226	U-238	9.999E-01	3.407E-18	5.110E-17	5.962E-16	1.581E-14	3.866E-13	1.382E-11	3.688E-10	1.357E-08
Ra-226	∑DOSE(j)		4.104E-04	4.103E-04	4.100E-04	4.091E-04	4.066E-04	3.985E-04	3.811E-04	3.871E-04
Pb-210	Ra-226	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.531E-32	5.998E-32	7.855E-32	1.713E-31
Pb-210	U-234	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210	U-238	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210	∑DOSE(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.531E-32	5.998E-32	7.855E-32	1.713E-31
Tc-99	Tc-99	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.644E-01	5.367E-08
Th-232	Th-232	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-228	Th-232	1.000E+00	3.846E-26	1.096E-25	2.292E-25	4.835E-25	6.760E-25	7.691E-25	1.033E-24	2.904E-24
Th-228	Th-232	1.000E+00	2.168E-21	1.331E-20	5.303E-20	1.994E-19	3.333E-19	3.747E-19	4.688E-19	1.027E-18
U-234	U-234	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	U-238	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	∑DOSE(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	U-234	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	U-238	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	∑DOSE(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-235	U-235	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pa-231	U-235	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ac-227	U-235	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.708E-31	4.101E-30
U-238	U-238	5.400E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-238	U-238	9.999E-01	3.476E-27	3.481E-27	3.491E-27	3.527E-27	3.633E-27	4.026E-27	5.402E-27	1.512E-26
U-238	∑DOSE(j)		3.476E-27	3.481E-27	3.491E-27	3.527E-27	3.633E-27	4.026E-27	5.402E-27	1.512E-26

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

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	Ra-226	1.000E+00	2.120E-02	2.119E-02	2.117E-02	2.110E-02	2.089E-02	2.019E-02	1.831E-02	1.301E-02
Ra-226	U-234	1.000E+00	0.000E+00	4.679E-09	4.209E-08	4.670E-07	4.186E-06	4.586E-05	3.964E-04	3.838E-03
Ra-226	U-238	9.999E-01	0.000E+00	7.037E-16	1.899E-14	7.026E-13	1.890E-11	6.913E-10	1.801E-08	5.897E-07
Ra-226	∑S(j):		2.120E-02	2.119E-02	2.117E-02	2.110E-02	2.090E-02	2.024E-02	1.871E-02	1.685E-02
Pb-210	Ra-226	1.000E+00	0.000E+00	6.486E-04	1.886E-03	5.648E-03	1.274E-02	1.953E-02	1.858E-02	1.320E-02
Pb-210	U-234	1.000E+00	0.000E+00	4.810E-11	1.279E-09	4.487E-08	1.048E-06	2.549E-05	3.218E-04	3.616E-03
Pb-210	U-238	9.999E-01	0.000E+00	5.435E-18	4.347E-16	5.138E-14	3.700E-12	3.221E-10	1.337E-08	5.385E-07
Pb-210	∑S(j):		0.000E+00	6.486E-04	1.886E-03	5.648E-03	1.274E-02	1.955E-02	1.890E-02	1.682E-02
Tc-99	Tc-99	1.000E+00	5.730E-01	5.599E-01	5.345E-01	4.544E-01	2.857E-01	5.633E-02	5.443E-04	4.828E-11
Th-232	Th-232	1.000E+00	2.550E-02	2.550E-02	2.550E-02	2.550E-02	2.550E-02	2.550E-02	2.549E-02	2.547E-02
Ra-228	Th-232	1.000E+00	0.000E+00	2.896E-03	7.738E-03	1.786E-02	2.480E-02	2.549E-02	2.548E-02	2.546E-02
Th-228	Th-232	1.000E+00	0.000E+00	4.754E-04	3.170E-03	1.439E-02	2.446E-02	2.549E-02	2.548E-02	2.546E-02
U-234	U-234	1.000E+00	2.400E+00	2.400E+00	2.399E+00	2.397E+00	2.392E+00	2.373E+00	2.320E+00	2.143E+00
U-234	U-238	9.999E-01	0.000E+00	1.083E-06	3.248E-06	1.082E-05	3.238E-05	1.071E-04	3.142E-04	9.685E-04
U-234	∑S(j):		2.400E+00	2.400E+00	2.399E+00	2.397E+00	2.392E+00	2.373E+00	2.320E+00	2.144E+00
Th-230	U-234	1.000E+00	0.000E+00	2.160E-05	6.480E-05	2.159E-04	6.470E-04	2.147E-03	6.364E-03	2.033E-02
Th-230	U-238	9.999E-01	0.000E+00	4.874E-12	4.386E-11	4.870E-10	4.376E-09	4.836E-08	4.286E-07	4.512E-06
Th-230	∑S(j):		0.000E+00	2.160E-05	6.480E-05	2.159E-04	6.470E-04	2.147E-03	6.364E-03	2.034E-02
U-235	U-235	1.000E+00	1.170E-01	1.170E-01	1.170E-01	1.169E-01	1.166E-01	1.157E-01	1.132E-01	1.048E-01
Pa-231	U-235	1.000E+00	0.000E+00	2.475E-06	7.424E-06	2.473E-05	7.403E-05	2.450E-04	7.198E-04	2.230E-03
Ac-227	U-235	1.000E+00	0.000E+00	3.898E-08	3.435E-07	3.549E-06	2.632E-05	1.709E-04	6.429E-04	2.155E-03
U-238	U-238	5.400E-05	2.063E-05	2.063E-05	2.062E-05	2.061E-05	2.056E-05	2.040E-05	1.996E-05	1.848E-05
U-238	U-238	9.999E-01	3.820E-01	3.819E-01	3.819E-01	3.816E-01	3.807E-01	3.778E-01	3.696E-01	3.421E-01
U-238	∑S(j):		3.820E-01	3.820E-01	3.819E-01	3.816E-01	3.807E-01	3.778E-01	3.696E-01	3.421E-01

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

RESCALC.EXE execution time = 15.82 seconds

Attachment 3

Dose to Inadvertent Intruder

Construction Scenario
Dose to Inadvertent Intruder

Dose Calculation per NUREG-0782 G-57											
	Isotope	$PDCF_3$ (Sv/Bq)	$PDCF_3$ (mrem/μCi)	Half Life (years)	C_w (Ci/m^3)	f_o	f_d	f_w	T_{sa}	Exposure Factor	Dose (mrem/year)
Air	Th-230	7.07E-05	2.62E+05	7.538E+04	5.60E-07	1.000	0.5	1	2.84E-10	0.057	1.19E-12
	Np-237	1.46E-04	5.40E+05	2.144E+06	8.00E-08	1.000	0.5	1	2.84E-10	0.057	3.50E-13
	Tc-99	2.25E-09	8.33E+00	2.110E+05	8.80E-06	1.000	0.5	1	2.84E-10	0.057	5.93E-16
	Th-232	3.11E-04	1.15E+06	1.405E+10	6.40E-08	1.000	0.5	1	2.84E-10	0.057	5.96E-13
	Ra-228	1.29E-06	4.77E+03	5.750E+00	6.40E-08	1.000	0.5	1	2.84E-10	0.057	2.47E-15
	Th-228	9.23E-05	3.42E+05	1.912E+00	6.40E-08	1.000	0.5	1	2.84E-10	0.057	1.77E-13
	U-234	3.58E-05	1.32E+05	2.455E+05	1.99E-03	1.000	0.5	1	2.84E-10	0.057	2.14E-09
	U-235	3.32E-05	1.23E+05	7.038E+08	1.10E-04	1.000	0.5	1	2.84E-10	0.057	1.10E-10
	U-238	3.20E-05	1.18E+05	4.468E+09	3.25E-04	1.000	0.5	1	2.84E-10	0.057	3.11E-10
	Sr-90	3.51E-07	4.77E+03	2.890E+01	1.60E-06	1.000	0.5	1	2.84E-10	0.057	6.18E-14
	Isotope	$PDCF_5$ ($Sv\ Bq^{-1}s^{-1}m^{-3}$)	$PDCF_5$ ($mrem\ \mu Ci^{-1}y^{-1}cm^{-3}$)	Half Life (years)	C_w (Ci/m^3)	f_o	f_d	f_w	f_s	% of year for Exposure	Dose (mrem/year)
Direct Gamma	Th-230	6.47E-21	7.56E+02	7.538E+04	5.60E-07	1.000	0.5	1	5.70E-02	N/A	1.21E-05
	Np-237	4.17E-19	4.87E+04	2.144E+06	8.00E-08	1.000	0.5	1	5.70E-02		1.11E-04
	Tc-99	6.72E-22	7.85E+01	2.110E+05	8.80E-06	1.000	0.5	1	5.70E-02		1.97E-05
	Th-232	2.79E-21	3.26E+02	1.405E+10	6.40E-08	1.000	0.5	1	5.70E-02		5.94E-07
	Ra-228	0.00E+00	0.00E+00	5.750E+00	6.40E-08	1.000	0.5	1	5.70E-02		0.00E+00
	Th-228	4.25E-20	4.96E+03	1.912E+00	6.40E-08	1.000	0.5	1	5.70E-02		9.05E-06
	U-234	2.15E-21	2.51E+02	2.455E+05	1.99E-03	1.000	0.5	1	5.70E-02		1.43E-02
	U-235	3.86E-18	4.51E+05	7.038E+08	1.10E-04	1.000	0.5	1	5.70E-02		1.42E+00
	U-238	5.52E-22	6.45E+01	4.468E+09	3.25E-04	1.000	0.5	1	5.70E-02		5.97E-04
	Sr-90	3.77E-21	4.40E+02	2.890E+01	1.60E-06	1.000	0.5	1	5.70E-02		2.01E-05
Total											**1.43E+00**

The total dose* to the inadvertent intruder is estimated using the following equation:

$$H = \sum_{n} (f_o f_d f_w f_s)_{air} C_w\ PDCF_3 + \sum_{n} (f_o f_d f_w f_s)_{DirectGamma}\ C_w\ PDCF_5$$

*contribution from progeny not included

Explanation of calculation and terms:

$PDCF_3$	Radionuclide Specific Pathway Dose Conversion Factor for Inhalation Source: FGR 11, Table 2.1 (Exposure to Dose Conversion Factors for Inhalation), *Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion and Ingestion.* Slowest transport class used.
$PDCF_5$	Radionuclide Specific Pathway Dose Conversion Factor for direct Gamma Exposure Source: FGR 12, Table III.7 (Dose Coefficients for Exposure to Soil Contaminated to an Infinite Depth) *External Exposure to Radionuclides in Air, Water and Soil.*
C_w	Radionuclide Concentration in Waste
f_o	Activity fraction remaining after decay $f_o = e^{-\lambda t}$ where t is the the time period between the end of active disposal and the initiation of the scenario; the site closure plan for USEI ensures monthy monitoring and maintenance of sinange for 30 years after closure.
f_d	Dillution factor due to particular disposal practives 0.5 for random, 0.75 for stacked, or 0.5 for decontainerized - much of the waste dosposed of at USEI is decontainerized soil.
f_w	Waste form and Package Factor - No credit is taken for waste form or solidification
f_s	Site Selection Factor $f_s = T_{sa} \times ExposureFactor$ $T_{sa} = 2.53\times10^{-10} \times (10/v) \times (s/30) \times (50/PE)^2 = 2.81\times10^{-10}$ where: v = 4.47 m/s (average annual wind speed at Boise, ID Airport) s = 50% (default silt content of soil) PE = 91 (default precipitation-evaporation index)

Attachment 4

NSA-TR-10-01, Revision 0, dated February 2010, "Nuclear Criticality Safety Assessment of the US Ecology Idaho (USEI) Site for the Land Fill Disposal of Building Debris Decommissioning Waste from the Hematite Site"

Nuclear Criticality Safety Assessment of the US Ecology Idaho (USEI) Site for the Land Fill Disposal of Building Debris Decommissioning Waste from the Hematite Site

Revision 0

February 2010

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NuclearSafety Associates

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Revision History

Rev. #	By	Significant Changes
0	B. Matthews & C. Henkel	Original issue

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Glossary of Acronyms, Abbreviations, and Terms

Acronym/Term	Definition
'	Foot (12")
"	Inch (2.54 cm)
AEC	Atomic Energy Commission
ALARA	As Low As Reasonably Achievable
AESOP	Work Order Supplement and associated electronic database
Bq	One radioactive disintegration per second
cc	Cubic centimeter
CFR	Code of Federal Regulations
Ci	Curie (equivalent to 3.7×10^{10} Bq)
cm	Centimeter
CSC	Criticality Safety Control
DCGL	Derived Concentration Guideline Levels
D&D	Decontamination and Decommissioning
DinD	Defense-in-Depth
Fissile Material	Material containing fissile nuclides (e.g., ^{235}U) in a quantity/concentration sufficient to require NCS controls/oversight.
g	Gram
GUNFC	Gulf United Nuclear Fuels Corporation
HDP	Hematite Decommissioning Project
HEU	Highly Enriched Uranium
kg	Kilogram
L	Liter
LLW	Low Level Waste
μ	Micro (1.0×10^{-6})
m	Meter
mg	Milligram
mil	One thousandth
NCS	Nuclear Criticality Safety
NCSA	Nuclear Criticality Safety Assessment
NCS Exempt Material	Material containing an insufficient quantity/concentration of fissile nuclides (e.g., ^{235}U) to require NCS controls/oversight
p	Pico (1.0×10^{-12})
SNM	Special Nuclear Material - material containing fissile nuclides (e.g., ^{235}U)
SSC	System, Structure, and Component
U	Uranium
UNC	United Nuclear Corporation
vol. %	Percentage by volume
wt. %	Percentage by weight

1.0 INTRODUCTION

This Nuclear Criticality Safety Assessment (NCSA) is provided to demonstrate that a criticality accident is not credible at the US Ecology Idaho (USEI) site due to the burial of building demolition debris received from the Hematite site. The USEI activities include the receipt and burial of the building debris decommissioning waste generated during demolition of the former process buildings and other ancillary buildings at the Hematite site, excluding their underlying slabs and foundations. This NCSA supplements a similar assessment documented in Reference 10, which addressed consignment of exhumed buried process wastes and contaminated soils to the USEI site for disposal.

USEI is currently receiving uranium that is not enriched, whereas the building demolition debris shipped from the Hematite plant will involve low and possibly high enriched uranium. Therefore, the purpose of this NCSA is to document the evaluation of the risk of a criticality incident at the USEI site based on the process implemented at the Hematite site, the very low concentrations of uranium associated with the building demolition debris, and the disposal activities at the USEI Site.

This NCSA is organized as follows:

- **Section 1** introduces the building demolition and debris shipping activities at the Hematite site as well as the building demolition debris decommissioning waste receipt and disposal activities at the USEI site.
- **Section 2** provides the risk assessment of the building demolition debris decommissioning waste burial operations outlined in Section 1.
- **Section 3** summarizes the important facility design features, equipment and procedural requirements identified in the criticality safety assessment provided in Section 2.
- **Section 4** details the conclusions of the NCSA for burial of Hematite building demolition debris decommissioning waste at the USEI site.

1.1 Description of the Hematite Site

The Westinghouse Hematite site, located near Festus, MO, is a former nuclear fuel cycle facility that is currently undergoing decommissioning. The Hematite site consists of approximately 228 acres, although operations at the site were confined to the "central tract" area which spans approximately 19 acres. The remaining 209 acres, which is not believed to be radiologically contaminated, is predominantly pasture or woodland.

The central tract area is bounded by State Road P to the north, the northeast site creek to the east, the union-pacific railroad tracks to the south, and the site creek/pond to the west. The central tract area currently includes former process buildings, facility administrative buildings, a documented 10CFR20.304 burial area, two evaporation ponds, a site pond, storm drains, sewage lines with a corresponding drain field, and several locations comprising contaminated limestone fill.

1.2 Hematite Site History

Throughout its history, operations at the Hematite facility included the manufacturing of uranium metal and compounds from natural and enriched uranium for use as nuclear fuel. Specifically, operations included the conversion of uranium hexafluoride (UF_6) gas of various ^{235}U enrichments to uranium oxide, uranium carbide, uranium dioxide pellets, and uranium metal. These products were manufactured for use by the federal government and government contractors and by commercial and research reactors approved by the Atomic Energy Commission (AEC). Research and Development was also conducted at the facility, as were uranium scrap recovery processes.

The Hematite facility was used for the manufacture of low-enriched (i.e., ≤ 5.0 wt.% ^{235}U), intermediate-enriched (i.e., >5 wt.% and up to 20 wt.% ^{235}U) and high-enriched (i.e., > 20 wt.% ^{235}U) materials during the period 1956 through 1974. In 1974 production of intermediate and high-enriched material was discontinued and all associated materials and equipment were removed from the facility. From 1974 to cessation of manufacturing operations in 2001, the Hematite facility produced nuclear fuel assemblies for commercial nuclear power plants. In 2001, fuel manufacturing operations were terminated and the facility license was amended to reflect a decommissioning scope. Accountable uranium inventory was removed and Decontamination and Decommissioning (D&D) of equipment and surfaces within the process buildings was undertaken. This effort resulted in the removal of the majority of process piping and equipment from the buildings.

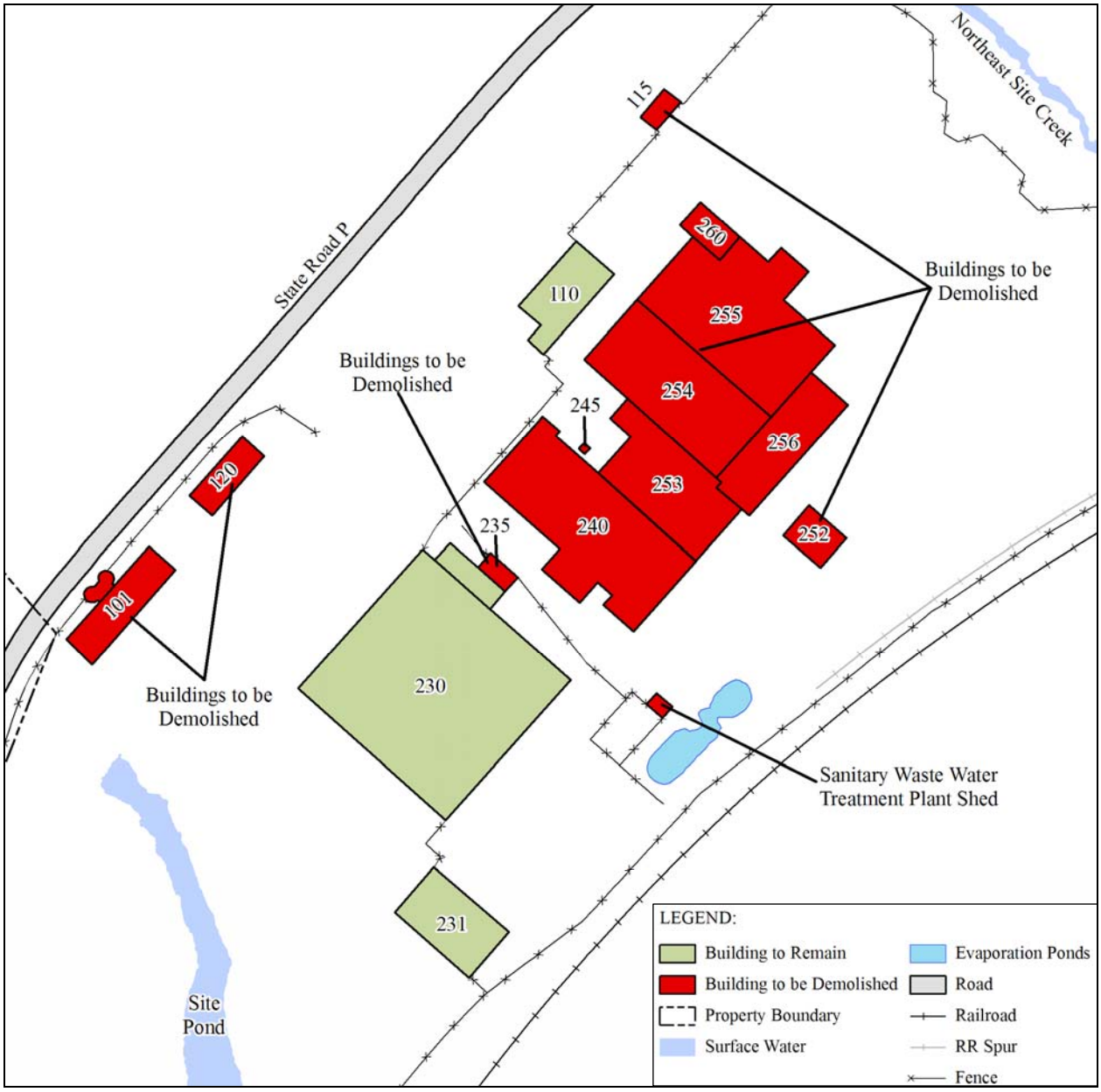
1.3 Buildings to be Demolished

This section lists the buildings that are designated for demolition, and for which consignment of their demolition debris to the USEI site for disposal is indicated. These buildings are listed in Table 1-1 and illustrated in Figure 1-1. Consignment of their demolition debris to the USEI site for disposal is evaluated in this NCSA. However, this evaluation does not include consignment of demolition debris originating from the removal of the underlying slabs and foundations.

Table 1-1 Hematite Site Buildings Designated for Demolition and Consignment to the USEI site for Disposal

Building Group	Encompassed Buildings
Former Process Buildings	Buildings 240, 253, 254, 255, 256-1, 256-2 & 260 (includes Maintenance Building, UF_6 Storage Building, Oxide Building, Limestone Storage Building & Misc. Non-Production Areas)
Barns	Tile Barn (Building 101) & Wood Barn (Building 120)
Vault/Storage Buildings	Waste Vault (Building 235) & South Vault (Building 252)
Other Non-Production Buildings	Building 115, 245 & Sanitary Waste Water Treatment Plant Shed

Source: Original



Source: Original

Figure 1-1 Hematite Site Buildings Designated for Demolition and Consignment to the USEI site for Disposal

1.4 Current State of Buildings to be Demolished

This section describes the existing condition of the buildings listed in Table 1-1 (Section 1.3), which are designated for demolition.

1.4.1 Former Process Buildings

The former process buildings encompass buildings 240, 253, 254, 255, 256-1, 256-2, and 260. These buildings are illustrated in Figure 1-1 and Figure 1-2 and were used for fuel manufacturing operations prior to termination of fuel production in 2001.

Source: Original

Figure 1-2 Hematite Site Former Process Buildings Designated for Demolition and Consignment to the USEI site for Disposal

The current condition of the former process buildings is far removed from the conditions that existed prior to initiation of the past decommissioning work. The current condition is generally typified by empty buildings, with a relatively small quantity of remaining equipment consisting of mainly ventilation ducts, piping, and bulky equipment. The majority of the remaining equipment was cleaned and inspected during prior D&D activities, and accessible surfaces sprayed with fixatives to lock-down surface contamination.

1.4.1.1 Characterization Programs and Results

A comprehensive radiological survey program was undertaken during 2009 to provide radiological data to assist in quantifying the residual mass of ^{235}U associated with piping, ventilation ducts, and miscellaneous items/components remaining within the former process buildings that exhibited elevated radiation levels. In addition, the radiological survey program

encompassed building surfaces, including the floors, walls, ceilings, and roof*. The characterization activities were initiated in response to the results of preliminary radiological surveys of piping performed during late 2008, which indicated the presence of residual ^{235}U in various process pipes.

The results of the 2009 characterization program are presented in Table 1-2 and Table 1-3, which summarize the estimated mass and areal density of ^{235}U associated with the process buildings. Table 1-2 presents the ^{235}U mass estimates derived for the elevated equipment, piping, ventilation ducts, and miscellaneous items/components remaining within the former process buildings. Table 1-3 provides a summary of the ^{235}U mass and average and peak areal density estimates derived for the building surfaces in each facility area.

Table 1-2 ^{235}U Mass Estimates Derived for Equipment, Piping, and Miscellaneous Components/Items Currently Remaining within the Former Process Buildings

Category	Mass Estimate ($g^{235}U$)
Equipment	404
Main Piping	630
Miscellaneous Components/Items (a)	733
Combined Total	1767

Source: Adapted from Table 3, Ref. 18

NOTES: a) Note that the ^{235}U mass total provided for miscellaneous components/items includes the contribution from elevated ventilation ducts and general trash, debris, and dunnage.

* Note that characterization of the building roof included consideration of the possibility that the ^{235}U associated with the building roof may have penetrated the surface over time. For example, contamination may have been covered over by roofing materials used in repair activities. Also, rainfall could have caused contamination to migrate into the roof substrate over time.

Table 1-3 ^{235}U Mass Estimates Derived for the Surfaces (Floors, Walls, Ceilings and Roof) of the Former Process Buildings

Building Structure	Mass Estimate ($g^{235}U$)	Average Areal Density Estimate [(b)] ($g^{235}U/ft^2$)	Peak Areal Density Estimate ($g^{235}U/ft^2$)
Floors	3514	0.118	1.8
Walls and Ceilings Combined	618	0.006	0.028
Roof [(a)]	2779	0.04	2.1

Source: Adapted from Table 4, Table 5, and Para. 3 of Section 6.0, Ref. 18

NOTES: a) The derivation of the roof values in Ref. 9 included consideration of the possibility that the ^{235}U associated with the building roof may have penetrated the surface over time. For example, contamination may have been covered over by roofing materials used in repair activities. Also, rainfall could have caused contamination to migrate into the roof substrate over time.

b) The average areal density estimates are based on the maximum average areal density computed over all building areas of the corresponding surface.

It is noted that the peak areal density values listed in Table 1-3 apply to only limited portions of the floors, walls/ceilings and roof, respectively. The localization of these contamination peaks explains why the average areal density values derived for each facility area are substantially smaller – by a factor of greater than 17, 350, and 52 for the building floors, walls/ceilings, and roof, respectively.

1.4.1.2 Decontamination and Decommissioning Operations Planned Prior to Building Demolition

Specific D&D operations* are planned within the former process buildings prior to building demolition. The purpose of these D&D operations is to prepare the former process buildings for demolition by removing and decontaminating the remaining equipment, piping, ventilation ducts, and miscellaneous items/components, as necessary, to ensure that the building demolition debris will meet the relevant criteria for transportation and off-site disposal at the USEI site.

The former process building D&D operations will be conducted under task specific work package(s) and will adhere to the criticality safety precautions identified in the governing NCSA (Ref. 8). The approach that will be used includes an initial phase of removal and decontamination of selected piping, ventilation ducts, and miscellaneous items/components from the various process buildings. The removed items will be loaded into a transportation package/container and staged on the concrete pad South East of Building 230 prior to shipment to an accepting NRC-licensed waste disposal site/facility. It is currently not intended to consign the removed items to the USEI site. Therefore, all items removed from the former

* This section provides a high level overview of planned D&D operations. The overview provided is intended to orient the reader and should not be construed as constituting a detailed process description.

process buildings as part of the abovementioned D&D operations are not addressed within the scope of this NCSA, i.e., these items are not assessed as part of the range of materials that will be consigned to the USEI site for disposal.

In addition to the removal of selected items from the former process buildings during the initial phase, recovery of UO_2 from items not intended for removal from the buildings prior to building demolition work will be performed on an as-needed basis to ensure that the building demolition debris meets the relevant criteria for transportation and off-site disposal at the USEI site.

As part of the D&D operations work package development, the results of the 2009 characterization program were examined to identify the explicit equipment, piping, ventilation duct, and miscellaneous items/components that will be decontaminated and/or removed from former process buildings prior to their demolition. The explicit equipment, piping, ventilation ducts, and miscellaneous items/components targeted for removal from the process buildings are listed in Table 1-4. These items will be decontaminated within the former process buildings following their removal if deemed necessary from a waste management standpoint. As previously stated, the items removed from the former process buildings during D&D operations (i.e., the items listed in Table 1-4) are not intended for disposal at the USEI site. Consequently, this NCSA assumes that these items will have been removed from the buildings prior to their demolition. This underlying assumption is reinforced by the Criticality Safety Controls (CSCs) established in Section 3.2.2, which require confirmatory action prior to initiation of building demolition activities.

Table 1-5 provides a schedule of the explicit equipment, piping, ventilation ducts, and miscellaneous items/components targeted for decontamination only prior to building demolition (i.e., not removal). Each of these items are intended for disposal at the USEI site provided that decontamination to the levels indicated in Table 1-5 can be achieved. The decontamination method that will be employed for these items consists of vacuuming any loose UO_2 powders. Following decontamination additional fixative will be applied to the contaminated surfaces of these items, as necessary, from a contamination control standpoint. Based on the results of recent characterization work, it is anticipated that the majority of these items will not have any loose UO_2 holdup. In this case, the decontamination operations would only comprise application of fixative. Since the items listed in Table 1-5 are intended for disposal at the USEI site, this NCSA assumes that the items will be consigned to the USEI site as part of the building demolition debris. However, it is assumed that the D&D operations concerning these items will achieve a minimum decontamination level for certain items prior to building demolition, as specified in Table 1-5, or that these items will be removed and not consigned to the USEI site for disposal. This underlying assumption is reinforced by the CSCs established in Section 3.2.2, which require confirmatory action prior to initiation of building demolition activities.

Table 1-6 lists the items that are not indicated for removal or decontamination during the planned D&D operations prior to building demolition. Together with the items listed in Table 1-5, these items will remain within the former process buildings and will be consigned to the

USEI site as a component of the building demolition debris.

Table 1-4 List of Items Targeted for Removal during D&D Operations within the Former Process Buildings – these Items are Not Intended for Consignment to the USEI Site

Item	Characterization Radiological Survey Report(s)	Mass Estimate ($g^{235}U$)
blue valve 260-66	0666 CH 090810	157.0
y-duct 254-33	0821 CH 090827, 0614 CH 090729	132.1
sink p-trap 255-47	0730 CH 090814	52.2
254-9	0818 CH 090826	33.7
sample racks 240-10C	0707 CH 090813	29.3
overhead sample lines 1 254-33	0744 CH 090818, 0762 CH 090819	18.7
254-10	0819 CH 090827	17.9
sample lines 255-56	0777 CH 090824	10.9
sink 240-14	0799 CH 090826	8.9
filter basket 260-76	1061 CH 090924, 1065 CH 090924	7.4
260-8	0761 CH 090819	6.1
254-6, 254-7	0592 CH 090727	6.0
ceiling stub 2 240-11	0589 CH 090727, 0599 CH 090728	5.8
260-10	0782 CH 090824	5.3
overhead sample lines 2 254-33	0741 CH 090818, 0763 CH 090818	5.2
260-4	0700 CH 090811, 0749 CH 090819	3.3
254-8	0613 CH 090729	1.6
elbow 3in 254-34	1053 CH 090924	1.1
Pipe 254-1	0562 CH 090721, 0635 CH 090803, 0734 CH 090818	53.0
Pipe 255-1	0550 CH 090720, 0619 CH 090730 0623 CH 090730, 0631 CH 090803 0647 CH 090804, 0661 CH 090805 0670 CH 090806, 0672 CH 090806 0673 CH 090806, 0674 CH 090806 0675 CH 090806, 0687 CH 090810	149.7
Pipe 255-2	0543 CH 090717, 0618 CH 090730 0634 CH 090803, 0645 CH 090804 0657 CH 090805, 0669 CH 090806 0671 CH 090806, 0677 CH 090806 0681 CH 090806, 0688 CH 090810	140.8
Pipe 255-3	0544 CH 090717, 0547 CH 090720 0622 CH 090730, 0633 CH 090803 0646 CH 090804, 0656 CH 090805 0665 CH 090806, 0691 CH 090811	50.8
Pipe 255-4	0551 CH 090720, 0694 CH 090810	68.5
Pipe 260-2	0602 CH 090727, 0703 CH 090812	121.1
Pipe 260-3	0578 CH 090723, 0704 CH 090812, 0748 CH 090819	29.0

Source: Table 1-5, Ref. 8

Table 1-5 List of Items Targeted for Decontamination Only during D&D Operations within the Former Process Buildings – these Items are Intended for Consignment to the USEI Site as Part of the Building Demolition Debris

Item	Characterization Radiological Survey Report(s)	Existing Mass Estimate ($g^{235}U$)	Assumed Post D&D Operations Mass Estimate ($g^{235}U$)
HEPA 1 240-12	0724 CH 090812	8.0	8.0
HEPA 2 240-12	0724 CH 090812	7.1	7.1
HEPA 3 253-26	0724 CH 090812	7.1	7.1
HEPA 4 256-38	0724 CH 090812	0.6	0.6
HEPA 5 254-34	0724 CH 090812	47.2	≤ 15.0
HEPA 6 254-34	0724 CH 090812	146.2	≤ 15.0
HEPA 7 254-35	0724 CH 090812	13.9	13.9
HEPA 8 254-35	0724 CH 090812	6.5	6.5
HEPA 9 254-41	0773 CH 090819, 0783 CH 090824	0.0	0.0
HEPA 10 254-41		0.0	0.0
HEPA 11 254-42		3.7	3.7
HEPA 12 254-42		0.4	0.4
HEPA 13 254-42	0774 CH 090820, 0783 CH 090824	0.0	0.0
HEPA 14 254-42		56.8	≤ 15.0
HEPA 15 254-39		0.0	0.0
HEPA 16 255-53		3.2	3.2
HEPA 17 255-53		3.3	3.3
HEPA 18 255-51		9.2	9.2
HEPA 19 255-51		4.9	4.9
HEPA 20 260		1.2	1.2
HEPA 21 260		0.4	0.4
HEPA intake duct west 254-34	0731 CH 090813	47.2	≤ 10.0
cable tray 260	0849 CH 090904	27.6	≤ 10.0
254-5	0585 CH 090727, 0747 CH 090819	21.0	≤ 10.0
HEPA intake duct east 254-34	0725 CH 090813	14.4	≤ 10.0
filter shredder components - north	0790 CH 090825, 0843 CH 090902 0852 CH 090902	14.1	14.1
pipe stubs 254-34 254-35	0814 CH 090827, 0826 CH 090831	4.4	4.4
pipe stubs 254-33 254-34	0823 CH 090831, 0826 CH 090831	3.2	3.2

Source: Adapted from Table 1-6, Ref. 8

Table 1-6 List of Items Not Targeted for Removal or Decontamination during D&D Operations within the Former Process Buildings – these Items are Intended for Consignment to the USEI Site as Part of the Building Demolition Debris, without Additional Decontamination

Item	Characterization Radiological Survey Report(s)	Mass Estimate ($g^{235}U$)
Six blender tops and bottoms 254-33	0742 CH 090818.pdf, 0743 CH 090818.pdf, 0780 CH 090824.pdf	21.87
duct above damper 240-12	0785 CH 090825.pdf, 0796 CH 090819.pdf	8.37
drain box 253-26	0715 CH 090817.pdf	7.50
Pipe 254-2		5.90
Pipe 254-3		5.88
Pipe 254-4		3.08
floor stub 240-14	0723 CH 090813.pdf	1.77
hepa exhaust duct 240-12 y-duct at blower 240-12	0755 CH 090818.pdf	1.68
stub1-240	0807 CH 090827.pdf	1.47
Pipe 260-1		1.45
stack flange-240	0816 CH 090827.pdf	1.33
260-5	0717 CH 090813.pdf	0.92
260-7	0760 CH 090819.pdf	0.91
drain pipe tap 240-14	0739 CH 090818.pdf	0.87
ceiling stub 3 240-11	0590 CH 090727.pdf	0.85
filter shredder components - south	0830 CH 090827.pdf, 0871 CH 090825.pdf	0.71
stub2-240	0806 CH 090827.pdf	0.60
12in overhead stub 254-33	0853 CH 090902.pdf	0.51
stub3-240	0813 CH 090827.pdf	0.48
260-6	0752 CH 090818.pdf, 0759 CH 090819.pdf, 0768 CH 090820.pdf	0.47
exhaust blower 240-12	0745 CH 090818.pdf	0.43
pipe dead leg 240-13	0601 CH 090728.pdf	0.32
Pipe Reducer 256-64	0789 CH 090825.pdf	0.27
pvc piping 254-30	0766 CH 090820.pdf	0.25
elbow 2 240-13	0709 CH 090813.pdf, 0708 CH 090813.pdf	0.16
pressure indicator valve 260-75	1054 CH 090924.pdf	0.13
260-9	0779 CH 090824.pdf	0.12
misc elbows 260-77	0781 CH 090824.pdf	0.08
flow gauge pipe 240-12	0751 CH 090819.pdf	0.03
General Debris and Trash		80.0
vent heater 240-11	0844 CH 090902.pdf, 0851 CH 090902.pdf	0.0
strainer 240-13	0714 CH 090813.pdf	0.0
overhead duct 255-32	0811 CH 090827.pdf	0.0
metal pipe 255-32	0767 CH 090820.pdf	0.0
HEPA intake duct 253-26	0706 CH 090812.pdf, 0868 CH 090909.pdf	0.0

Item	Characterization Radiological Survey Report(s)	Mass Estimate ($g^{235}U$)
gamma detectors 254-33 255-58	0740 CH 090818.pdf	0.0
flange 240-13	0716 CH 090813.pdf	0.0
elbow 1 240-13	0600 CH 090728.pdf	0.0
Dunnage	0835 CH 090901.pdf	0.0
drain Line 255-48	0732 CH 090818.pdf	0.0
Conveyor 256-64	0788 S 090825.pdf, 0801 CH 090826.pdf	0.0
Conveyor - South 256-38	0839 CH 090903.pdf, 0855 CH 090903.pdf	0.0
Conveyor - North 256-38	0836 CH 090901.pdf	0.0
ceiling stub 1 240-11	0593 CH 090728.pdf	0.0
air vent-255	0825 S 090831.pdf, 0828 CH 090831.pdf	0.0
5in conduit 240-11	0765 CH 090820.pdf	0.0
255-5	0581 CH 090723.pdf	0.0

Source: Original

1.4.2 Barns

The Hematite site barns encompass the Tile and Wood barns, which are denoted as buildings 101 and 120, respectively, in Figure 1-1. These barns were used for retired equipment storage during plant operations and are currently empty, with the exception of a small number of waste items with very low or negligible contamination level. These items are as follows:

- Approximately 1 cubic yard of drywall, wood, wire and trash; and
- 1 Furnace.

No further use of the barns is planned prior to their demolition.

1.4.2.1 Characterization Programs and Results

Recent radiological surveys were performed to provide radiological data to assist in quantifying the residual mass of ^{235}U associated with the surfaces of the tile and wood barns, including the floors, walls, and ceilings. Note that the barn roofs were not surveyed because the barns have not been used for any process operations and no equipment or piping is, or has been, positioned on or above the roof surface.

The radiological survey results for the tile and wood barns are presented in Table 1-7, which summarize the ^{235}U mass and average and peak areal density estimates derived for the barn surfaces.

Table 1-7 ^{235}U Mass and Areal Density Estimates Derived for the Surfaces (Floors, Walls, and Ceilings) of Buildings 101 and 120

Building Structure	Mass Estimate ($g^{235}U$)	Average Areal Density Estimate ($g^{235}U/ft^2$)	Peak Areal Density Estimate ($g^{235}U/ft^2$)
Floors	264 (1)	0.019 (3)	0.065 (5)
Walls and Ceilings Combined	58 (2)	0.002 (4)	0.003 (6)

Source: 1) High/High estimate from Table 3-6, Ref. 14.
2) High/High estimate from Table 3-8, Ref. 14.
3) Based on the value reported in Cell N13 of Worksheet "FloorsAux" of Workbook "walls.xlsm" contained on the DVD Attachment 2 of Ref. 14.
4) Based on the value reported in Cell N13 of Worksheet "WallsAux" of Workbook "walls.xlsm" contained on the DVD Attachment 2 of Ref. 14.
5) Based on the value reported in Cell CU15 of Worksheet "FloorsAux" of Workbook "walls.xlsm" contained on the DVD Attachment 2 of Ref. 14.
6) Based on the value reported in Cell W15 (rounded up) of Worksheet "WallsAux" of Workbook "walls.xlsm" contained on the DVD Attachment 2 of Ref. 14.

1.4.2.2 Decontamination and Decommissioning Operations Planned Prior to Building Demolition

No D&D operations are planned within the Hematite site barns prior to their demolition. Consequently, this NCSA assumes that these buildings will be demolished in their existing condition.

1.4.3 Vault/Storage Buildings

The Hematite site vault/storage buildings encompass the West and South vaults, which are denoted as buildings 235 and 252, respectively (Figure 1-1). These buildings were used for storage of Special Nuclear Material (SNM) during plant operations. The South vault (building 252) is currently empty except for metallic spacing rings in place on the floor and one metal bin. The West vault (building 235) currently contains a total of fourteen (14) Low Enriched Uranium (LEU) pellets held within a lidded container, in addition to bagged trash (mainly used protective clothing) used during recent characterization activities. Thirteen of the fourteen LEU pellets were recovered from the former process buildings during radiological characterization activities conducted during 2008. An additional LEU pellet was recovered during February 2010. The combined ^{235}U mass associated with fourteen LEU pellets in storage is approximately 3 $g^{235}U$. The bagged trash contains very low levels of contamination and consequently does not pose any ^{235}U contamination concerns for consignment to the USEI site together with building demolition debris.

The former process building D&D operations outlined in Section 1.4.1.2 will likely result in the recovery of additional UO_2 from the former process buildings prior to their demolition. This recovered UO_2 will be temporarily stored within the West vault together with the fourteen LEU pellets described above. In addition, remediation of the site burial pits and contaminated soils may result in the recovery and storage of additional SNM within the West vault and potentially

the South vault. At all times, SNM retained within the West and South vault will be contained within approved containers, precluding the potential to contaminate the surfaces of the buildings. Prior to demolition of the West and South vault all SNM will be removed and segregated. These assumptions on operational practice are reinforced by the CSCs established in Section 3.2.2, which require confirmatory action prior to initiation of building demolition activities.

1.4.3.1 Characterization Programs and Results

Recent radiological surveys were performed to provide radiological data to assist in quantifying the residual mass of ^{235}U associated with the surfaces of buildings 235 and 252, including the floors, walls, and ceilings. The radiological survey results are presented in Table 1-8, which summarize the ^{235}U mass and average and peak areal density estimates derived for the building surfaces.

Table 1-8 ^{235}U Mass and Areal Density Estimates Derived for the Surfaces (Floors, Walls, Ceilings, and Roof) of Buildings 235 and 252

Building Structure	Mass Estimate ($g^{235}U$)	Average Areal Density Estimate ($g^{235}U/ft^2$)	Peak Areal Density Estimate ($g^{235}U/ft^2$)
Floors	251 (1)	0.105 (3)	3.8 (5)
Walls and Ceilings Combined	27 (2)	0.002 (4)	0.11 (6)

Source: 1) High/High estimate from Table 3-6, Ref. 14.
2) High/High estimate from Table 3-8, Ref. 14.
3) Based on the value reported in Cell N14 of Worksheet "FloorsAux" of Workbook "walls.xlsm" contained on the DVD Attachment 2 of Ref. 14.
4) Based on the value reported in Cell N14 of Worksheet "WallsAux" of Workbook "walls.xlsm" contained on the DVD Attachment 2 of Ref. 14.
5) Based on the value reported in Cell CU72 of Worksheet "FloorsAux" of Workbook "walls.xlsm" contained on the DVD Attachment 2 of Ref. 14.
6) Based on the value reported in Cell CU62 of Worksheet "WallsAux" of Workbook "walls.xlsm" contained on the DVD Attachment 2 of Ref. 14.

1.4.3.2 Decontamination and Decommissioning Operations Planned Prior to Building Demolition

No D&D operations are planned within the Hematite site West and South vaults (buildings 235 and 252) prior to their demolition, other than the removal of any contained SNM in storage as described in Section 1.4.3.

1.4.4 Other Non-Production Buildings

Other non-production buildings designated for demolition include building 115, building 245, and the Sanitary Waste water Treatment Plant (SWTP) shed (Figure 1-1).

Building 115 was known as the Fire Pump House and had a generator and a fire pump previously. The building was built in 1992 and housed a diesel-powered generator and fire water pump, and has no history of radioactive material use. It is currently empty but may be

used in the future (prior to demolition) as a material handling/evaluation area and/or radiological survey area. Prior to demolition of building 115 all introduced radioactive materials/SNM will be removed. These assumptions on operational practice are reinforced by the CSCs established in Section 3.2.2, which require confirmatory action prior to initiation of building demolition activities.

Building 245 was known as the Well House and was previously used for potable water well and chlorination. This building is no longer in use and was abandoned in accordance with state regulations. Currently, building 245 contains a variety of miscellaneous items such as a chair, a snow shovel, a garden hose, a window, etc. These miscellaneous items do not pose any ^{235}U contamination concerns and may be consigned to the USEI site together with the building demolition debris.

The SWTP shed historically received discharge from multiple site structures during operation of the facility. The SWTP received water from sinks, toilets, showers and drinking fountains. The SWTP was also used to receive laundry water (after the water was filtered and held for sampling) and waste water from the former process water demineralizer system and laboratory sinks. The SWTP shed consists of a series of settling and aeration tanks and an adjacent building that contains data logging and electronic instrumentation, floor drains and an open work area. The portions of this system that have been impacted by licensed activities are limited to the process components in contact with waste water, and that have the potential to collect solids that settle from the suspension. Prior to demolition of the SWTP shed, the equipment described above will be removed and separately dispositioned. This assumption on operational practice is reinforced by the CSCs established in Section 3.2.2, which require confirmatory action prior to initiation of building demolition activities.

1.4.4.1 Characterization Programs and Results

Recent radiological surveys were performed to provide radiological data to assist in quantifying the residual mass of ^{235}U associated with the surfaces of building 115, building 245, and the SWTP shed, including the floors, walls, and ceilings. Note that no roofs were surveyed because building 115, building 245, and the SWTP shed have not been used for any process operations and no equipment or piping is, or has been, positioned on or above the roof surface.

The radiological survey results for the building 115, building 245, and the SWTP shed are presented in Table 1-9, which summarize the ^{235}U mass and average and peak areal density estimates derived for the various surfaces.

Table 1-9 ^{235}U Mass and Areal Density Estimates Derived for the Surfaces (Floors, Walls, and Ceilings) of Buildings 115, 245, and the SWTP Shed

Building Structure	Mass Estimate ($g^{235}U$)	Average Areal Density Estimate ($g^{235}U/ft^2$)	Peak Areal Density Estimate ($g^{235}U/ft^2$)
Floors	14 (1)	0.014 (3)	0.016 (5)
Walls and Ceilings Combined	4 (2)	0.001 (4)	0.001 (6)

Source: 1) High/High estimate from Table 3-6, Ref. 14.
2) High/High estimate from Table 3-8, Ref. 14.
3) Based on the value reported in Cell N12 of Worksheet "FloorsAux" of Workbook "walls.xlsm" contained on the DVD Attachment 2 of Ref. 14.
4) Based on the value reported in Cell N12 of Worksheet "WallsAux" of Workbook "walls.xlsm" contained on the DVD Attachment 2 of Ref. 14.
5) Based on the value reported in Cell W12 of Worksheet "FloorsAux" of Workbook "walls.xlsm" contained on the DVD Attachment 2 of Ref. 14.
6) Based on the value reported in Cell W12 of Worksheet "WallsAux" of Workbook "walls.xlsm" contained on the DVD Attachment 2 of Ref. 14.

1.4.4.2 Decontamination and Decommissioning Operations Planned Prior to Building Demolition

No D&D operations are planned for building 115, building 245, and the SWTP shed prior to their demolition, other than the removal of any introduced radioactive materials/SNM from building 115, and the removal of the SWTP shed equipment described in Section 1.4.4.1.

This NCSA conservatively assumes that all building demolition debris is contaminated to the same level as the former process building demolition debris (refer to Section 2.4.1 for details). This assumption is conservative because the existing contamination levels of building 115, building 245, and the SWTP shed (see Table 1-9) are lower than the existing contamination level of the former process buildings outlined in Section 1.4.1, and future use is either not indicated or is not expected to result in any significant additional contamination. Nevertheless, this conservative assumption is reinforced by the CSCs established in Section 3.2.2, which require confirmatory action prior to initiation of building demolition activities.

1.5 Waste Material for Burial at the USEI Site

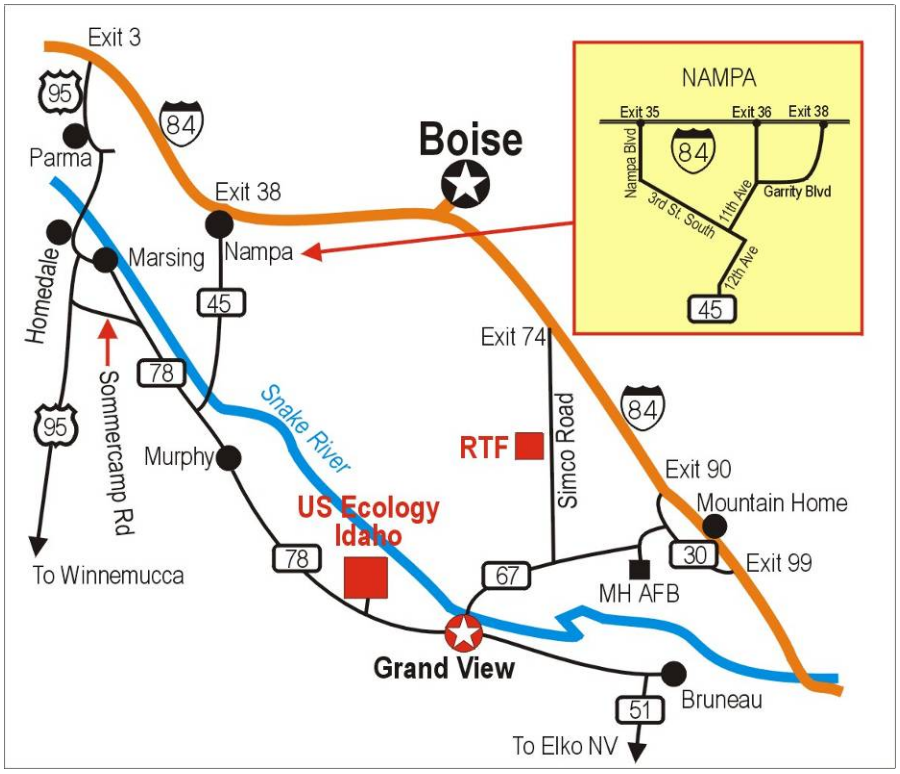
Waste shipped from the Hematite site to the USEI site for disposal may include the following low level sources:

1. Debris generated from the demolition of the former process buildings and ancillary buildings/structures at the Hematite site, but not including building slabs and foundations.
2. Exhumed burial waste from the Hematite burial pits and contaminated soils and backfill material associated with the Hematite burial pits and other remediation areas at the Hematite site; and
3. Solids recovered from the Water Treatment System (i.e., used filter media, IX beds, solids in the holding tanks, etc.) employed at the Hematite site during Decommissioning operations.

As previously stated, this NCSA addresses the consignment of building demolition debris (waste stream 1) to the USEI site. The consignment of waste streams (2) and (3) are separately evaluated in Reference 10.

1.6 USEI Site Description

US Ecology Idaho (USEI), Inc., owns and operates a hazardous waste treatment, storage, and disposal facility located approximately 10.5 miles west of Grand View, Idaho. (See Figure 1-2.) The USEI facility lies far from population centers in an arid climate with low annual rainfall and a high evaporation rate. The 160-acre site in Owyhee County is located on more than 1,000 contiguous acres of land owned by USEI. These factors, in combination with thick sub-surface layers of highly impermeable silts, clays, and sediments, make the site ideally suited for the secure treatment and disposal of hazardous and industrial wastes. USEI manages hazardous waste under a Resource Conservation and Recovery Act (RCRA) Part B Operating Permit (IDD073114654) issued on November 12, 2004 by the State of Idaho.



Source: Ref. 7

Figure 1-3 USEI Location Map

The USEI facility received a state permit to accept an expanded range of low-activity radioactive materials in 2001, and the permit has been amended several times since then. The facility's state RCRA Part B Operating Permit was renewed for a 10-year period in 2004. USEI is fully permitted to manage RCRA, Toxic Substances Control Act (TSCA), and the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) wastes, and NRC-exempted radioactive waste. The facility provides waste management services including chemical stabilization of organic and inorganic solids, sludges and liquids, along with landfill disposal, aqueous evaporation treatment, debris treatment, and PCB management and disposal.

USEI offers rail transportation service to the facility from all points in the continental United States (refer to Figures 1-3 and 1-4). Nearly 2,000,000 tons of wastes have been received at the Rail Transfer Facility in the last three years, demonstrating an ability to handle large environmental remediation projects.

Source: Ref. 7

Figure 1-4 USEI Rail Transfer Facility Interior

Source: Ref. 7

Figure 1-5 USEI Rail Transfer Facility Exterior

1.7 USEI Site History

The USEI site was originally constructed as a U.S. Air Force Titan 1 Missile Complex and eventually decommissioned by the U.S. Air Force in 1965. In 1973, the State of Idaho permitted Western Containment, Inc. (Wes-Con) to dispose industrial waste at the site. Wes-Con received and disposed industrial and PCB wastes in trenches and in portions of the abandoned Titan Missile silos. In 1980, Wes-Con submitted a Part A notification under the Resource Conservation and Recovery Act (RCRA) for hazardous waste disposal. Envirosafe Services of Idaho, Inc. (ESII) purchased the site in 1981 and was granted RCRA interim status the same year. ESII obtained a RCRA Part B Operating Permit on December 15, 1988, and a TSCA Storage and Disposal Permit on November 29, 1991. The facility was purchased by American Ecology Corporation in January 2001, and renamed US Ecology Idaho, Inc. in May 2001.

The history of construction at the USEI site is summarized below:

- 1984: The first double-lined landfill cell constructed.
- 1988: Outdoor Stabilization Facility constructed.
- 1990: Phase I of the second double-lined cell (Cell 14) constructed.
- 1993: Phase II of Cell 14 completed.
- 1994: Debris Handling Facility completed.
- 1998: New Containment Building housing the stabilization units completed.
- October 2003: USEI's newest landfill, Cell 15, completed and disposal operations commenced.
- 2005: Cell 15 Phase II expansion completed.
- 2007: Cell 15 Phase III expansion completed.

1.8 Facility Description

1.8.1 Geography

The USEI facility is located off Highway 78 approximately 10.5 miles west of the town of Grand View, in Owyhee County, Idaho. Grand View has a population of 350. The nearest residence is 1 mile southwest of the site.

The site is situated on a one-mile wide plateau that slopes from south to north. Maximum surface relief on the facility is 90 feet and the mean surface elevation is 2600 feet above sea level. The site is located in a desert environment with an average rainfall of 7.26 inches per year and an average evaporation rate in excess of 42 inches per year.

Castle Creek, the nearest surface water, is an intermittent creek located one-half mile west of the site that lies topographically 150 feet below the facility. The Snake River, the largest surface water source near the site, lies approximately 2½ miles north and 350 feet in elevation below the facility. EPA site evaluations indicate little possibility of site flooding due to a number of

factors, primarily low rainfall, high evaporation, and location of the facility outside the 100-year flood plain.

The facility is located within seismic zone 2 and therefore does not require a seismic standard demonstration under 40 CFR Part 264 Appendix IV.

Currently, USEI has eighteen (18) Piezometers and thirty-nine (39) monitoring wells screened within two aquifers below the site. In accordance with USEI Part B R and TSCA permits, pH, specific conductivity, and a custom list of 28 VOCs are sampled semi-annually. Sampling for PCB analysis is performed each year. Groundwater sampling is performed in accordance with the requirements of USEI's current operating permit. Analysis is completed by a certified contract laboratory. The results of the semi-annual groundwater sampling and analysis activities are submitted to IDEQ semi-annually, in accordance with the requirements of USEI's RCRA Part B Permit, and to U.S. EPA Region 10 each year, in accordance with the requirements of USEI's TSCA permit.

Runoff due to rain is managed through an engineered drainage collection and containment system. The system directs runoff from the interior of the site into one of three on-site RCRA Surface Impoundments. A run-on diversion system prevents run-on from entering the facility.

Site drainage and run-off controls are designed to contain and control run-off from a 25-year, 24-hour storm (1.75 inches of precipitation). Active waste disposal, storage, and treatment operations are segregated from uncontaminated areas by a series of diversion berms and channels. The control system consists of drainage swales, engineered grades, drainage conduits, flumes, riprap, and surface impoundments.

A system of interceptor channels collects and conveys run-off from the active waste handling areas to the rain water Surface Impoundments/Collection Ponds. Runoff from clean areas to the active area is prevented by a series of dikes and channels around active units. Run-off may be transferred from Collection Ponds 1, 2, and 3 and routed to the Evaporation Pond for solar evaporation.

Runoff from the active areas of Cells 5, 14 and 15 are collected within the unit and transferred to storage tanks and treated as multi-source leachate. Once the leachate has been treated to below Land Disposal Restrictions (LDRs) leachate is routed to the primary Evaporation Pond (also a RCRA Surface Impoundment) for solar evaporation.

1.8.2 Landfill Cells

Two RCRA/TSCA landfills are actively used to dispose of containerized solids, bulk solids, and electrical equipment (i.e., small capacitors, transformer carcasses, etc.).

Construction of Cell 15 was initiated on March 1, 2003 and the cell was in operation by October 2003. Phase I of Cell 15 provided about 1,000,000 cubic yards of cell space. When all phases are complete Cell 15 is designed to contain over 3.6 million cubic yards of material (refer to Figure 1-5). Second phase construction was completed in 2005, and third phase construction

was completed in 2007.

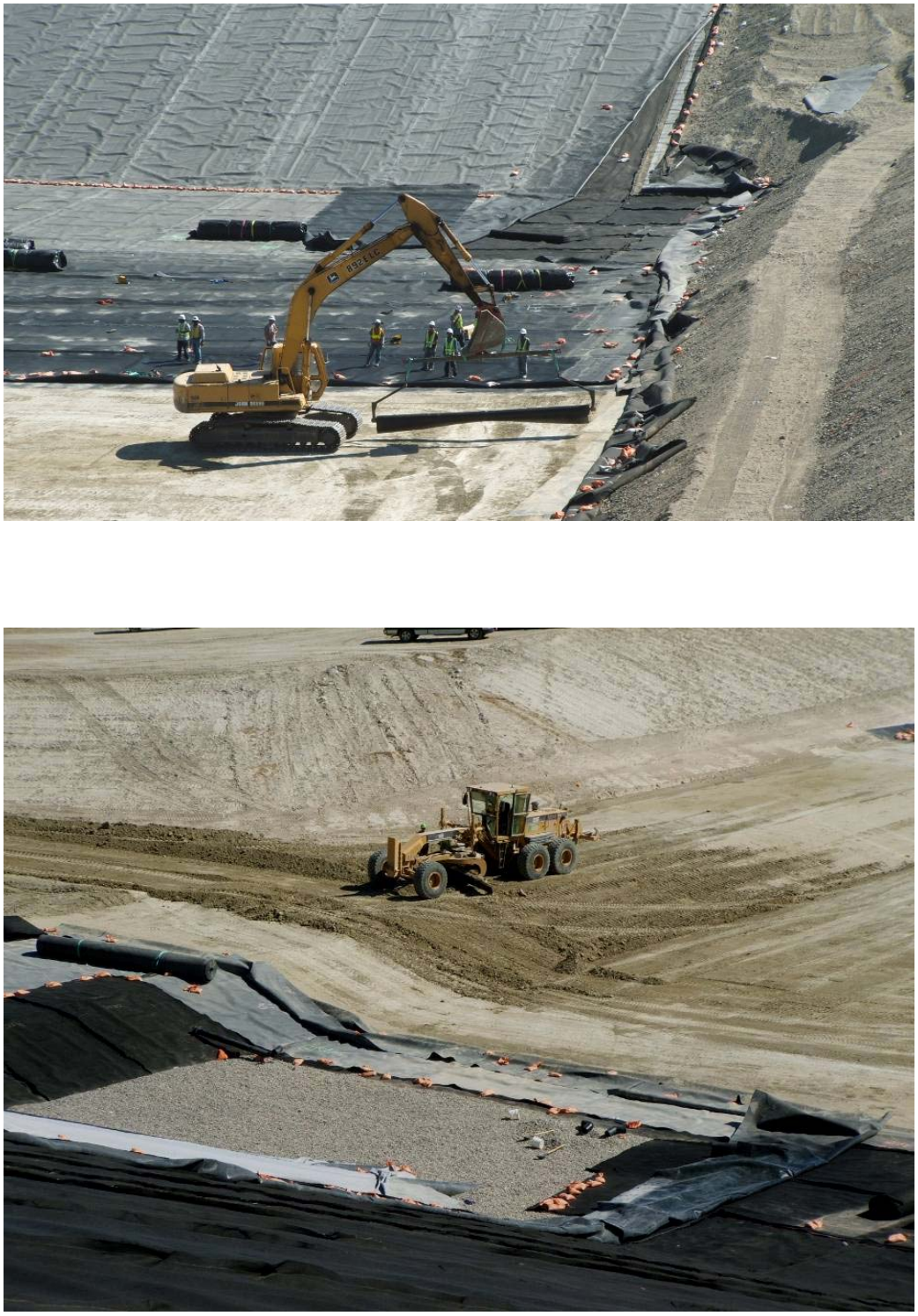
Source: Ref. 7

Figure 1-6 First Load of Waste in Cell 15

1.8.2.1 Landfill Cell Liner System

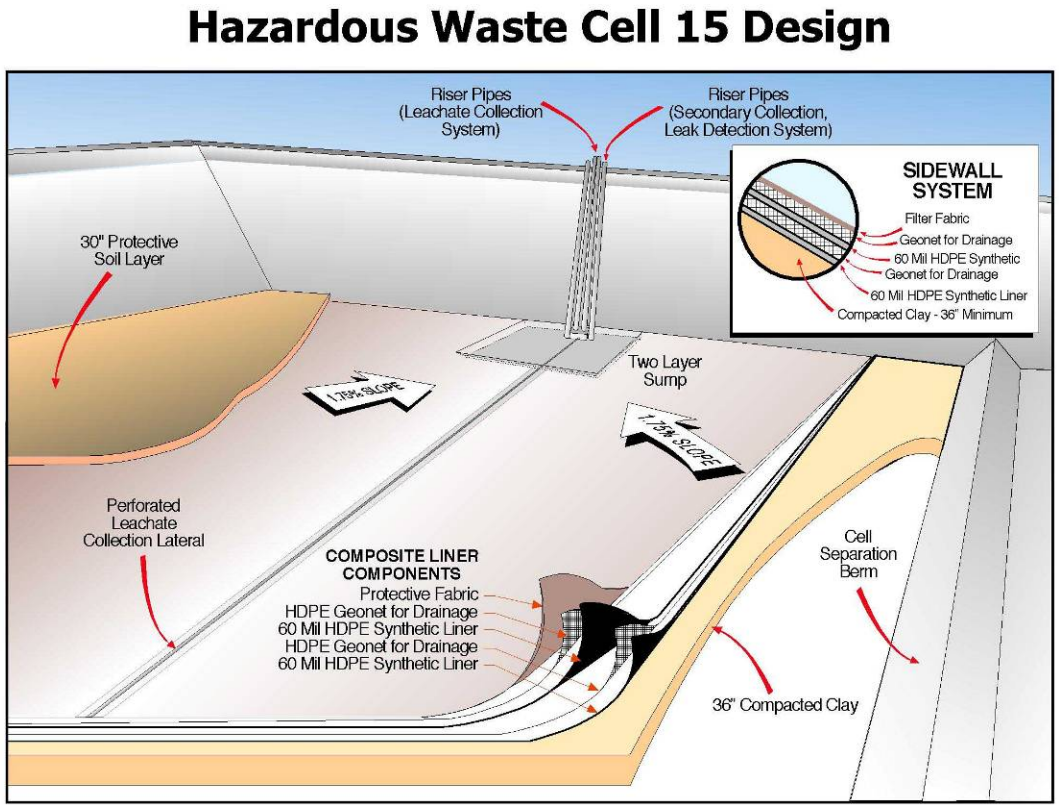
USEI's landfill liner system for cells 14 and 15 consists of a dual composite liner with a leak detection system overlying the primary liner. See Figure 1-6 for a schematic depiction. The liner system was constructed from bottom to top as indicated:

- Subgrade: In-situ compacted silty, sandy soil.
- Secondary Soil Liner: Minimum 36-inches of recompacted clay with a permeability of less than 1×10^{-7} cm/sec.
- Secondary Flexible Membrane Liner: 60 or 80-mil high density polyethylene.
- Leak Detection Zone: Composite layer consisting of a synthetic drainage net, geotextile fabric, 12-inches of stone, and a secondary geotextile fabric.
- Primary Flexible Membrane Liner: 60 or 80-mil high density polyethylene.
- Primary Leachate Collection Zone: Composite layer consisting of a synthetic drainage net, geotextile fabric, 12-inches of sand, and a second geotextile fabric.
- Protective Layer: 12-inches of compacted soil.



Source: Ref. 7

Figure 1-7 Cell 15 Liner Installation



Source: Ref. 7

Figure 1-8 Schematic of Cell 15 Design

1.8.2.2 Leachate Collection, Inspection and Treatment

The leachate collection system drains and traps moisture and liquids percolating through the landfill. The leachate collection system is protected from clogging by a geotextile filter and protected from physical disturbance by 6-inches of soil. Cells are graded so that liquids drain towards the leachate collection system. The sumps are pumped according to a Leachate Management Schedule outlined in USEI's operating permits.

Leachate levels are checked weekly in the primary leachate systems and daily in the secondary leak detection collection and removal system. Both sumps are checked in the event the facility receives more than ½ inch of rainfall in a 24-hour period. Leachate is pumped and removed in accordance with action levels established in the Part B Permit. Records are maintained for each pumping event. Pumping records indicate leachate levels before and after pumping, the volume pumped, and the on-site dispensation of the leachate.

The leachate is managed in accordance with 40 CFR Part 268.7, using a carbon absorption system. The treated leachate is stored until the required testing is completed. Upon passing the required parameters, the leachate is disposed in the solar evaporation pond.

1.8.3 Surface Impoundments

USEI has three RCRA-permitted surface impoundments for the collection of storm water runoff (Rainwater Collection Ponds 1, 2, and 3). A fourth RCRA-permitted impoundment is primarily used for solar evaporation (Evaporation Pond 1 – refer to Figure 1-8).

USEI's Surface Impoundments are constructed with dual synthetic liner systems and associated leak detection capabilities. The Storm-water pond liner systems are constructed as indicated from bottom to top:

- Subgrade: In-situ compacted silty, sandy soil.
- Secondary Flexible Membrane Liner: 40-mil Medium Density Polyethylene.
- Leak Detection Zone: Composite layer consisting of a geotextile fabric, 12 inches of sand, and a collection pipe.
- Primary Flexible Membrane Liner: 60-mil High Density Polyethylene.
- Protective layer: 12 inches of sand, geotextile fabric and 6 inches of stone.

The Evaporation Pond liner system is constructed in a slightly different fashion to place a flexible membrane liner on the surface:

- Subgrade: In-situ compacted silty, sandy soil.
- Secondary Flexible Membrane Liner: 40-mil Medium Density Polyethylene.
- Leak Detection Zone: Composite layer consisting of a geotextile fabric, 12 inches of sand, and a collection pipe.
- Primary Soil Liner: 12 inches of compacted clay with permeability of less than 1×10^{-6} cm/sec.
- Primary Flexible Membrane Liner: 80-mil High Density Polyethylene.

Source: Ref. 7

Figure 1-9 Evaporative Surface Impoundment

1.9 Managing Wastes for Treatment and Disposal

The Receiving Department enters all waste management information into the Company's American Ecology Standard Operating Platform (AESOP) system (i.e., weights, reagents, constituents, concentrations, disposal locations, etc.). Depending on the waste in question, wastes received at USEI may be placed in temporary storage, or sent to one of the stabilization units, the debris handling facility, or directly land-filled. In regards to the Hematite waste, approximately 95% of the wastes will be directly land-filled (i.e., no treatment), with the remaining 5% expected to require stabilization for RCRA regulated metals. Upon final waste placement, three-dimensional disposal coordinates are recorded on a Work Order Supplement and associated electronic database (AESOP).

1.9.1 Processing Containerized Waste

Waste streams with similar waste codes, characteristics and compatibility are typically consolidated for batch treatment. For example:

- F006, 7, 8, 9, 11, 12, 19 waste streams are usually combined.
- D004-011 waste streams are usually combined.

Batches are analyzed after treatment to ensure that all treatment standards for all waste codes in the batch have been met. Containers of debris are also consolidated for treatment; however, there are no concentration-based standards for encapsulation. Instead, the requirements of 40 CFR Part 268.45 and USEI's permit must be met to ensure that debris was treated for each contaminant subject to treatment.

Containers of waste that do not require further treatment are placed directly into the landfill,

based upon compatibility. The coordinates of the containerized wastes are recorded to permit retrieval in the future, if for any reason this is desired.

1.9.2 Processing Bulk Wastes

Bulk wastes requiring treatment may be off-loaded into three different areas; 50-cubic yard stabilization bins at the Stabilization Plant, 100-cubic yard stabilization tanks in the Stabilization Building, or onto the sort floors in the Debris Handling Facility. Alternatively, containerized bulk waste may be stored in one of USEI's RCRA storage areas. Waste off-loaded directly into bins or tanks can be treated immediately. Wastes that are off-loaded onto the sort floors typically need additional handling prior to treatment. Downsizing, sorting, crushing and other handing may be required prior to treatment.

Bulk wastes destined for direct landfill are directed to the landfill cell specified on the WPQ summary sheet after inspection and approval for receipt. Waste locations in the landfill are based upon compatibility, and disposal locations are recorded.

1.10 Scope of Assessment

This scope of this NCSA is limited to safe handling and disposal at the USEI site of Hematite site decommissioning waste derived from the demolition of the buildings listed in Table 1-1. This NCSA does not consider consignment of decommissioning wastes derived from the demolition of the slabs and foundations associated with the buildings listed in Table 1-1. However, this NCSA does address the potential removal of contamination from the building floors during collection of the building structure demolition debris, and the resultant potential increase in the ^{235}U concentration of the building demolition debris.

1.11 Methodology

1.11.1 Approach

This NCSA uses a risk-informed approach. Risk insights, gained from the findings of the risk assessment, are used to establish aspects of the design and process that are susceptible to faults important to nuclear criticality safety.

The risk informed approach is complemented with an As Low As Reasonably Achievable (ALARA) assessment that is focused on identifying practicable measures that can be reasonably implemented to further reduce the risk of criticality to a level as low as is reasonably achievable. The ALARA assessment also serves to provide an additional degree of confidence that a criticality incident resulting from the activities assessed is not credible.

In summary, the approach used in this NCSA is as follows:

1. Establish the margin of safety between normal (i.e., expected) conditions and foreseen credible abnormal conditions.

2. Determine whether the inherent margin of safety is sufficient to safely accommodate the credible deviations from normal conditions, and if not, identify feature(s) of the process* that are important to ensuring criticality safety under all credible conditions.
3. Establish what additional practicable measures, if any, can reasonably be implemented to ensure that the risks from criticality are as low as is reasonably achievable.

1.11.2 Method of Criticality Control

The criticality safety basis for the disposal of building demolition debris derived from the Hematite site decommissioning operations is based on assuring that all decommissioning wastes consigned to the USEI site satisfy the concentration limit established for their safe disposal.

* In the selection of safety controls, preference is placed on use of engineered controls over procedural controls.

2.0 CRITICALITY SAFETY ASSESSMENT

The criticality safety assessment of the USEI site for the receipt and burial of decommissioning waste derived from demolition of the Hematite site buildings listed in Table 1-1 is organized as follows:

- **Section 2.1** describes the hazard identification technique employed in the criticality safety assessment of waste disposal at the USEI site and provides a summary of the hazard identification results.
- **Section 2.2** outlines the generic assumptions used in the criticality safety assessment.
- **Section 2.3** contains the criticality safety assessment of waste disposal at the USEI site under normal (i.e., expected) conditions.
- **Section 2.4** contains the criticality safety assessment of waste disposal at the USEI site under abnormal (i.e., unexpected) conditions.

2.1 Criticality Hazard Identification

This section outlines the technique used to identify criticality hazards associated with the Hematite waste disposal at USEI site. A summary of the hazards identified is also provided, together with a brief description of their disposition in the NCSA.

2.1.1 Hazard Identification Method

The hazard identification technique employed in this criticality safety assessment uses a *What-if* analysis where the remediation approach and overall objectives are scrutinized and examined against postulated situations, focused on challenging criticality safety. As part of this process, the *What-if* analysis steps through the eleven (11) criticality safety controlled parameters to determine the extent of their importance to criticality safety.

The eleven (11) criticality safety controlled parameters examined include:

- Geometry
- Interaction
- Mass
- Isotopic/Enrichment
- Moderation
- Density
- Heterogeneity
- Neutron Absorbers
- Reflection
- Concentration
- Volume

The eleven (11) parameters listed above are traditionally considered in criticality safety assessments of processes at operating facilities possessing SNM. Typically, the non-processed based nature of decommissioning operations and associated residues limits the ability to control many parameters, resulting in the need to use bounding values for parameters in the NCSA in many instances.

2.1.2 Hazard Identification Results

A summary of the criticality hazards identified from the *What-if* analysis is presented in Table 2-1. Hazards that result in events with similar consequences and safeguards are grouped in single criticality accident event sequences, analyzed in Section 2.4.

Table 2-1 Criticality Hazards Identified from the What-if Analysis

What-if…	Causes	Consequences	Accident Sequence in NCSA
Geometry			
There are no identified hazards associated with geometry because the safety assessment is based on safe concentration for an infinite system.			
Interaction			
Wrong waste is loaded for shipment.	• Procedure non-compliance.	Potential interaction between packages that may normally require spacing.	**Section 2.4.3**
Mass			
Wrong waste is loaded for shipment.	• Procedure non-compliance.	Potential to exceed a maximum safe mass of ^{235}U in a localized area.	**Section 2.4.3**
There is a reconfiguration of ^{235}U solids in a waste cell.	• Uranium dissolution and migration due to ground water and/or water from precipitation.	Potential to exceed a maximum safe mass of ^{235}U in a localized area. Potential to exceed a maximum safe mass of ^{235}U in the leachate or evaporation pond(s).	**Section 2.4.4**
The wastes prepared for shipment contain an excessively high ^{235}U concentration.	• Presence of high ^{235}U mass content items and contamination hotspots on building surfaces. • Removal of contamination from Building slabs during collection of structural debris.	Potential to exceed a maximum safe mass of ^{235}U in a localized area.	**Sections 2.4.1 and 2.4.2**
Isotopic/Enrichment			
There are no identified hazards associated with presence of variable enrichment uranium. This is because the safety assessment is conservatively based on subcritical limits derived for uranium metal at maximum theoretical density, with 100 wt.% ^{235}U/U enrichment.			
Moderation			
There are no identified hazards associated with moderation of uranium particulates. This is because the safety assessment is conservatively based on subcritical limits derived for optimally moderated fictitious uranium mixtures at optimum concentration.			

What-if…	Causes	Consequences	Accident Sequence in NCSA
Density			
There are no identified hazards associated with presence of variable density uranium. This is because the safety assessment is conservatively based on subcritical limits derived for uranium metal at maximum theoretical density.			
Heterogeneity			
There are no identified hazards associated with heterogeneity of uranium. This is because the safety assessment is conservatively based on subcritical limits derived for optimally moderated homogeneous uranium mixtures (with 100 wt.% ^{235}U/U enrichment), for which subcritical limits are smaller than equivalent heterogeneous uranium-H_2O mixtures.			
Neutron Absorbers			
There are no identified hazards associated with absence of fixed neutron absorbers. This is because the safety assessment does not credit fixed neutron absorbers.			
Reflection			
There are no identified hazards associated with reflection of uranium. This is because the safety assessment conservatively uses subcritical limits based on full (i.e., 30 cm) thickness close fitting water, concrete, and/or soil reflection conditions, which are considered to bound any credible reflection condition.			
Concentration			
Wrong waste is shipped.	• Procedure non-compliance.	Potential to exceed a maximum safe concentration of ^{235}U in a localized area.	**Section 2.4.3**
There is a reconfiguration of ^{235}U solids in a waste cell.	• Uranium dissolution and migration due to ground water and/or water from precipitation.	Potential to exceed a maximum safe concentration of ^{235}U in a localized area. Potential to exceed a maximum safe concentration of ^{235}U in the leachate or evaporation pond(s).	**Section 2.4.4**

What-if…	Causes	Consequences	Accident Sequence in NCSA
The wastes prepared for shipment contain an excessively high ^{235}U concentration.	• Presence of high ^{235}U mass content items and contamination hotspots on building surfaces. • Removal of contamination from Building slabs during collection of structural debris.	Potential to exceed a maximum safe concentration of ^{235}U in a localized area.	**Sections 2.4.1 and 2.4.2**
Volume			
Volume control is not viable due to the large volume of waste to be shipped.			

2.2 Generic Safety Case Assumptions

The activities considered in this criticality safety assessment relate to the processes as defined in Section 1. This section outlines the generic assumptions on which this criticality safety assessment is based.

2.2.1 Fissile Material Assumptions

The pertinent underlying assumptions of the assessment related to the *fissile material* that may be encountered in these activities are as follows:

- This assessment does not consider fissile nuclides other than ^{235}U. Based on the history of the Hematite site and site documentation (refer to Sections 1.2 and 1.3), there is no expectation that fissile nuclides other than ^{235}U could exist within the Hematite site boundary.
- The Hematite waste received at the USEI site will not be treated and will be consigned directly to a waste cell.

2.2.2 Operational Practice Assumptions

The pertinent underlying assumptions of this NCSA related to operational practice are as follows:

- Prior to initiation of building demolition activities all of the items listed Table 1-4 of this NCSA will have been completely removed from the former process buildings and segregated to ensure that they cannot be inadvertently consigned to the USEI site for disposal. This assumption is reinforced by the CSCs established in Section 3.2.2.
- Prior to initiation of building demolition activities each item listed in Table 1-5 of this NCSA will have been decontaminated to the required level, as indicated in Table 1-5, or otherwise completely removed from the former process buildings and segregated to ensure that they cannot be inadvertently consigned to the USEI site for disposal. This assumption is reinforced by the CSCs established in Section 3.2.2.
- Prior to demolition of the West and South vault (buildings 235 and 252) and building 115, all contained radioactive materials/SNM will have been removed and segregated. In addition, the building surfaces will have been verified to not comprise greater ^{235}U contamination than their existing condition, as documented in this NCSA. This assumption is reinforced by the CSCs established in Section 3.2.2.
- Prior to demolition of the Tile and Wood barns (buildings 101 and 120) and building 245, the building surfaces will have been verified to not comprise greater ^{235}U contamination than their existing condition, as documented in this NCSA. This assumption is reinforced by the CSCs established in Section 3.2.2.
- Prior to demolition of the SWTP Shed, all contained SWTP equipment will have been removed and the shed surfaces will have been verified to not comprise greater ^{235}U contamination than currently exists, as documented in this NCSA. This assumption is reinforced by the CSCs established in Section 3.2.2.

2.3 Normal Conditions

Under normal (i.e., expected) conditions Hematite decommissioning wastes derived from building demolition debris will contain low concentrations of ^{235}U, not exceeding the USEI waste acceptance limit of 1.0 $g^{235}U/10L$. This limiting value is significantly smaller than the minimum critical infinite sea concentration of 1.4 $g^{235}U/L$ (39.6 $g^{235}U/ft^3$) for a fictitious bounding medium consisting of only SiO_2 and ^{235}U (NUREG/CR-6505 Vol. 1), affording a large margin of safety at the USEI site under normal conditions. Furthermore, in practice, the margin of safety is much greater because the uranium associated with the building demolition debris is expected to be predominantly LEU, affording a greater minimum critical infinite sea concentration. In addition, SiO_2 represents a conservative media on which to base a minimum critical concentration limit because of its very small neutron capture cross-section compared to the materials that would comprise building demolition debris (predominantly concrete and steel).

2.4 Abnormal Conditions

Postulated abnormal conditions associated with final waste characterization and burial at the USEI site concern the potential for an increase in uranium mass and/or concentration levels on receipt, or following emplacement within the disposal system.

The following postulated criticality scenarios are discussed and assessed in this section:

- Concentration limit is exceeded when building demolition debris is prepared for shipment;
- Concentration limit is exceeded when scraping the surface of building floors during collection of demolition structural debris results in removal of ^{235}U contamination;
- Wrong material is loaded for shipment to the USEI site; and
- Migration and localized concentration of ^{235}U in USEI Landfill Cells, Leachate System, and/or Evaporation pond.

2.4.1 Concentration Limit is Exceeded when Building Demolition Debris is Prepared for Shipment

2.4.1.1 Discussion

Any waste shipped from the Hematite site to the USEI site must not exceed an average concentration of 1.0 $g^{235}U/10L$. This concentration limit is below the concentration limit for transportation and is substantially below (by a factor of 40) the maximum subcritical infinite sea concentration of 4.0 $g^{235}U/L$ for nominal soil (Appendix A).

This upset scenario involves shipping building demolition debris with an excessively high ^{235}U concentration to be USEI site. The building demolition debris consists of the remnants of the Hematite site buildings listed in Table 1-1 and illustrated in Figure 1-1. This includes the building walls, mezzanines, and roofs, together with the items listed in Table 1-5 and Table 1-6, which apply to the former process buildings. Note that building slabs and foundations are excluded from this assessment.

2.4.1.2 Risk Assessment

The risk assessment that follows evaluates the ^{235}U concentration of the decommissioning wastes that will be derived from demolition of the roof, walls/ceilings, and contents of the buildings listed in Table 1-1. Each of these waste streams (i.e., roof debris, wall/ceilings debris, and building contents debris are discussed in turn).

Building Roofs

The roof of the former process buildings is known to be contaminated from spills from piping, and from ventilation related equipment. The roof the other (non-process) buildings listed in Table 1-1 are insignificantly contaminated because of the absence of such equipment for those buildings. Therefore, the assessment that follows is conservatively based on the roof of the former process buildings.

The roof of the former process buildings is composed of a nominal 3 inch thick layer of low density concrete, 0.5 inch fiberboard and 0.06 inch EPDM rubber, providing a total thickness of 3.56 in (9.0424 cm). Based on this substrate model, the areal density of ^{235}U contamination corresponding to the USEI waste acceptance concentration limit of 1$g^{235}U/10L$ is 0.84 $g^{235}U/ft^2$.

The 2009 characterization program results presented in Table 1-3 record an area-averaged areal density of 0.040 $g^{235}U/ft^2$ for the roof of the former process buildings. Hence, on an area-averaged basis, the contamination level is approximately 20 times lower than the limiting value of 0.84 $g^{235}U/ft^2$ defined above.

There are five distinct hotspot areas associated with the roof of the former process buildings with contamination levels as high as 2.1 g $^{235}U/ft^2$. This peak areal density corresponds to a volumetric density of 2.5 $g^{235}U/10L$, which on a localized basis would exceed the USEI

concentration limit of 1.0 $g^{235}U/10L$. However, these hotspot areas are known to be precisely located as a result of the comprehensive building characterization radiological surveys described in Section 1.4.1.1, and occupy a combined roof surface area of only ~16 ft^2. Based on this collective hotspot area, the combined mass of ^{235}U associated with these hotspots is 33 $g^{235}U$. This small mass total represents a negligible criticality risk even if all of the hotspots were somehow co-located. In practice, the hotspots will be naturally comingled and diluted with surrounding low-concentration structural debris during the demolition process and thus will not exceed the USEI concentration limit for disposal.

Building Walls/Ceilings

The building wall/ceiling areal density estimates were derived using a surface planar source. This model is appropriate for the building walls/ceilings due to their orientation and thus low potential for migration of surface contamination to the underlying bulk. Based on the surface planar source model, the building walls/ceilings have an area-averaged areal density of only 0.006 $g^{235}U/ft^2$ (Table 1-3). This value is based on the highest average value reported for all buildings listed in Table 1-1, and corresponds to the value reported for the former process buildings in Table 1-3. It is seen that this value is significantly lower than the area-averaged roof areal density estimate (Table 1-3) discussed above. In addition, the peak observed wall hotspot area has an areal density of only 0.11 $g^{235}U/ft^2$, based on the highest peak value reported in Table 1-8 for buildings 235 and 252. Even assuming the peak hotspot areal density for all walls, the USEI concentration limit of 1.0 $g^{235}U/10L$ is not exceeded provided the average wall thickness is not less than 0.47 in (1.18 cm), assuming an unrealistic 100% compaction of wall structural debris. This minimum wall thickness is significantly below the actual average wall thickness for all buildings, except for the SWTP shed, and potentially the Hematite site barns. However, the peak observed wall hotspot area for these buildings and the SWTP shed has an areal density of only 0.003 $g^{235}U/ft^2$ (Table 1-7), which corresponds to a minimum wall thickness limit of just 0.013 in (0.032 cm), assuming an unrealistic 100% compaction of wall structural debris. This minimum wall thickness value is below the actual average wall thickness for the SWTP shed, and the Hematite site barns. Hence the structural debris resulting from wall demolition will be below the 1 $g^{235}U/10L$ limit. In fact, because most walls have substantially greater thickness than the limiting values noted above, the structural debris resulting from wall demolition will exhibit a very low ^{235}U concentration relative to the USEI limit.

Building Contents

As discussed in Section 1.4.1.2, the former process buildings contain various contaminated items, some of which will be removed from the buildings prior to their demolition. The items listed in Table 1-4 are not intended for disposal at the USEI site. Consequently, this NCSA assumes that these items will have been removed from the buildings prior to their demolition. This underlying assumption is captured in Section 2.2.2 and is reinforced by a CSC in Section 3.2.2, which requires confirmatory action prior to initiation of building demolition activities.

The items listed in Table 1-5 and Table 1-6 are not indicated for removal from the former process buildings prior to building demolition, although some of the items listed in Table 1-5

will be decontaminated. The majority of the items listed in Table 1-5 comprise large HEPA filter housings. Three of the HEPA units are indicated for decontamination and are known to contain loose, easily removed contamination. These three HEPA units will be decontaminated as part of the pre-demolition D&D operations described in Section 1.4.1.2 until the residual mass associated with each unit is estimated to be no greater than 15 g ^{235}U, using the mass estimation methods employed in Reference 13. The HEPA filter housings are large, hollow steel boxes with an installed weight of 2580 lbs each (Ref. 11). Assuming a steel density of 7.76 g/cm^3, each HEPA unit comprises a 100% compacted steel volume of greater than 151 L. Hence, even assuming full compaction, the HEPA units will have a ^{235}U concentration below the 1 g ^{235}U/10L USEI limit.

Table 1-5 also lists a filter shredder system, which comprises the shredder platform, remains of the shaker, conveyer, blender, blender stand, and loading box enclosure. The volume of material (predominantly steel) associated with this system is considerably greater than the volume of an individual HEPA unit due to its large size (the estimated volume is approximately 1400 L, which is based on a combined system weight of 23,900 lbs (Ref. 15) and a 100% compacted steel volume at 7.76 g/cm^3 density). Considering the 14.1 g ^{235}U mass estimate associated with the filter shredder system (Table 1-5) and the considerably greater volume of compacted steel it comprises, it is seen that this system will have a ^{235}U concentration well below the 1 g ^{235}U/10L USEI limit.

The various pipe stubs listed in Table 1-5 comprise very small gram quantities of ^{235}U. This small mass total represents a negligible criticality risk even if all of the pipe stubs were co-located within the building demolition debris. In practice, the pipe stubs will be naturally comingled and diluted with surrounding low-concentration structural debris during the demolition process and thus will not exceed the USEI concentration limit for disposal. The remaining equipment listed in Table 1-5, including two sections of duct, a cable tray, and pipe section 254-5 will be decontaminated as part of the pre-demolition D&D operations described in Section 1.4.1.2 until the residual mass estimated for each item is no greater than 10 g ^{235}U (determined using the mass estimation methods employed in Reference 12). The low individual ^{235}U mass associated with these items and their natural comingling with the surrounding low concentration structural debris during the building demolition process will ensure their acceptability for consignment to the USEI site for disposal.

All of the items listed in Table 1-6 will be consigned to the USEI site as a component of the building demolition debris. The residual mass estimated for each of these items, with two exceptions, is below 10 g ^{235}U and their natural comingling with the low-concentration structural debris during the demolition process will ensure their acceptability for consignment to the USEI site for disposal. The two exceptions noted concern the six blenders and the general debris and trash. The six blenders, however, represent a combined steel volume of approximately 1350 L, which is based on a combined weight of 23,118 lbs (Ref. 16) and a 100% compacted steel volume at 7.76 g/cm^3 density. This combined volume corresponds to a ^{235}U concentration substantially below the 1 g ^{235}U/10L USEI limit. The 80 g ^{235}U associated with the general debris and trash concerns large volumes of bagged, boxed and drummed dirt, trash, dunnage, and dry active waste. These wastes comprise very low ^{235}U contamination and

consequently their consignment to the USEI site for disposal will not present any criticality safety concerns.

The remaining buildings listed in Table 1-1 either do not currently contain any items with significant contamination and will not be exposed to further contamination prior to building demolition, or will be verified to not contain any contaminated items prior to building demolition. This underlying assumption is captured in Section 2.2.2 and is reinforced by a CSC in Section 3.2.2, which requires confirmatory action prior to initiation of building demolition activities.

2.4.1.3 Summary of Risk Assessment

Based on the discussion provided above it is concluded that this event sequence can not credibly result in a criticality incident at the USEI site because the low levels of contamination in relation to the large volume of structural debris, including walls/ceilings, roofs, and remaining items within the buildings ensures that the wastes consigned to the USEI site for disposal will not exceed an average concentration of 1 g^{235}U/10L, which is safely subcritical.

2.4.1.4 Safety Controls

No CSCs or DinD controls have been identified in the risk assessment because a criticality accident due to consignment of building demolition debris with excessively high ^{235}U concentration to the USEI site is not credible. However, it is noted that the risk assessment employs assumptions regarding the D&D operations outlined in Section 1.4.2.2, where it is assumed that 1) the items listed in Table 1-4 will have been removed from the process buildings prior to their demolition, and 2) the items listed in Table 1-5 for decontamination will have been decontaminated prior to building demolition. These underlying assumptions are captured in Section 2.2.2 and are reinforced by the CSCs in Section 3.2.2, which require confirmatory action prior to initiation of building demolition activities. The risk assessment also assumes that the non-former process buildings listed in Table 1-1 will be verified to not contain any contaminated items prior to building demolition. This underlying assumption is captured in Section 2.2.2 and is reinforced by a CSC in Section 3.2.2, which requires confirmatory action prior to initiation of building demolition activities.

2.4.2 Concentration Limit is Exceeded when Scraping the Surface of Building Floors during Collection of Demolition Structural Debris Results in Removal of ^{235}U Contamination

2.4.2.1 Discussion

This upset scenario involves scraping ^{235}U contamination from the surfaces of the floors within the buildings designated for demolition, during collection of the structure building demolition debris. This scenario has the potential to increase the concentration of the building demolition debris and result in the decommissioning waste being improperly characterized for shipment to the USEI site.

2.4.2.2 Risk Assessment

Section 2.4.1 evaluates building demolition activities and demonstrates that the debris derived from the demolition of the buildings listed in Table 1-1 will not exceed the concentration limit for receipt and disposal at the USEI site. However, in the event that ^{235}U contamination residing on the surface of the building floors is removed or partially removed during collection of the building structure demolition debris, the ^{235}U concentration of the building demolition debris could potentially be increased.

A bounding condition for this event scenario corresponds to complete removal of all surface contamination associated with the building floors. Table 1-3, Table 1-7, Table 1-8, and Table 1-9 in Section 1.4 provide bounding estimates for the mass of ^{235}U associated with surface contamination of the floors of the buildings designated for demolition (Table 1-1). The combined mass value for all floors is 4,043 g^{235}U. This bounding value applies to the surfaces of the floors and is considered to represent an upper bound mass that could potentially be mobilized by scraping or grazing the building floors during collection of the building structure demolition debris.

Reference 17 provides an estimate of the volume of materials associated with the structure of the buildings designated for demolition. Using only the estimate for the former process buildings, and neglecting the volume of materials associated with interior equipment, the total volume estimate of structural materials, and hence building demolition debris, is greater than 127,000 ft^3, which is equivalent to approximately 3.6 x10^6 L. Conservatively dividing the total ^{235}U mass estimate for all building floor surfaces by this lower bound demolition debris volume estimate results in an average concentration of approximately 1.1 mg^{235}U/L. This very low concentration value is approximately two orders of magnitude below the USEI concentration limit of 1.0 g^{235}/10L and thus is negligible from a criticality safety perspective. Based on this negligible potential additional ^{235}U concentration, any credible mass of ^{235}U that could be mobilized due to scraping or grazing the surfaces of the floors within the buildings designated for demolition will not result in the building demolition debris exceeding the average 1.0 g^{235}/10L concentration limit for receipt and disposal at the USEI site.

It is recognized that this assessment averaged the potential mass mobilized from the building floors over the total volume of structural debris created by building demolition. This is

appropriate because the ^{235}U contamination associated with the building floors encompasses the entire foot print of the buildings, spanning very large areas. Consequently, the potential to create localized regions of building demolition debris with higher ^{235}U concentration is very small because the buildings cover very large areas and demolition of the buildings will result in collection of building debris over the majority, if not all, of the surface of the building floors.

It is also noted that the floors of buildings 235 and 252 (refer to Table 1-8) exhibit the peak hot spot areas for all of the buildings listed in Table 1-1, and due to the relatively small volume of structural debris that will be generated from demolition of these buildings, the resultant potential increase in concentration from scraping or grazing the building floors could be greater than the 1.1 $mg^{235}U/L$ value derived above. However, based on the results reported in columns *CU* and *CV* of worksheet *FloorsAux* of MSExcel Workbook *walls_v1202* (Attachment 2, Ref. 14), it is seen that the combined mass of all hotspot areas associated with the floors of buildings 235 and 252 is only 28.3 $g^{235}U$. This small mass total represents a negligible criticality risk even if all of the hotspots were removed from scraping of the floors and the associated ^{235}U was deposited within a localized volume of structural debris. In practice, the hotspots will be naturally comingled and diluted with surrounding low-concentration structural debris during the demolition process and thus will not exceed the USEI concentration limit for disposal.

2.4.2.3 Summary of Risk Assessment

Based on the discussion provided above it is concluded that this event sequence can not credibly result in a criticality incident at the USEI site. This is because mobilization of contamination associated with the surfaces of the building floors would result in only a negligible increase in concentration of the building demolition debris and will therefore not result in the building demolition debris exceeding the average 1.0 $g^{235}/10L$ concentration limit for receipt and disposal at the USEI site.

2.4.2.4 Safety Controls

No CSCs or DinD controls have been identified in the risk assessment because a criticality accident due to consignment of building demolition debris with excessively high ^{235}U concentration to the USEI site is not credible.

2.4.3 Wrong Material is Loaded for Shipment to USEI

2.4.3.1 Discussion

As stated previously, any waste shipped from the Hematite Site must not exceed an average concentration of 1.0 $g^{235}U/10L$. This is significantly below the maximum subcritical infinite sea concentration of 4.0 $g^{235}U/L$ for nominal soil (Appendix A).

This upset scenario involves loading the wrong waste for shipment. This upset has the potential to allow the concentration limit to be exceeded by shipping higher concentration *non NCS Exempt* building demolition debris segregated at the Hematite site to the USEI site. Note that this event sequence addresses only Hematite decommissioning wastes derived from building demolition debris, and does not include building slabs and foundations. Also note that other non-building Hematite decommissioning wastes are separately addressed in Section 2.4.3 of Reference 10.

2.4.3.2 Risk Assessment

The risk assessment provided in Section 2.4.1 demonstrates that the materials associated with the structure and content of the buildings designated for demolition (Table 1-1) contain sufficiently low ^{235}U concentration to ensure that the receipt and disposal of their demolition debris at the USEI site cannot credibly result in a criticality accident. This risk assessment considered all materials associated with the buildings designated for demolition, including their existing content, however, assumptions were made regarding the outcome of future D&D operations within the former process buildings prior to their demolition. In addition assumptions were made regarding potential future use of some of the non-former process buildings designated for demolition.

Based on the building overview provided in Section 1.4 and the risk assessment provided in Section 2.4.1, it is seen that the former process buildings contain various contaminated items, some of which will be removed from the buildings prior to their demolition. Specifically, the items listed in Table 1-4 are not intended for disposal at the USEI site and were therefore not considered as any component of the building demolition debris in Section 2.4.1.

It is therefore necessary to ensure that the items listed in Table 1-4 have been removed from the buildings prior to their demolition. By requiring that the items listed in Table 1-4 are confirmed to be removed from the former process buildings either at the completion of D&D operations, or at a later date prior to building demolition, will ensure that it would be at least unlikely for any of these items to still remain within the buildings at the time of their demolition. Requiring independent verification will ensure that it would be independently unlikely for any of these items to still remain within the buildings at the time of their demolition. The combination of the two independent checks will ensure that the items listed in Table 1-4 will not be included in the building demolition debris and will thus not cause the building demolition debris to exceed the criteria for waste acceptance and burial at the USEI site. Based on these considerations, there is no potential for a criticality incident during receipt and burial of building demolition wastes at the USEI site, due to the inadvertent consignment

of the items listed in Table 1-4. This is because this scenario requires simple independent verifications of the removal of items. Even if these controls were failed, the total mass of ^{235}U involved would be only 1115.4 g ^{235}U (Table 1-4), and would correspond to a very low concentration of ^{235}U when comingled with the building structural debris which would, in practice, meet the limit for receipt and disposal at the USEI site.

The items listed in Table 1-5 and Table 1-6 are not indicated for removal from the former process buildings prior to building demolition, although some of the items listed in Table 1-5 will be decontaminated. The Table 1-5 items indicated for decontamination include three HEPA units, two sections of duct, a cable tray, and pipe section 254-5. These seven items will be decontaminated as part of the pre-demolition D&D operations described in Section 1.4.1.2 until the residual mass estimated for each item is below 10 g ^{235}U (determined using the mass estimation methods employed in Reference 12). The risk assessment provided in Section 2.4.1 demonstrates that the low individual ^{235}U mass associated with these items following their decontamination, and their natural comingling with the surrounding low concentration structural debris during the building demolition process, will ensure their acceptability for consignment to the USEI site for disposal. In practice, even if these items were not decontaminated prior to building demolition, the low combined mass involved (360.4 g ^{235}U, Table 1-5) would result in a very small probability that their comingling with the building demolition debris could result in the debris exceeding the USEI concentration limit for receipt and disposal. Nevertheless, it is prudent to establish a CSC to ensure that it would be unlikely that the items indicated for decontamination in Table 1-5 are not decontaminated to the credited level, or otherwise not removed from the buildings prior to their demolition. Requiring independent verification will ensure that it would be independently unlikely for any of these items to contain greater than the credited ^{235}U mass at the time of building demolition. The combination of the two independent checks will ensure that these items will not result in the building demolition debris exceeding the criteria for waste acceptance and burial at the USEI site. Based on these considerations, there is no potential for a criticality incident during receipt and burial of building demolition wastes at the USEI site, due to non-decontamination or inadequate decontamination of the seven items listed in Table 1-5. This is because this scenario requires simple independent verifications of the decontamination of seven items. Even if these controls were failed, the total mass of ^{235}U involved would be only 360.4 g ^{235}U (Table 1-5), and would correspond to a very low concentration of ^{235}U when comingled with the building structural debris which would, in practice, meet the limit for receipt and disposal at the USEI site.

The non-former process buildings designated for demolition (Table 1-1) are not as contaminated as the former process buildings. However, potential future use of some of these buildings may result in additional contamination. In addition some buildings may be used in the future to store/use radioactive materials/SNM. It is therefore necessary to ensure that prior to their demolition, each of these buildings still exhibit lower contamination levels relative to the former process buildings. This is achieved by establishing a CSC to require that any buildings used in the future to store or use radioactive material/SNM are re-surveyed to ensure that their current lower contamination condition is still valid prior to their demolition. This CSC will ensure that it would be unlikely for the debris originating from the demolition of

these buildings to exceed the USEI concentration limit for receipt and disposal. Combined with the independent unlikely probability that these buildings could be contaminated in any future use to a level that would result in exceeding the USEI concentration limit (due to the strict SNM controls for containerization, handling and evaluation of SNM outlined in Reference 10), ensures that there is no potential for a criticality incident during receipt and burial of the debris from demolition of these buildings.

Because some of the non-former process buildings designated for demolition (Table 1-1) may contain radioactive materials/SNM in the future, it is also important to ensure that these materials are removed and packaged for shipment to an accepting facility prior to building demolition. In addition, because the SWTP shed equipment is not evaluated in Section 2.4.1 it is also important that this equipment is removed prior to demolition of the SWTP shed. Consistent with the approach used above, CSCs are established to ensure independent verifications that these items are removed prior to building demolition. The provision of simple independent unlikely to fail CSCs will ensure that the demolition debris from these buildings will meet the concentration limit for receipt and disposal at the USEI site.

2.4.3.3 Summary of Risk Assessment

Based on the discussion provided above, it is concluded that there is no potential for a criticality accident due to inadvertently transferring high concentration Hematite segregated wastes to the USEI site. This is because the event sequence would require failure of multiple independent simple administrative CSCs related to removing, decontaminating, and segregating waste with concentrations potentially above the USEI limit for receipt and disposal.

2.4.3.4 Safety Controls

The explicit CSCs relevant to ensuring concentration control for receipt and burial of Hematite building demolition debris decommissioning wastes are provided in Section 3.2.2 and are listed below. These controls ensure that the risks from criticality are as low as is reasonably achievable.

> **Administrative CSC 01:** *Prior to performing any building demolition activities associated with the former process buildings, it SHALL be confirmed that all of the items listed in Table 1-4 of this NCSA have been completely removed from the former process buildings and segregated to ensure that they cannot be inadvertently consigned to the USEI site for disposal.*

Administrative CSC 02: *Prior to performing any building demolition activities associated with the former process buildings, it SHALL be confirmed that each of the seven items listed in Table 1-5 of this NCSA for decontamination has been decontaminated to the required level (as specified in Table 1-5), or otherwise completely removed from the former process buildings and segregated to ensure that they cannot be inadvertently consigned to the USEI site for disposal.*

Administrative CSC 03: *Prior to demolition of the West and South vaults (buildings 235 and 252) and building 115, all contained SNM SHALL be removed and segregated to ensure that they cannot be inadvertently consigned to the USEI site for disposal.*

Administrative CSC 04: *Prior to demolition of the SWTP Shed all contained SWTP equipment SHALL be removed and segregated to ensure that they cannot be inadvertently consigned to the USEI site for disposal.*

Administrative CSC 05: *Prior to demolition of the Tile Barn (building 101), the Wood Barn (building 120), the West and South vaults (buildings 235 and 252), building 115, building 245, and the SWTP shed, the surfaces of the respective buildings/shed SHALL be confirmed to not comprise greater ^{235}U contamination than documented in Table 1-7, Table 1-8, and Table 1-9 of this NCSA. Note that any buildings/shed not used in future radioactive material/SNM operations do not require confirmatory characterization provided the subject buildings/shed have not been used in such future radioactive material/SNM operations.*

Administrative CSC 06: *Building pre-demolition CSCs 01, 02, 03, 04, and 05 shall be independently followed/confirmed by at least one individual.*

In support of the above administrative CSCs, the following equipment is credited:

Safety Related Equipment 01: *Instruments used in support of building characterization radiological surveys (when used in support of a CSC).*

Basis: Provides confidence that ^{235}U contamination associated with building surfaces and items contained within will be detected and accounted for to ensure that the waste materials shipped to the USEI site for disposal will have a fissile nuclide concentration not exceeding 1 g ^{235}U/10L.

2.4.4 Migration and Localized Concentration of ^{235}U in USEI Landfill Cells, Leachate System, and/or Evaporation pond

2.4.4.1 Discussion

The preceding event sequences in this NCSA demonstrate that there is no potential to ship Hematite building demolition debris decommissioning wastes with a concentration exceeding 1.0 g^{235}U/10L to the USEI site. This low concentration level is significantly below the maximum subcritical infinite sea concentration of 4.0 g^{235}U/L for nominal soil (Appendix A). This low concentration level is also substantially below a fictitious minimum critical concentration of 1.4 g^{235}U/L for bounding soil consisting of only SiO_2 per NUREG/CR-6505 (Ref. 5).

This upset scenario pertains to the ^{235}U migration and reconfiguration into an area of the cell that exceeds the minimum critical concentration. The risk assessment that follows demonstrates that the resulting accident sequence is not credible to result in a criticality incident. Note that Section 2.4.4 of Reference 10 provides a similar assessment for the other (non-building) Hematite decommissioning wastes that are indicated for disposal at the USEI site.

2.4.4.2 Risk Assessment

NUREG/CR-6505 (Ref. 5, pg. 45) demonstrates that nominal soil in a slab configuration requires a lower areal density for a criticality to be possible versus a cylindrical or spherical geometry. For instance, at a concentration of 0.006 g^{235}U/cm^3 (i.e., 6 kg^{235}U/L), the calculated critical areal density is 5.2 kg ^{235}U/m^2 for an infinite slab in a planar configuration whereas the corresponding critical linear density for an infinite cylinder is 7.8 kg ^{235}U/m^2. Therefore, achieving a criticality in a cylindrical geometry requires significant lateral and vertical ^{235}U migration. In addition, NUREG/CR-6505 (Ref. 5, pg. 46) demonstrates the corresponding critical areal density for a spherical geometry is 9.34 kg ^{235}U/m^2. Based on the above comparisons, a slab provides the most likely condition for a possible criticality.

Considering that a slab provides the most efficient condition for a criticality, NUREG/CR-6505 (Ref. 5, pg. 96) demonstrates that a slab thickness of 2131 cm and areal density of 30.2 kg/m^2 is required for a criticality to be possible for corresponding density of 1.4 g^{235}U/L for bounding SiO_2 soil. Therefore, not only does the Hematite building demolition debris decommissioning waste limiting concentration of 1 g^{235}U/10L have to increase by a factor of more than ten, but a significant quantity has to migrate to a layer at least 2131 cm (21.31 m) thick for a criticality to be possible. For higher ^{235}U concentrations a smaller slab thickness is required, but the concentration factor must also be higher before a criticality could be possible. For instance, NUREG/CR-6505 (Ref. 5, pg. 99) demonstrates that a slab thickness of 94.57 cm and areal density of 5.4039 kg/m^2 is critical, corresponding to a density of 5.7 g^{235}U/L for the bounding SiO_2 soil. Also, for nominal soil NUREG/CR-6505 (Ref. 5, pg. 94) demonstrates that a slab thickness of 78.86 cm and areal density of 4.732 kg/m^2 is critical, corresponding density of 6.0 g^{235}U/L.

The maximum safe ^{235}U mass of 760 g^{235}U (Table A-1) corresponds to a full water-reflected spherical homogeneous mixture of ^{235}U and water ~14 L in volume at an optimum concentration of 55 g^{235}U/L. It is not reasonable to postulate that such idealized conditions could be achieved or even approximated in a waste/soil due to the poor moderating characteristics of building demolition debris (predominantly concrete and steel) relative to full density water, as previously noted. In practice an accumulation representing kilogram quantities of *fissile material* would be required in a compact volume, and with an efficient geometry and distribution, before a criticality could credibly occur.

Section 10 of NUREG/CR-6505 (Ref. 5, pg. 45) concludes that a concentration factor of greater than ten is not considered credible for migration of ^{235}U based on the hydrogeochemical modeling and assumptions used for the Envirocare Site. Section 1.4 of NUREG/CR-6505 (Ref. 5, pg. 2) states that no other sites were considered, but the same analysis methods can be used to evaluate other sites. Therefore, the methodology was compared to the conditions at the USEI site and Reference 6 confirms that the methods and results in NUREG/CR-6505 also support that a concentration factor of greater than ten is also not considered credible for migration of ^{235}U at the USEI site. As stated above, the concentration limit is 1 g^{235}U/10L for waste shipments from the Hematite site to the USEI site. Based on this low concentration level, a criticality incident is not credible at the USEI site due to migration and concentration of ^{235}U, because it would require a concentration increase by more than a factor of ten and Reference 6 concludes that a concentration increase by more than a factor of ten is not credible.

The conclusion that a criticality is not credible at the USEI site is further supported by the disposal cell placement practices and leachate collection systems in place at the USEI site, as documented in Section 2.4.4 of Reference 10.

2.4.4.3 Summary of Risk Assessment

Based on the discussion provided above, it is concluded that it is not credible for this scenario to result in a criticality accident at the USEI site. Consequently no controls are identified to ensure the subcriticality of Hematite building demolition debris decommissioning wastes at the USEI site. All the controls for this scenario are provided in previous accident sequences in this NCSA. These controls are listed in Section 3.2.2 and will ensure that the USEI site waste acceptance concentration limit of 1 g^{235}U/10L is not exceeded.

3.0 SUMMARY OF CRITICALITY SAFETY CONTROLS

3.1 Criticality Safety Parameters

The extent of control of each of the various criticality safety parameters introduced in Section 2.1 is summarized in Table 3-1.

Table 3-1 Criticality Safety Parameters

Nuclear Parameter	Controlled (Y/N)	Basis	Reference
Geometry	N	The safety assessment of receipt and burial of Hematite building demolition debris decommissioning wastes at the USEI site does not credit geometry.	N/A
Interaction	Y	The safety assessment of receipt and burial of Hematite building demolition debris decommissioning wastes at the USEI site credits administrative CSCs to ensure that high concentration wastes that may normally require spacing are not shipped to the USEI site.	Section 2.4.3
Mass	N	The safety assessment of receipt and burial of Hematite building demolition debris decommissioning wastes at the USEI site does not credit mass control because the very low concentration of ^{235}U associated with the building demolition debris ensures that an unlimited quantity of decommissioning wastes will be safely subcritical upon receipt and following disposal at the USEI site.	N/A
Isotopic / Enrichment	N	The safety assessment of receipt and burial of Hematite building demolition debris decommissioning wastes at the USEI site is conservatively based on subcritical limits derived for uranium metal with 100 wt.% ^{235}U/U enrichment.	N/A
Moderation	N	The safety assessment of receipt and burial of Hematite building demolition debris decommissioning wastes at the USEI site is conservatively based on subcritical limits derived for optimally moderated infinite media comprising only ^{235}U and a bounding soil consisting of only SiO_2.	N/A

Nuclear Parameter	Controlled (Y/N)	Basis	Reference
Density	N	The safety assessment of receipt and burial of Hematite building demolition debris decommissioning wastes at the USEI site is conservatively based on subcritical limits derived for uranium metal at maximum theoretical density.	N/A
Heterogeneity	N	The safety assessment of receipt and burial of Hematite building demolition debris decommissioning wastes at the USEI site is conservatively based on subcritical limits derived for homogeneous uranium-moderator mixtures (with 100 wt.% ^{235}U/U enrichment), for which subcritical limits are smaller than equivalent heterogeneous uranium-moderator mixtures.	N/A
Neutron Absorbers	N	The safety assessment of receipt and burial of Hematite building demolition debris decommissioning wastes at the USEI site does not credit fixed neutron absorbers.	N/A
Reflection	N	The safety assessment of receipt and burial of Hematite building demolition debris decommissioning wastes at the USEI site conservatively uses subcritical limits based on optimally moderated infinite media, which bounds any credible reflection condition.	N/A
Concentration	Y	The safety assessment of receipt and burial of Hematite building demolition debris decommissioning wastes at the USEI site credits administrative CSCs to ensure that there is no potential to ship waste with an unanalyzed concentration to the USEI site.	Section 2.4.3
Volume	N	The safety assessment of receipt and burial of Hematite building demolition debris decommissioning wastes at the USEI site does not credit volume control.	N/A

3.2 Criticality Safety Controls and Defense-in-Depth Controls

This section provides a schedule of Systems, Structures, and Components (SSCs), CSCs and DinD controls that have been established as important to safety in the risk assessment of Hematite building demolition debris decommissioning waste receipt and disposal at the USEI site.

3.2.1 Systems, Structures, and Components

The following SSCs have been recognized as important to ensuring the criticality safety of Hematite building demolition debris decommissioning waste receipt and disposal at the USEI site. The SSCs are identified as Safety Related Equipment (active function).

> **Safety Related Equipment 01:** *Instruments used in support of building characterization radiological surveys (when used in support of a CSC).*
>
> *Basis:* *Provides confidence that ^{235}U contamination associated with building surfaces and items contained within will be detected and accounted for to ensure that the waste materials shipped to the USEI site for disposal will have a fissile nuclide concentration not exceeding 1 $g^{235}U/10L$.*

3.2.2 Criticality Safety Controls

The following CSCs have been recognized as important to ensuring the criticality safety of Hematite building demolition debris decommissioning waste receipt and disposal at the USEI site.

> **Administrative CSC 01:** *Prior to performing any building demolition activities associated with the former process buildings, it SHALL be confirmed that all of the items listed in Table 1-4 of this NCSA have been completely removed from the former process buildings and segregated to ensure that they cannot be inadvertently consigned to the USEI site for disposal.*
>
> **Administrative CSC 02:** *Prior to performing any building demolition activities associated with the former process buildings, it SHALL be confirmed that each of the seven items listed in Table 1-5 of this NCSA for decontamination has been decontaminated to the required level (as specified in Table 1-5), or otherwise completely removed from the former process buildings and segregated to ensure that they cannot be inadvertently consigned to the USEI site for disposal.*
>
> **Administrative CSC 03:** *Prior to demolition of the West and South vaults (buildings 235 and 252) and building 115, all contained SNM SHALL be removed and segregated to ensure that they cannot be inadvertently consigned to the USEI site for disposal.*
>
> **Administrative CSC 04:** *Prior to demolition of the SWTP Shed all contained SWTP equipment SHALL be removed and segregated to ensure that they cannot be inadvertently consigned to the USEI site for disposal.*

Administrative CSC 05: *Prior to demolition of the Tile Barn (building 101), the Wood Barn (building 120), the West and South vaults (buildings 235 and 252), building 115, building 245, and the SWTP shed, the surfaces of the respective buildings/shed SHALL be confirmed to not comprise greater ^{235}U contamination than documented in Table 1-7, Table 1-8, and Table 1-9 of this NCSA. Note that any buildings/shed not used in future radioactive material/SNM operations do not require confirmatory characterization provided the subject buildings/shed have not been used in such future radioactive material/SNM operations.*

Administrative CSC 06: *Building pre-demolition CSCs 01, 02, 03, 04, and 05 shall be independently followed/confirmed by at least one individual.*

3.2.3 Defense-in-Depth Controls

No DinD controls have been identified from the criticality safety assessment of Hematite building demolition debris decommissioning waste receipt and disposal at the USEI site.

4.0 CONCLUSION

This criticality safety assessment demonstrates that the disposal of Hematite building demolition debris decommissioning waste at the USEI site can be safely performed. The assessment has determined that there are very large margins of safety under normal (i.e., expected) conditions and that there is considerable tolerance to abnormal conditions. Under all normal and foreseen abnormal conditions a criticality event is considered either not credible or is precluded by controls in place at the Hematite site.

This analysis applies to disposal of Hematite building demolition debris decommissioning wastes at the USEI site. The scope of this assessment is limited to the materials associated with the structure and content of the buildings designated for demolition (Table 1-1), and does not include building slabs and foundations.

5.0 REFERENCES

1. American National Standard for Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors, ANS-8.1, American Nuclear Society.

2. Atlantic Richfield Hanford Company (1969), Criticality Handbook Volume II, R D Carter, G R Kiel, K R Ridgway.

3. LA-10860-MS, Critical Dimensions of Systems Containing ^{235}U, ^{239}Pu, and ^{233}U, 1986 Revision.

4. NSA-TR-09-05, Rev. 0, Nuclear Criticality Safety Calculations to Support Criticality Parameter Sensitivity Studies for ^{235}U Contaminated Soil/Wastes, April 2009.

5. NUREG/CR-6505, Vol. 1, The Potential for Criticality Following Disposal at Low-Level Waste Facilities, June 1997.

6. SAHEM00194-09-0003, Application of NUREG-6505V2 to Waste from the Hematite Site, Geological Engineering and Environmental Services Company, February 6, 2009.

7. Section II US Ecology Idaho Facility Overview.

8. NSA-TR-09-25, Rev. 0, Nuclear Criticality Safety Assessment of Decontamination and Decommissioning Operations within the Former Process Buildings at the Hematite Site, B. Matthews, December 2009.

9. NSA-TR-09-23, Rev. 0, Calculations to Establish an Estimate of the Mass of ^{235}U Associated with the Floors, Walls, Ceilings, and Roof of the Hematite Facility Former Process Buildings, C. Henkel, October 2009.

10. NSA-TR-09-14, Rev. 0, Nuclear Criticality Safety Assessment of the US Ecology Idaho (USEI) Site for the Land Fill Disposal of Decommissioning Waste from the Hematite Site, R. Maurer, May 2009.

11. Barnebey & Sutcliffe drawing #27268, HEPA Filter Housings, March 9, 1989.

12. NSA-TR-09-21, Rev. 0, Calculations to Establish an Estimate of the Mass of ^{235}U Associated with Piping, Ventilation Duct, and Miscellaneous Components in the Hematite Facility Former Process Buildings, B. Matthews, October 2009.

13. NSA-TR-09-22, Rev. 0, Calculations to Establish an Estimate of the Mass of ^{235}U Associated with Equipment Remaining in the Hematite Facility Former Process Buildings, M. Corum, October 2009.

14. NSA-TR-10-02, Rev. 0, Calculations to Establish an Estimate of the Mass of ^{235}U Associated with the Floors, Walls, Ceilings, and Roof of Various Hematite Facility Non-Former Production Buildings, C. Henkel, February 2010.

15. Westinghouse drawings C-5019-2001, B-5019-2002, B-5019-3011 and vendor literature for shredder, blender, and sifter, and vendor literature for structural steel weight.

16. Westinghouse drawing D-5018-8011 and vendor literature for stainless material weight.

17. HDP-TBD-WM-902, Building Demolition Debris Volume and Weight Estimate.

18. Westinghouse (E. K. Hackmann) letter to NRC (Document Control Desk), HEM-09-121, dated October 23, 2009, "Hematite Decommissioning Project Summary Report of the 2009 Process Building".

APPENDIX A

Relevant Criticality Data

CHARACTERISTICS OF BURIED WASTES AND CONTAMINATED SOILS

It is considered that building demolition debris is generally a low-risk *fissile material* because the form and associated matrix conditions are far from optimum for a neutron chain reaction. The characteristics of building demolition debris are completely dissimilar to those of an efficient fissile system. Efficient critical systems comprise:

- Efficient moderating materials;
- Uniform fissile / moderator mixtures;
- Concentrations of several tens of grams fissile per liter;
- Compact arrangements;
- Lack of voidage and diluents;
- Lack of neutron poisons; and
- Efficient reflectors or interaction with other *fissile material*.

As each parameter, or combination of parameters, moves away from the optimum the fissile mass required for a criticality increases. As this mass increases the probability that such a high fissile mass could have arisen and remained undetected decreases.

While criticality would be possible under highly non-optimum conditions (e.g., in low density, poisoned systems) the fissile mass needed for criticality (i.e., many kilograms) would far exceed credible quantities.

Single Items

The presence of a sufficiently large fissile mass (i.e., ≥ a minimum critical mass) in a single accumulation could potentially result in a criticality. The maximum subcritical mass for ^{235}U in water is 760 g (Ref. 1), corresponding to optimum conditions of:

- Spherical homogeneous accumulation of ^{235}U/ water;
- Full water moderation (i.e., full density water, no poisons, diluents, voidage etc.);
- Optimum concentration of approximately 55 g^{235}U/L (corresponding to a volume of approximately 14 liters);
- Full water reflection; and
- Isotopic content of 100 w/o ^{235}U.

This value has traditionally been used in the assessment of isolated HEU units as a pessimistic but bounding case to generically consider all possible conditions within contaminated wastes.

As discussed above, the nature of building demolition debris is such that it is not considered credible that a situation could arise in which all parameters are optimized and the presence of a minimum critical mass would result in a criticality. The reactivity of any system and hence the fissile mass that would be required for criticality is dependent on the combination of a number of parameters, e.g., concentration, moderating properties of the waste matrix, geometry and reflection conditions.

CRITICAL AND SUBCRITICAL LIMITS

Table A-1 outlines the subcritical and critical limits for ^{235}U-water systems.

Table A-1 Single Parameter Limits for homogeneous ^{235}U/water mixtures

Parameter	Critical Limit[1]	Maximum Subcritical Limit[2]	Description / Restrictions
Mass	820 g ^{235}U	760 g ^{235}U	Any geometrical configuration, even when optimally moderated and fully reflected by water. Applies to all chemical forms (e.g., oxides as powders, metals, etc.).
Concentration	11.8 g ^{235}U/L	11.6 g ^{235}U/L	Unlimited volume of homogeneous solution in any chemical form (e.g., nitrate, oxalate, etc.), and in any geometry.
Volume	6.1 L	5.5 L	Homogeneous solution in any chemical form (e.g., nitrate, oxalate, etc.), at any concentration, fully reflected by water.
Geometry (∞ Cylinder Diameter)	14.3 cm	13.7 cm	Homogeneous solution in any chemical form (e.g., nitrate, oxalate, etc.), at any concentration and volume, and fully reflected by water.
Geometry (∞ Slab Thickness)	4.9 cm	4.4 cm	Homogeneous solution in any chemical form (e.g., nitrate, oxalate, etc.), at any concentration and volume, and fully reflected by water.
Geometry (∞ Slab Areal Concentration)	390 g/ft^2 (0.42 g/cm^2)	372 g/ft^2 (0.40 g/cm^2)	Homogeneous solution in any chemical form (e.g., nitrate, oxalate, etc.), any volume (i.e., any slab depth) and fully reflected by water.

Source: Ref. 1 and Ref. 2

Notes:
1. Ref. 2, page III.B-2
2. Ref. 1, Table 1

Table A-2 outlines the single parameter critical limits for homogeneous U-water systems as a function of the U enrichment.

Table A-2 Critical Limits for homogeneous U/water mixtures as a function of U enrichment

U Enrichment wt.% ^{235}U/U	Spherical Critical Mass (g)	Spherical Critical Volume (L)	Critical ∞ Cylinder Diameter (cm)	Critical ∞ Slab Thickness (cm)
3#	3200	80.0	38.0	20.0
5#	1950	37.0	28.0	14.0
30.3#	990	11.0	19.0	7.4
100##	820	6.1	14.3	4.9

Source: Ref. 2 and Ref. 3

Notes:
Ref. 2, page III.B-2
Ref. 3, Figures 14-17

Reference 4 presents the results of a broad and comprehensive set of calculations performed to compare the reactivity of various finite and infinite systems containing uranium. This calculation established a minimum critical infinite sea concentration for a ^{235}U/soil mixture of 5.5 g^{235}U/L. Assuming a maximum safe fissile concentration of 4.0 g^{235}U/L provides a substantial subcritical margin of 0.15 g^{235}U/L. This margin is considered sufficiently large to also address any additional penalty that may be appropriate to account for validation of the materials modeled in the calculations used to establish the limit.