Relocation Impacts of a Major Release from SRTC

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SAVANNAH RIVER SITE

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Abstract

The relocation impacts of a postulated accidental release, scenario 1-RD-3, are evaluated for the Savannah River Technology Center (SRTC). The extent of the area potentially contaminated to a level that would result in doses exceeding the relocation protective action guide (PAG) is calculated. The maximum calculated distance downwind from the accident at which the relocation PAG is exceeded is also determined. The consequences of the particulate portion of the release are evaluated using the HOTSPOT model and an EXCEL spreadsheet. The consequences of the tritium release are evaluated using UFOTRI.

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Introduction

The relocation impacts of a postulated accidental release, scenario 1-RD-3, are evaluated for the Savannah River Technology Center (SRTC). For the particulate release, the size of the area, as well as the maximum distance out to which relocation would be recommended are calculated. For the tritium release, the dose at the site boundary due to re-emission in the first year following the release is calculated and compared to the Protective Action Guide (PAG)

Approach

The methodology for determining the areas potentially requiring relocation is outlined below.

1. Determine the source terms (radionuclide-specific respirable and total airborne releases).
2. Determine the relocation PAGs for the radionuclides in the source terms in accordance with the *Manual of Protective Action Guides and Protective Actions for Nuclear Incidents* (EPA 1992).
3. Calculate the doses (from inhalation and ground shine) associated with a unit deposition of (respirable) particulates. The inhalation source term is derived from the respirable airborne release. The ground shine source term is derived from the total (nonrespirable plus respirable) airborne release.
4. Sum the doses resulting from the unit deposition. Divide the relocation PAG by the sum of the doses to obtain the Derived Response Level (DRL) for relocation.
5. Run the dispersion/deposition model HOTSPOT (Homann 1994) to determine areas impacted.
6. If tritium is released, use the UFOTRI model (Raskob 1990 and 1993) to calculate doses from residual tritium in the environment, and compare to PAGs.

Background

The area affected is considered to be that area in which the deposition due to an accidental release could cause the projected dose to an individual in that area to exceed the PAG. The Environmental Protection Agency (EPA) presents the rationale for its relocation PAG in its *Manual of Protective Action Guides and Protective Actions for Nuclear Incidents* (EPA 1992, section 4.2.1, p. 4-4 and Appendix E). The objectives of the relocation PAG are to keep the dose in any year after the first year following the accident from exceeding 500 mrem (5 mSv), and to keep the cumulative dose over 50 years (including the first year) from exceeding 5,000 mrem (50 mSv). For the reactor accidents addressed in EPA (1992), the PAG is 2,000 mrem (20 mSv) projected dose*. Additionally, it specifies that at 50 times the numerical value of the PAG, relocation to limit beta exposure to skin would be warranted.

* The projected sum of effective dose equivalent from external gamma radiation and committed effective dose equivalent from inhalation of resuspended materials, from exposure or intake during the first year.

For fission product releases, relocation decisions are based on whole body irradiation (or effective dose equivalent); preferential irradiation of single tissues is not anticipated to be limiting. However, the radiological hazards associated with many radionuclides (such as plutonium and other actinides) differ significantly from those of the fission product mix considered in EPA (1992). Guidance from the ICRP gives dose limits to single tissues, based on non-stochastic effects that are a factor of ten greater than the effective dose limit based on stochastic effects (ICRP 1977). In general, the radiation associated with the decay of fission products is very penetrating and presents an external hazard (i.e., a person need only be exposed to the radioactive material to receive a dose; the material does not have to be ingested or inhaled) or a whole body irradiation hazard (material inside the body irradiates many tissues as it decays). The radiation associated with the decay of many actinides is not very penetrating and, therefore, only presents a significant radiological hazard when the material is taken into the body, either by inhalation or ingestion. Even then, specific organs are more limiting based on the radiosensitivity of the organ and the distribution of the radionuclides in the body. For the inhalation and ingestion pathways the dose to bone surfaces is more limiting than the effective dose for many actinides.

In order to facilitate comparisons between measured quantities and projected doses, it is often convenient to express a projected dose in terms of a measurable quantity. The value of a measurable quantity that corresponds to a dose value of interest (such as a PAG) is referred to as a derived response level (DRL). Spreadsheet calculations will be performed to determine the relocation DRL for the particulate portion of the nuclide mix of interest. This DRL will then be used in conjunction with the HOTSPOT computer model to determine the size or extent of the area affected by the release of particulates.

The dose resulting from tritium will be evaluated using the UFOTRI model.

Analysis

Derivation of the total release

The postulated respirable source terms for SRTC release scenario 1-RD-3 are found in Attachments 2, 3, and 5 of the SRTC Emergency Planning Hazards Assessment (EPHA) (S-EHA-A-00001), Rev. 1, Appendix B, Calculation 1. These respirable source terms are derived from a detailed analysis involving consideration of physical forms and dispersing mechanisms. An overall damage ratio (DR) is applied to the overall source term from the Attachments in S-EHA-A-00001, Rev. 1, Appendix B, Calculation 1 (see sheet 8 of 30 for the DR specification). To determine the total release, it is necessary to "back out" the respirable fraction (RF) from the respirable release source terms. This is done in calculation S-CLC-A-00104 and summarized in Table 1. The activities in Table 1 do not include a correction for a DR less than unity, and the Pu-239/241 and Pu-242 activities are for mixes.

Table 1. Total airborne releases for SRTC scenario 1-RD-3, with mixes and DR not applied

Nuclide	Pre-DR total airborne release (Ci)
Am-241	1.21E-02
Am-243	9.68E-04
Ba-133	5.38E-13
Ce-144	1.90E-05
Cf-249	1.27E-05
Cf-252	1.59E-02
Cm-244	2.03E-02
Cm-246	1.00E-03
Co-60	7.19E-01
Cs-137	1.19E+00
H-3	2.14E+04
Np-237	4.20E-05
Pm-147	2.52E-08
Pu-238	5.10E-02
Pu-239	1.78E-05
Pu-239/241mix	4.56E-01
Pu-240	9.72E-07
Pu-241	2.91E-01
Pu-242mix	1.28E-02
Sr-90	1.18E+00
Tc-99	3.60E-13
Th-232	1.93E-06
Tl-204	9.00E-10
U-235	1.78E-06
U-238	2.15E-04

Reference: S-CLC-A-00104 Table 1, Sheet 6

Two additional steps are applied to the potential release activities in Table 1. First, the Pu-239/241 and Pu-242 mixes must be separated into their constituents. The makeups of these mixes are given in Tables 2 and 3.

Table 2. Pu-239/241 mix activity fractions

Nuclide	Activity fraction
Pu-238	0.0073
Pu-239	0.2029
Pu-240	0.0462
Pu-241	0.6761
Pu-242	0.0003
Am-241	0.0675

Reference: S-CLC-A-00080 Rev. 0, Sheet 4 of 26

Table 3. Pu-242 mix activity fractions

Nuclide	Activity fraction
Pu-238	0.0786
Pu-239	0.00024
Pu-240	0.01184
Pu-241	0.88886
Pu-242	0.00074
Am-241	0.01977

Reference: S-CLC-A-00080 Rev. 0, Sheet 4 of 26

The final step is to apply a damage ratio (DR) of 0.75, consistent with the DR assumed for respirable releases in the SRTC EPHA. These total releases are shown in Table 4.

Table 4. Total airborne releases for SRTC scenario 1-RD-3, unmixed and with DR applied

Nuclide	DR=0.75, unmixed total release (Ci)
Am-241	3.23E-02
Am-243	7.26E-04
Ba-133	4.04E-13
Ce-144	1.42E-05
Cf-249	9.53E-06
Cf-252	1.19E-02
Cm-244	1.53E-02
Cm-246	7.50E-04
Co-60	5.40E-01
Cs-137	8.91E-01
H-3	1.61E+04
Np-237	3.15E-05
Pm-147	1.89E-08
Pu-238	4.15E-02
Pu-239	6.94E-02
Pu-240	1.59E-02
Pu-241	4.58E-01
Pu-242	1.10E-04
Sr-90	8.84E-01
Tc-99	2.70E-13
Th-232	1.45E-06
Tl-204	6.75E-10
U-235	1.34E-06
U-238	1.62E-04

Reference: SourceSRTC.xls, Worksheet "Nonresp + resp", columns L to N

Details of these spreadsheet calculations are presented in Attachment A. The total airborne particulate activity released is 2.96 Ci.

Determination of respirable release

The respirable source terms for SRTC release scenario 1-RD-3 are found in Attachments 2, 3, and 5 of S-EHA-A-00001, Rev. 1, Appendix B, Calculation 1. Respirable source terms from S-EHA-A-00001, Rev. 1, Appendix B, Calculation 1, without a DR of 0.75 and with Pu-239/241 and Pu-242 mixed, are listed in Table 5.

Table 5. Respirable airborne releases for SRTC scenario 1-RD-3, with mixes and DR not applied

Nuclide	Table 5 Pre-DR respirable airborne release (Ci)	Table 52 Pre-DR respirable airborne release (Ci)	Table 71 Pre-DR respirable airborne release (Ci)
Am-241	2.21E-03	1.86E-03	5.80E-03
Am-243	2.08E-04	6.59E-05	3.33E-04
Ba-133	2.69E-13	0.00E+00	2.69E-13
Ce-144	9.97E-07	7.75E-06	1.02E-05
Cf-249	2.13E-06	0	8.86E-06
Cf-252	7.85E-03	1.78E-03	6.29E-03
Cm-244	6.23E-03	3.99E-03	1.26E-02
Cm-246	3.70E-04	2.01E-05	2.75E-04
Co-60	3.30E-01	2.75E-02	3.62E-01
Cs-137	6.53E-02	4.88E-01	6.35E-01
H-3	1.07E+04	9.66E+00	1.07E+04
Np-237	8.86E-06	2.33E-08	2.37E-05
Pm-147	1.26E-08	0	1.26E-08
Pu-238	1.28E-02	1.00E-03	9.21E-03
Pu-239	8.88E-06	0	8.88E-06
Pu-239/241mix	5.96E-02	4.21E-03	8.09E-02
Pu-240	6.85E-07	0	0
Pu-241	4.80E-02	0	2.03E-01
Pu-242mix	2.31E-03	0	7.15E-03
Sr-90	6.04E-02	4.86E-01	6.31E-01
Tc-99	1.80E-13	0	1.80E-13
Th-232	1.02E-06	7.28E-09	8.89E-07
Tl-204	4.50E-10	0	4.50E-10
U-235	3.64E-07	2.27E-08	5.30E-07
U-238	2.66E-05	2.73E-07	4.13E-05

Reference: Source.xls, Worksheets Table 5, Table 52, and Table 71, Column C

Two additional steps are applied to the potential release activities in the preceding table. First, the Pu-239/241 and Pu-242 mixes must be separated into their constituents. The makeups of these mixes are in Tables 2 and 3.

The final step is to apply a damage ratio of 0.75, consistent with the SRTC EPA. These respirable releases are shown in Table 6. The respirable source term for 1-RD-3 is the sum of the three cases, and also presented in Table 6. Details of the calculation are presented in Attachment A. The summed respirable source term in Table 6 is used for subsequent calculations. The total respirable particulate airborne activity, summed over all nuclides and all three cases, is 2.67 Ci.

Table 6. Respirable airborne releases for SRTC scenario 1-RD-3, unmixed and DR applied

Nuclide	Table 5 DR'd respirable airborne release (Ci)	Table 52 DR'd respirable airborne release (Ci)	Table 71 DR'd respirable airborne release (Ci)	Summed DR'd respirable airborne release (Ci)
Am-241	4.71E-03	1.61E-03	8.55E-03	1.49E-02
Am-243	1.56E-04	4.94E-05	2.50E-04	4.55E-04
Ba-133	2.02E-13	0.00E+00	2.02E-13	4.04E-13
Ce-144	7.48E-07	5.81E-06	7.65E-06	1.42E-05
Cf-249	1.60E-06	0.00E+00	6.65E-06	8.24E-06
Cf-252	5.89E-03	1.34E-03	4.72E-03	1.19E-02
Cm-244	4.67E-03	2.99E-03	9.45E-03	1.71E-02
Cm-246	2.78E-04	1.51E-05	2.06E-04	4.99E-04
Co-60	2.48E-01	2.06E-02	2.72E-01	5.40E-01
Cs-137	4.90E-02	3.66E-01	4.76E-01	8.91E-01
H-3	8.03E+03	7.25E+00	8.03E+03	1.61E+04
Np-237	6.65E-06	1.75E-08	1.78E-05	2.44E-05
Pm-147	9.45E-09	0.00E+00	9.45E-09	1.89E-08
Pu-238	9.94E-03	7.73E-04	7.39E-03	1.81E-02
Pu-239	9.43E-03	6.41E-04	1.34E-02	2.35E-02
Pu-239/241mix				
Pu-240	2.15E-03	1.46E-04	3.05E-03	5.34E-03
Pu-241	6.74E-02	2.13E-03	1.97E-01	2.66E-01
Pu-242 pure	1.39E-05	9.47E-07	1.98E-05	3.47E-05
Sr-90	4.53E-02	3.65E-01	4.73E-01	8.83E-01
Tc-99	1.35E-13	0.00E+00	1.35E-13	2.70E-13
Th-232	7.65E-07	5.46E-09	6.67E-07	1.44E-06
Tl-204	3.38E-10	0.00E+00	3.38E-10	6.75E-10
U-235	2.73E-07	1.70E-08	3.98E-07	6.88E-07
U-238	2.00E-05	2.05E-07	3.10E-05	5.11E-05

Reference: Source.xls, Worksheet "resp sums", Columns A to F

Protective action guides

For evaluating the size of the area affected by potential accidents, relocation PAGs were used. Consideration was given to both effective dose and dose to bone surfaces. Since dose limits to single tissues, based on non-stochastic effects, are a factor of ten greater than the effective dose limit based on stochastic effects (ICRP 1977); the limit used for single tissues (e.g., bone surfaces) was ten times that used for effective dose. These PAG values were used for evaluating the size of the area in which relocation may be warranted as a consequence of potential accidents.

For releases consisting primarily of long-lived radionuclides, the relocation PAG level of 2,000 mrem (20 mSv) in the first year may not, by itself, provide the intended level of long-term protection. The relocation PAG is intended to prevent doses exceeding 500 mrem (5 mSv) in any year after the first year following the accident, or 5,000 mrem (50 mSv) over the fifty years immediately following the accident. The relocation PAG values for projected doses that were considered for this work are presented in Table 7.

Table 7. PAG values used in this analysis

PAG	Timeframe
2,000 mrem (20 mSv) effective dose, or 20,000 mrem (200 mSv) committed dose equivalent to a single tissue or organ	the first year following an accident
500 mrem (5 mSv) effective dose, or 5,000 mrem (50 mSv) committed dose equivalent to a single tissue or organ	any year after the first year following an accident
5,000 mrem (50 mSv) effective dose, or 50,000 mrem (500 mSv) committed dose equivalent to a single tissue or organ	over 50 years (including the first year) following an accident

The effective dose is the "projected sum of effective dose equivalent from external gamma radiation and committed effective dose equivalent from inhalation of resuspended materials, from exposure or intake during the" time period of interest (EPA 1992). Similarly, the dose to an individual organ should consider both the committed dose from any intake plus any external contribution to dose, if significant.

Determination of the DRL

For the general case when the total (respirable plus nonrespirable particulates) release may be different from the respirable release, the following approach is used. Tritium will be treated as a special case.

This analysis is ultimately referenced to a unit deposition of respirable material. The unit respirable deposition has a corresponding deposition of total particulate material. Figure 1 illustrates the steps of this analysis.

The first step is to assume a unit respirable deposition ($1 \mu\text{Ci}/\text{m}^2$) of the nuclide mix of interest.

This mix is then apportioned to the individual nuclides based on the activity fraction (the ratio of the individual nuclide activity to the sum of the activity released). That is:

$$dep_i = dep_{sum} \left(\frac{A_i}{A_{sum}} \right)$$

where

dep_i = the respirable deposition concentration of the i^{th} nuclide in $\mu\text{Ci}/\text{m}^2$,

dep_{sum} = the sum over all nuclides of the respirable deposition concentration ($1 \mu\text{Ci}/\text{m}^2$),

A_i = the respirable activity of the i^{th} nuclide (Ci), and

A_{sum} = the sum of the respirable activities released (Ci).

This calculation is performed in Spreadsheet "Source_terms_reloc.xls", Worksheet "Relo_SRTC", Columns E and F. Daughter radionuclide activity fractions are also calculated. Details of the spreadsheet calculations are in Attachment A.

Figure 1. Determination of the dose from a unit respirable release

The respirable deposition for each nuclide determined above is used to calculate the dose contributed by that nuclide for inhalation of resuspended material pathways for both effective and organ doses.

The skin dose from beta radiation and external whole-body dose from gamma exposure result from emanations from both respirable and nonrespirable particles that have been deposited on the ground. To find the total (respirable plus nonrespirable) deposition for each radionuclide that corresponds to a unit respirable deposition, two steps are performed. First, total depositions for each nuclide are found for a unit total deposition, using the preceding equation for respirable deposition, except substituting total depositions and activities for respirable depositions and activities. This is performed in Worksheet "Relo_SRTC", Columns C and D. Column D is the activity fraction, which is equivalent to the total deposition of the i^{th} nuclide that results from a unit total deposition.

The postulated respirable release is $x = 2.67$ Ci (Worksheet "Relo_SRTC", Cell E35) and the total release is $y = 2.96$ Ci (Worksheet "Relo_SRTC", Cell C35). The assumption is made that nonrespirable particles are deposited at the same rate as respirable particles, so the ratio of total activity deposited per unit area to the respirable activity deposited per unit area, at any location, will be in the same ratio as the total to respirable activity released. A respirable deposition of $1 \mu\text{Ci}/\text{m}^2$ corresponds to a total deposition $y/x = 2.96 / 2.67 = 1.11$ times as large, or $1.11 \mu\text{Ci}/\text{m}^2$. Multiplication of the total deposition of the i^{th} nuclide that results from a unit total deposition by this factor of 1.11 results in the total deposition of the i^{th} nuclide that results from a unit respirable deposition.

In Worksheet "Relo_SRTC", this y/x term is found in the external EDE (Column I) and skin dose (Column K) formulas as $\$C\$35/\$E\35 .

Once the respirable and total nuclide-specific depositions are found that correspond to a unit respirable deposition, doses of interest may be found by applying dose conversion factors. Respirable depositions are used to calculate committed dose equivalents to the bone surfaces and committed effective dose equivalents. Total depositions are used to calculate skin doses and doses from external gamma exposure. These calculations are in Columns H, I, K, and L of Worksheet "Relo_SRTC".

The CEDE from a unit respirable deposition is calculated in Column H. The CEDE from inhalation of each radionuclide is summed (Cell H47). The CEDE from each nuclide is the product of the following terms:

$\$C\7	unit respirable deposition, $1 \mu\text{Ci}/\text{m}^2$
$\$C\3	resuspension factor, m^{-1}
$\$C\4	breathing rate, m^3/yr
$\$C\5	conversion factor, $\text{Bq}/\mu\text{Ci}$
$\$C\6	conversion factor, mrem/Sv
$\$C\8	exposure period, 1 yr
$F(10 \text{ to } 34)$	respirable activity fraction
$\text{Relocation!H}(10 \text{ to } 34)$	CEDE DCF, Sv/Bq

The external dose equivalent from the total deposition corresponding to a unit respirable deposition is calculated in Column I. The external dose from each radionuclide is summed (Cell I47). The external dose equivalent for each nuclide is calculated as the product of the factors below:

$\$C\7	unit respirable deposition, $1 \mu\text{Ci}/\text{m}^2$
$\$C\8	exposure period, 1 yr
$D(10 \text{ to } 45)$	total activity fraction
$\text{Relocation!E}(10 \text{ to } 45)$	external EDE DCF, mrem/yr per $\mu\text{Ci}/\text{m}^2$
$\$C\$35/\$E\35	ratio of total deposition to respirable deposition

The skin dose from the total deposition corresponding to a unit respirable deposition is calculated in Column K. The skin dose from each radionuclide is summed (Cell K47). The skin dose for each nuclide is calculated as the product of the factors below:

\$C\$7	unit respirable deposition, $1 \mu\text{Ci}/\text{m}^2$
\$C\$8	exposure period, 1 yr
D(10 to 45)	total activity fraction
Relocation!F(10 to 45)	skin dose DCF, mrem/yr per $\mu\text{Ci}/\text{m}^2$
\$C\$35/\$E\$35	ratio of total deposition to respirable deposition

The bone surfaces committed dose equivalent (CDE) from a unit respirable deposition is calculated in Column L. The sum of the CDE from inhalation of each radionuclide is summed (Cell L47). The CDE from each nuclide is the product of the following terms:

\$C\$7	unit respirable deposition, $1 \mu\text{Ci}/\text{m}^2$
\$C\$3	resuspension factor, m^{-1}
\$C\$4	breathing rate, m^3/yr
\$C\$5	conversion factor, $\text{Bq}/\mu\text{Ci}$
\$C\$6	conversion factor, mrem/Sv
\$C\$8	exposure period, 1 yr
F(10 to 34)	respirable activity fraction
Relocation!H(10 to 34)	bone surfaces CDE DCF, Sv/Bq

Inhalation dose conversion factors (DCFs) are from Federal Guidance Report 11 (EPA 1988). The lung clearance class for each nuclide was chosen to maximize the effective dose. For most nuclides this also maximized the bone surface DCF. External exposure DCFs are from DOE/EH-0070 (1988). To simplify calculations, and due to the anticipated small contribution of the external dose relative to the internal doses, the external contribution to the bone surface dose was approximated by the external contribution to the effective dose. For this nuclide mix and exposure scenario, this approximation did not introduce any appreciable error.

In Figure 1, $D_{\text{unit,resp}}$ is the dose due to a unit deposition of respirable material. It includes the CEDE (or the CDE for organ doses) from inhalation of resuspended material (respirable portion of deposited material only) plus the external exposure from ground shine due to the total deposited activity corresponding to the unit respirable deposition.

The calculations just described were for doses due to exposure in the first year following an accident, without considering weathering. They were repeated, taking weathering into consideration, for the three time periods indicated in Table 7 above, with the dose in "any year after the first year following the accident" being represented by the dose in the second year following an accident. Weathering was modeled using the method presented in EPA (1992) where the weathering factor (WF) is defined as

$$WF = \frac{0.63}{\lambda_1 + \lambda_2} (1 - e^{-(\lambda_1 + \lambda_2)t}) + \frac{0.37}{\lambda_1 + \lambda_3} (1 - e^{-(\lambda_1 + \lambda_3)t})$$

where

- t = time during which radionuclides are inhaled (or exposure occurs),
- λ_1 = radioactive decay constant,
- λ_2 = assumed weathering decay constant for 63 percent of the deposited activity, taken as 1.13 per year, and
- λ_3 = assumed weathering decay constant for 37 percent of the deposited activity, taken as $7.48\text{E-}3$ per year.

To calculate the "weathered" doses for the various time periods, the exposure period referred to in the calculations above was replaced by this weathering factor. The dose due to exposure in the second year was determined by calculating doses due to exposure in the first year and the first two years, then subtracting the one-year dose from the two-year dose.

For a deposition of $1 \mu\text{Ci m}^{-2}$ of respirable activity of the 1-RD-1.3 mix and a fifty-year exposure period, the inhalation dose is 1,820 mrem CEDE (Worksheet "Relo_SRTC 50yr, Cell H47) and 31,950 mrem CDE to the bone surfaces (Worksheet "Relo_SRTC 50yr, Cell L47). A respirable deposition of $1 \mu\text{Ci m}^{-2}$ corresponds to a total deposition of $1.11 \mu\text{Ci m}^{-2}$. A total deposition of $1.11 \mu\text{Ci m}^{-2}$ gives an external dose of 150 mrem (Worksheet "Relo_SRTC 50yr, Cell I47). Adding the external and internal doses gives 1,970 mrem CEDE and 32,100 mrem CDE to the bone surfaces per deposition of $1 \mu\text{Ci m}^{-2}$ of respirable activity.

The DRLs may now be determined by dividing the PAGs by their corresponding dose per unit deposition. The DRLs associated with the effective and bone surface doses are much more limiting than those associated with the skin dose and are presented in Table 8. "Bone-surface dose" is the CDE to the bone surfaces. The DRLs calculated using the dose due to fifty years of exposure are the most limiting. Therefore, the DRLs presented for further analysis are those associated with effective and bone surface doses for fifty years of exposure. Details of the spreadsheet calculations are in Attachment A.

Table 8. PAGs and DRLs for SRTC particulate release

PAG (mrem)	Description	DRL ($\mu\text{Ci m}^{-2}$)	DRL Formula
2000	Effective dose, first year, no weathering	9.6	$\text{DRL} = \text{PAG}/(\text{CEDE} + \text{External})$
20000	Bone-surface dose, first year, no weathering	8.2	$\text{DRL} = \text{PAG}/(\text{BS Dose} + \text{External})$
2000	Effective dose, first year, with weathering	14.6	$\text{DRL} = \text{PAG}/(\text{CEDE} + \text{External})$
20000	Bone-surface dose, first year, with weathering	11.2	$\text{DRL} = \text{PAG}/(\text{BS Dose} + \text{External})$
500	Effective dose, second year, with weathering	5.9	$\text{DRL} = \text{PAG}/(\text{CEDE} + \text{External})$
5000	Bone-surface dose, second year, with weathering	4.3	$\text{DRL} = \text{PAG}/(\text{BS Dose} + \text{External})$
5000	Effective dose, fifty years, with weathering	2.5	$\text{DRL} = \text{PAG}/(\text{CEDE} + \text{External})$
50000	Bone-surface dose, fifty years, with weathering	1.6	$\text{DRL} = \text{PAG}/(\text{BS Dose} + \text{External})$

Reference: Source_terms_reloc.xls, Worksheet "Relo_SRTC DRLs Summary".

Tritium exposures will be evaluated by direct comparisons to the PAG, instead of using a DRL.

Determination of range and area of consequences

The HOTSPOT computer code was selected to evaluate the consequences of particulate releases (WSRC-TR-98-00392). In the following calculations, a source term equal to the respirable particulate activity of 2.67 Ci (summed over all radionuclides except tritium) is used, and the range and area affected for different meteorological parameters and DRLs found.

Pasquill-Briggs dispersion parameters are used.

HOTSPOT Parameters used for the SRTC release are listed in Table 9. These meteorological data were taken from the SRTC EPHA (S-EHA-A-00001, Rev.1).

Table 9. HOTSPOT input parameters for SRTC release 1-RD-3

Parameter	Average Meteorology	95% Adverse Meteorology
Release height	Ground	Ground
Wind speed	2.5 m/s	1.7 m/s
Surface roughness	100 cm	100 cm
Stability class	C	E
Deposition velocity	0.1/1/10 cm/sec	0.1/1/10 cm/sec
Release duration	60 min	60 min
Inversion layer	500 m	200 m

The tritium release is evaluated using the computer dose model UFOTRI (Raskob 1990, 1993) and the meteorological parameters in Table 9 (particulate deposition velocity is not applicable). Table 10 provides a listing of some of the additional parameters required in UFOTRI.

Table 10. Additional input parameters for UFOTRI

Additional Information		Meteorology	
Chemical Forms	0% HT / 100% HTO	Air temperature	32.22°C
No building wake		No Rainfall	0 mm/h
Initial soil water content	35%	Thermal energy of release	0 cal/sec
Relative humidity	0.8	Wind direction (in degrees)	315
		Dispersion parameters	Briggs
Soil and vegetation		Code coefficients	
Soil type	Sandy loam	HTO dry deposition velocity*	0.5 cm/s
Pore volume (default)	50 %	HT dry deposition velocity*	0.05 cm/s

* Deposition is calculated in UFOTRI without user-specified constants; values are place holders.

Results

Particulates

Tables 11 through 14 summarize the results obtained for SRTC accident scenario 1-RD-3 using the HOTSPOT computer code. The plots from which these data were obtained are included in Attachments B through G. For the average meteorology case, Tables 11 and 12 present the ranges and areas, respectively. "N/E" is used to indicate cases where the area affected was insignificant. Tables 13 and 14 contain results for runs made using adverse meteorological data.

Table 11. Ranges (in km) until deposition less than relocation DRL, average meteorology, SRTC

Basis for DRL	DRL ($\mu\text{Ci m}^{-2}$)	Deposition Velocity		
		0.1 cm s ⁻¹	1 cm s ⁻¹	10 cm s ⁻¹
Effective Dose	2.5	< 0.02	0.15	0.36
Bone Surface Dose	1.6	< 0.02	0.18	0.44

Table 12. Areas (in km²) with deposition above relocation DRL, average meteorology, SRTC

Basis for DRL	DRL ($\mu\text{Ci m}^{-2}$)	Deposition Velocity		
		0.1 cm s ⁻¹	1 cm s ⁻¹	10 cm s ⁻¹
Effective Dose	2.5	N/E	5.8E-03	3.5E-02
Bone Surface Dose	1.6	N/E	8.7E-03	5.3E-02

"N/E" indicates the area affected is insignificant.

Table 13. Ranges (in km) until deposition less than relocation DRL, 95% adverse meteorology, SRTC

Basis for DRL	DRL ($\mu\text{Ci m}^{-2}$)	Deposition Velocity		
		0.1 cm s ⁻¹	1 cm s ⁻¹	10 cm s ⁻¹
Effective Dose	2.5	0.14	0.4	0.48
Bone Surface Dose	1.6	0.18	0.55	0.58

Table 14. Areas (in km²) with deposition above relocation DRL, 95% adverse meteorology, SRTC

Basis for DRL	DRL ($\mu\text{Ci m}^{-2}$)	Deposition Velocity		
		0.1 cm s ⁻¹	1 cm s ⁻¹	10 cm s ⁻¹
Effective Dose	2.5	2.2E-03	2.2E-02	3.3E-02
Bone Surface Dose	1.6	3.7E-03	3.6E-02	4.8E-02

Tritium

UFOTRI was run to evaluate the dose due to tritium re-emission. The dose due to re-emission (for the first year following the accidental release) was calculated by subtracting the plume passage dose from the dose due to plume passage plus re-emission. These values are presented in Table 15 for the site boundary, a distance of 670 m from the release point.

Table 15. Dose due to tritium re-emission at 670 m from the release point

	HTO plume passage dose (mrem)	HTO plume passage plus re-emission (mrem)	Re-emission (mrem)
Average meteorology	5.12	6.43	1.3
Adverse meteorology	38.6	50.5	12

The dose due to tritium re-emission in the first year following a release is the maximum that would be expected, and that is small compared to the PAGs which govern relocation recommendations.

Conclusion

Even though SRTC is near the site boundary (a distance of approximately 0.67 km), no relocation protective actions are likely to be recommended for either the particulate release or the tritium release from this scenario.

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Attachments

Attachment A

Spreadsheet calculations

Attachment B

HOTSPOT results - average meteorology, 0.1 cm s^{-1}

Attachment C

HOTSPOT results - average meteorology, 1.0 cm s^{-1}

Attachment D

HOTSPOT results - average meteorology, 10 cm s^{-1}

Attachment E

HOTSPOT results - adverse meteorology, 0.1 cm s^{-1}

Attachment F

HOTSPOT results - adverse meteorology, 1.0 cm s^{-1}

Attachment G

HOTSPOT results - adverse meteorology, 10 cm s^{-1}

Attachment A

Spreadsheet calculations

	A	B	C	D	E	F	G	H	I
4					Pu239/241	Pu242	pre-DR		DR'd
5					unmix	unmix	unmixed		unmixed
6			respirable		respirable	respirable	respirable		respirable
7			STRC		release	release	release		release
8	Element	At. No.	Att. 3		Ci	Ci	Ci	DR=0.75	Ci
9			Table 5						
10	Am	241	2.21E-03		4.02E-03	4.57E-05	6.28E-03	0.75	4.71E-03
11	Am	243	2.08E-04				2.08E-04	0.75	1.56E-04
12	Ba	133	2.69E-13				2.69E-13	0.75	2.02E-13
13	Ce	144	9.97E-07				9.97E-07	0.75	7.48E-07
14	Cf	249	2.13E-06				2.13E-06	0.75	1.60E-06
15	Cf	252	7.85E-03				7.85E-03	0.75	5.89E-03
16	Cm	244	6.23E-03				6.23E-03	0.75	4.67E-03
17	Cm	246	3.70E-04				3.70E-04	0.75	2.78E-04
18	Co	60	3.30E-01				3.30E-01	0.75	2.48E-01
19	Cs	137	6.53E-02				6.53E-02	0.75	4.90E-02
20	H	3	1.07E+04				1.07E+04	0.75	8.03E+03
21	Np	237	8.86E-06				8.86E-06	0.75	6.65E-06
22	Pm	147	1.26E-08				1.26E-08	0.75	9.45E-09
23	Pu	238	1.28E-02		4.35E-04	1.69E-05	1.33E-02	0.75	9.94E-03
24	Pu	239	8.88E-06		1.21E-02	0.000469	1.26E-02	0.75	9.43E-03
25	Pu mix	239/241	5.96E-02						
26	Pu	240	6.85E-07		2.75E-03	0.000107	2.86E-03	0.75	2.15E-03
27	Pu	241	4.80E-02		4.03E-02	0.001562	8.99E-02	0.75	6.74E-02
28	Pu mix	242	2.31E-03	pure->	1.79E-05	6.93E-07	1.86E-05	0.75	1.39E-05
29	Sr	90	6.04E-02				6.04E-02	0.75	4.53E-02
30	Tc	99	1.80E-13				1.80E-13	0.75	1.35E-13
31	Th	232	1.02E-06				1.02E-06	0.75	7.65E-07
32	Tl	204	4.50E-10				4.50E-10	0.75	3.38E-10
33	U	235	3.64E-07				3.64E-07	0.75	2.73E-07
34	U	238	2.66E-05				2.66E-05	0.75	2.00E-05

	A	B	C	D	E	F	G	H	I
4					Pu239/241	Pu242	pre-DR		DR'd
5					unmix	unmix	unmixed		unmixed
6			respirable		respirable	respirable	respirable		respirable
7			STRC		release	release	release		release
8	Element	At. No.	Att. 3		Ci	Ci	Ci	DR=0.75	Ci
9			Table 5						
10	Am	241	0.00221		=C\$25*C43	=C\$28*C52	=C10+E10+F10	0.75	=G10*H10
11	Am	243	0.000208				=C11+E11+F11	0.75	=G11*H11
12	Ba	133	0.000000000000269				=C12+E12+F12	0.75	=G12*H12
13	Ce	144	0.000000997				=C13+E13+F13	0.75	=G13*H13
14	Cf	249	0.00000213				=C14+E14+F14	0.75	=G14*H14
15	Cf	252	0.00785				=C15+E15+F15	0.75	=G15*H15
16	Cm	244	0.00623				=C16+E16+F16	0.75	=G16*H16
17	Cm	246	0.00037				=C17+E17+F17	0.75	=G17*H17
18	Co	60	0.33				=C18+E18+F18	0.75	=G18*H18
19	Cs	137	0.0653				=C19+E19+F19	0.75	=G19*H19
20	H	3	10700				=C20+E20+F20	0.75	=G20*H20
21	Np	237	0.00000886				=C21+E21+F21	0.75	=G21*H21
22	Pm	147	0.0000000126				=C22+E22+F22	0.75	=G22*H22
23	Pu	238	0.0128		=C\$25*C38	=C\$28*C38	=C23+E23+F23	0.75	=G23*H23
24	Pu	239	0.00000888		=C\$25*C39	=C\$28*C39	=C24+E24+F24	0.75	=G24*H24
25	Pu mix	239/241	0.0596						
26	Pu	240	0.000000685		=C\$25*C40	=C\$28*C40	=C26+E26+F26	0.75	=G26*H26
27	Pu	241	0.048		=C\$25*C41	=C\$28*C41	=C27+E27+F27	0.75	=G27*H27
28	Pu mix	242	0.00231	pure->	=C\$25*C42	=C\$28*C42	=E28+F28	0.75	=G28*H28
29	Sr	90	0.0604				=C29+E29+F29	0.75	=G29*H29
30	Tc	99	0.000000000000018				=C30+E30+F30	0.75	=G30*H30
31	Th	232	0.00000102				=C31+E31+F31	0.75	=G31*H31
32	Tl	204	0.000000000045				=C32+E32+F32	0.75	=G32*H32
33	U	235	0.000000364				=C33+E33+F33	0.75	=G33*H33
34	U	238	0.0000266				=C34+E34+F34	0.75	=G34*H34

	A	B	C
36	Pu 239/241 mix activity fractions		
37	nuclide		activity frac
38	Pu	238	0.0073
39	Pu	239	0.2029
40	Pu	240	0.0462
41	Pu	241	0.6761
42	Pu	242	0.0003
43	Am	241	0.0675
44			
45	Pu 242 mix activity fractions		
46	nuclide		activity frac
47	Pu	238	0.0786
48	Pu	239	0.00024
49	Pu	240	0.01184
50	Pu	241	0.88886
51	Pu	242	0.00074
52	Am	241	0.01977

	A	B	C	D	E	F	G	H	I
4					Pu239/241	Pu242	pre-DR		DR'd
5					unmix	unmix	unmixed		unmixed
6			respirable		respirable	respirable	respirable		respirable
7			SRTC		release	release	release		release
8	Element	At. No.	Att. 5		Ci	Ci	Ci	DR=0.75	Ci
9			Table 52						
10	Am	241	1.86E-03		2.84E-04	0	2.14E-03	0.75	1.61E-03
11	Am	243	6.59E-05				6.59E-05	0.75	4.94E-05
12	Ba	133	0.00E+00				0.00E+00	0.75	0.00E+00
13	Ce	144	7.75E-06				7.75E-06	0.75	5.81E-06
14	Cf	249	0				0.00E+00	0.75	0.00E+00
15	Cf	252	1.78E-03				1.78E-03	0.75	1.34E-03
16	Cm	244	3.99E-03				3.99E-03	0.75	2.99E-03
17	Cm	246	2.01E-05				2.01E-05	0.75	1.51E-05
18	Co	60	2.75E-02				2.75E-02	0.75	2.06E-02
19	Cs	137	4.88E-01				4.88E-01	0.75	3.66E-01
20	H	3	9.66E+00				9.66E+00	0.75	7.25E+00
21	Np	237	2.33E-08				2.33E-08	0.75	1.75E-08
22	Pm	147	0				0.00E+00	0.75	0.00E+00
23	Pu	238	1.00E-03		3.07E-05	0	1.03E-03	0.75	7.73E-04
24	Pu	239	0		8.54E-04	0	8.54E-04	0.75	6.41E-04
25	Pu mix	239/241	4.21E-03						
26	Pu	240	0		1.95E-04	0	1.95E-04	0.75	1.46E-04
27	Pu	241	0		2.85E-03	0	2.85E-03	0.75	2.13E-03
28	Pu mix	242	0	pure->	1.26E-06	0	1.26E-06	0.75	9.47E-07
29	Sr	90	4.86E-01				4.86E-01	0.75	3.65E-01
30	Tc	99	0				0.00E+00	0.75	0.00E+00
31	Th	232	7.28E-09				7.28E-09	0.75	5.46E-09
32	Tl	204	0				0.00E+00	0.75	0.00E+00
33	U	235	2.27E-08				2.27E-08	0.75	1.70E-08
34	U	238	2.73E-07				2.73E-07	0.75	2.05E-07

	A	B	C	D	E	F	G	H	I
4					Pu239/241	Pu242	pre-DR		DR'd
5					unmix	unmix	unmixed		unmixed
6			respirable		respirable	respirable	respirable		respirable
7			SRTC		release	release	release		release
8	Element	At. No.	Att. 5		Ci	Ci	Ci	DR=0.75	Ci
9			Table 52						
10	Am	241	0.00186		=C\$25*C43	=C\$28*C52	=C10+E10+F10	0.75	=G10*H10
11	Am	243	0.0000659				=C11+E11+F11	0.75	=G11*H11
12	Ba	133	0				=C12+E12+F12	0.75	=G12*H12
13	Ce	144	0.00000775				=C13+E13+F13	0.75	=G13*H13
14	Cf	249	0				=C14+E14+F14	0.75	=G14*H14
15	Cf	252	0.00178				=C15+E15+F15	0.75	=G15*H15
16	Cm	244	0.00399				=C16+E16+F16	0.75	=G16*H16
17	Cm	246	0.0000201				=C17+E17+F17	0.75	=G17*H17
18	Co	60	0.0275				=C18+E18+F18	0.75	=G18*H18
19	Cs	137	0.488				=C19+E19+F19	0.75	=G19*H19
20	H	3	9.66				=C20+E20+F20	0.75	=G20*H20
21	Np	237	0.0000000233				=C21+E21+F21	0.75	=G21*H21
22	Pm	147	0				=C22+E22+F22	0.75	=G22*H22
23	Pu	238	0.001		=C\$25*C38	=C\$28*C38	=C23+E23+F23	0.75	=G23*H23
24	Pu	239	0		=C\$25*C39	=C\$28*C39	=C24+E24+F24	0.75	=G24*H24
25	Pu mix	239/241	0.00421						
26	Pu	240	0		=C\$25*C40	=C\$28*C40	=C26+E26+F26	0.75	=G26*H26
27	Pu	241	0		=C\$25*C41	=C\$28*C41	=C27+E27+F27	0.75	=G27*H27
28	Pu mix	242	0	pure->	=C\$25*C42	=C\$28*C42	=E28+F28	0.75	=G28*H28
29	Sr	90	0.486				=C29+E29+F29	0.75	=G29*H29
30	Tc	99	0				=C30+E30+F30	0.75	=G30*H30
31	Th	232	0.00000000728				=C31+E31+F31	0.75	=G31*H31
32	Tl	204	0				=C32+E32+F32	0.75	=G32*H32
33	U	235	0.0000000227				=C33+E33+F33	0.75	=G33*H33
34	U	238	0.000000273				=C34+E34+F34	0.75	=G34*H34

	A	B	C
36	Pu 239/241 mix activity fractions		
37	nuclide	activity frac	
38	Pu	238	0.0073
39	Pu	239	0.2029
40	Pu	240	0.0462
41	Pu	241	0.6761
42	Pu	242	0.0003
43	Am	241	0.0675
44			
45	Pu 242 mix activity fractions		
46	nuclide	activity frac	
47	Pu	238	0.0786
48	Pu	239	0.00024
49	Pu	240	0.01184
50	Pu	241	0.88886
51	Pu	242	0.00074
52	Am	241	0.01977

Table 52

	A	B	C	D	E	F	G	H	I
4					Pu239/241	Pu242	pre-DR		DR'd
5					unmix	unmix	unmixed		unmixed
6			respirable		respirable	respirable	respirable		respirable
7			STRC		release	release	release		release
8	Element	At. No.	Att. 2		Ci	Ci	Ci	DR=0.75	Ci
9			Table 71						
10	Am	241	5.80E-03		5.46E-03	0.000141	1.14E-02	0.75	8.55E-03
11	Am	243	3.33E-04				3.33E-04	0.75	2.50E-04
12	Ba	133	2.69E-13				2.69E-13	0.75	2.02E-13
13	Ce	144	1.02E-05				1.02E-05	0.75	7.65E-06
14	Cf	249	8.86E-06				8.86E-06	0.75	6.65E-06
15	Cf	252	6.29E-03				6.29E-03	0.75	4.72E-03
16	Cm	244	1.26E-02				1.26E-02	0.75	9.45E-03
17	Cm	246	2.75E-04				2.75E-04	0.75	2.06E-04
18	Co	60	3.62E-01				3.62E-01	0.75	2.72E-01
19	Cs	137	6.35E-01				6.35E-01	0.75	4.76E-01
20	H	3	1.07E+04				1.07E+04	0.75	8.03E+03
21	Np	237	2.37E-05				2.37E-05	0.75	1.78E-05
22	Pm	147	1.26E-08				1.26E-08	0.75	9.45E-09
23	Pu	238	9.21E-03		5.91E-04	5.22E-05	9.85E-03	0.75	7.39E-03
24	Pu	239	8.88E-06		1.64E-02	0.001451	1.79E-02	0.75	1.34E-02
25	Pu mix	239/241	8.09E-02						
26	Pu	240	0		3.74E-03	0.00033	4.07E-03	0.75	3.05E-03
27	Pu	241	2.03E-01		5.47E-02	0.004834	2.63E-01	0.75	1.97E-01
28	Pu mix	242	7.15E-03	pure->	2.43E-05	2.15E-06	2.64E-05	0.75	1.98E-05
29	Sr	90	6.31E-01				6.31E-01	0.75	4.73E-01
30	Tc	99	1.80E-13				1.80E-13	0.75	1.35E-13
31	Th	232	8.89E-07				8.89E-07	0.75	6.67E-07
32	Tl	204	4.50E-10				4.50E-10	0.75	3.38E-10
33	U	235	5.30E-07				5.30E-07	0.75	3.98E-07
34	U	238	4.13E-05				4.13E-05	0.75	3.10E-05

	A	B	C	D	E	F	G	H	I
4					Pu239/241	Pu242	pre-DR		DR'd
5					unmix	unmix	unmixed		unmixed
6			respirable		respirable	respirable	respirable		respirable
7			STRC		release	release	release		release
8	Element	At. No.	Att. 2		Ci	Ci	Ci	DR=0.75	Ci
9			Table 71						
10	Am	241	0.0058		=C\$25*C43	=C\$28*C52	=C10+E10+F10	0.75	=G10*H10
11	Am	243	0.000333				=C11+E11+F11	0.75	=G11*H11
12	Ba	133	0.000000000000269				=C12+E12+F12	0.75	=G12*H12
13	Ce	144	0.0000102				=C13+E13+F13	0.75	=G13*H13
14	Cf	249	0.00000886				=C14+E14+F14	0.75	=G14*H14
15	Cf	252	0.00629				=C15+E15+F15	0.75	=G15*H15
16	Cm	244	0.0126				=C16+E16+F16	0.75	=G16*H16
17	Cm	246	0.000275				=C17+E17+F17	0.75	=G17*H17
18	Co	60	0.362				=C18+E18+F18	0.75	=G18*H18
19	Cs	137	0.635				=C19+E19+F19	0.75	=G19*H19
20	H	3	10700				=C20+E20+F20	0.75	=G20*H20
21	Np	237	0.0000237				=C21+E21+F21	0.75	=G21*H21
22	Pm	147	0.0000000126				=C22+E22+F22	0.75	=G22*H22
23	Pu	238	0.00921		=C\$25*C38	=C\$28*C38	=C23+E23+F23	0.75	=G23*H23
24	Pu	239	0.00000888		=C\$25*C39	=C\$28*C39	=C24+E24+F24	0.75	=G24*H24
25	Pu mix	239/241	0.0809						
26	Pu	240	0		=C\$25*C40	=C\$28*C40	=C26+E26+F26	0.75	=G26*H26
27	Pu	241	0.203		=C\$25*C41	=C\$28*C41	=C27+E27+F27	0.75	=G27*H27
28	Pu mix	242	0.00715	pure->	=C\$25*C42	=C\$28*C42	=E28+F28	0.75	=G28*H28
29	Sr	90	0.631				=C29+E29+F29	0.75	=G29*H29
30	Tc	99	0.000000000000018				=C30+E30+F30	0.75	=G30*H30
31	Th	232	0.000000889				=C31+E31+F31	0.75	=G31*H31
32	Ti	204	0.000000000045				=C32+E32+F32	0.75	=G32*H32
33	U	235	0.000000053				=C33+E33+F33	0.75	=G33*H33
34	U	238	0.0000413				=C34+E34+F34	0.75	=G34*H34

	A	B	C
36	Pu 239/241 mix activity fractions		
37	nuclide		activity frac
38	Pu	238	0.0073
39	Pu	239	0.2029
40	Pu	240	0.0462
41	Pu	241	0.6761
42	Pu	242	0.0003
43	Am	241	0.0675
44			
45	Pu 242 mix activity fractions		
46	nuclide		activity frac
47	Pu	238	0.0786
48	Pu	239	0.00024
49	Pu	240	0.01184
50	Pu	241	0.88886
51	Pu	242	0.00074
52	Am	241	0.01977

	A	B	C	D	E	F	H
3			5	52	71	Sum	Sum
4			DR'd	DR'd	DR'd	DR'd	DR'd
5			unmixed	unmixed	unmixed	unmixed	unmixed
6			respirable	respirable	respirable	respirable	TOTAL
7			release	release	release	release	release
8	Element	At. No.	Ci	Ci	Ci	Ci	Ci
9							
10	Am	241	4.71E-03	1.61E-03	8.55E-03	1.49E-02	3.23E-02
11	Am	243	1.56E-04	4.94E-05	2.50E-04	4.55E-04	7.26E-04
12	Ba	133	2.02E-13	0.00E+00	2.02E-13	4.04E-13	4.04E-13
13	Ce	144	7.48E-07	5.81E-06	7.65E-06	1.42E-05	1.42E-05
14	Cf	249	1.60E-06	0.00E+00	6.65E-06	8.24E-06	9.53E-06
15	Cf	252	5.89E-03	1.34E-03	4.72E-03	1.19E-02	1.19E-02
16	Cm	244	4.67E-03	2.99E-03	9.45E-03	1.71E-02	1.53E-02
17	Cm	246	2.78E-04	1.51E-05	2.06E-04	4.99E-04	7.50E-04
18	Co	60	2.48E-01	2.06E-02	2.72E-01	5.40E-01	5.40E-01
19	Cs	137	4.90E-02	3.66E-01	4.76E-01	8.91E-01	8.91E-01
20	H	3	8.03E+03	7.25E+00	8.03E+03	1.61E+04	1.61E+04
21	Np	237	6.65E-06	1.75E-08	1.78E-05	2.44E-05	3.15E-05
22	Pm	147	9.45E-09	0.00E+00	9.45E-09	1.89E-08	1.89E-08
23	Pu	238	9.94E-03	7.73E-04	7.39E-03	1.81E-02	4.15E-02
24	Pu	239	9.43E-03	6.41E-04	1.34E-02	2.35E-02	6.94E-02
25	Pu mix	239/241					
26	Pu	240	2.15E-03	1.46E-04	3.05E-03	5.34E-03	1.59E-02
27	Pu	241	6.74E-02	2.13E-03	1.97E-01	2.66E-01	4.58E-01
28	Pu pure	242	1.39E-05	9.47E-07	1.98E-05	3.47E-05	1.10E-04
29	Sr	90	4.53E-02	3.65E-01	4.73E-01	8.83E-01	8.84E-01
30	Tc	99	1.35E-13	0.00E+00	1.35E-13	2.70E-13	2.70E-13
31	Th	232	7.65E-07	5.46E-09	6.67E-07	1.44E-06	1.45E-06
32	Tl	204	3.38E-10	0.00E+00	3.38E-10	6.75E-10	6.75E-10
33	U	235	2.73E-07	1.70E-08	3.98E-07	6.88E-07	1.34E-06
34	U	238	2.00E-05	2.05E-07	3.10E-05	5.11E-05	1.62E-04

	A	B	C	D	E	F	H
3			5	52	71	Sum	Sum
4			DR'd	DR'd	DR'd	DR'd	DR'd
5			unmixed	unmixed	unmixed	unmixed	unmixed
6			respirable	respirable	respirable	respirable	TOTAL
7			release	release	release	release	release
8	Element	At. No.	Ci	Ci	Ci	Ci	Ci
9							
10	Am	241	=Table5II10	=Table 52'II10	=Table71II10	=C10+D10+E10	=Nonresp + resp'IN10
11	Am	243	=Table5II11	=Table 52'II11	=Table71II11	=C11+D11+E11	=Nonresp + resp'IN11
12	Ba	133	=Table5II12	=Table 52'II12	=Table71II12	=C12+D12+E12	=Nonresp + resp'IN12
13	Ce	144	=Table5II13	=Table 52'II13	=Table71II13	=C13+D13+E13	=Nonresp + resp'IN13
14	Cf	249	=Table5II14	=Table 52'II14	=Table71II14	=C14+D14+E14	=Nonresp + resp'IN14
15	Cf	252	=Table5II15	=Table 52'II15	=Table71II15	=C15+D15+E15	=Nonresp + resp'IN15
16	Cm	244	=Table5II16	=Table 52'II16	=Table71II16	=C16+D16+E16	=Nonresp + resp'IN16
17	Cm	246	=Table5II17	=Table 52'II17	=Table71II17	=C17+D17+E17	=Nonresp + resp'IN17
18	Co	60	=Table5II18	=Table 52'II18	=Table71II18	=C18+D18+E18	=Nonresp + resp'IN18
19	Cs	137	=Table5II19	=Table 52'II19	=Table71II19	=C19+D19+E19	=Nonresp + resp'IN19
20	H	3	=Table5II20	=Table 52'II20	=Table71II20	=C20+D20+E20	=Nonresp + resp'IN20
21	Np	237	=Table5II21	=Table 52'II21	=Table71II21	=C21+D21+E21	=Nonresp + resp'IN21
22	Pm	147	=Table5II22	=Table 52'II22	=Table71II22	=C22+D22+E22	=Nonresp + resp'IN22
23	Pu	238	=Table5II23	=Table 52'II23	=Table71II23	=C23+D23+E23	=Nonresp + resp'IN23
24	Pu	239	=Table5II24	=Table 52'II24	=Table71II24	=C24+D24+E24	=Nonresp + resp'IN24
25	Pu mix	239/241					
26	Pu	240	=Table5II26	=Table 52'II26	=Table71II26	=C26+D26+E26	=Nonresp + resp'IN26
27	Pu	241	=Table5II27	=Table 52'II27	=Table71II27	=C27+D27+E27	=Nonresp + resp'IN27
28	Pu pure	242	=Table5II28	=Table 52'II28	=Table71II28	=C28+D28+E28	=Nonresp + resp'IN28
29	Sr	90	=Table5II29	=Table 52'II29	=Table71II29	=C29+D29+E29	=Nonresp + resp'IN29
30	Tc	99	=Table5II30	=Table 52'II30	=Table71II30	=C30+D30+E30	=Nonresp + resp'IN30
31	Th	232	=Table5II31	=Table 52'II31	=Table71II31	=C31+D31+E31	=Nonresp + resp'IN31
32	Tl	204	=Table5II32	=Table 52'II32	=Table71II32	=C32+D32+E32	=Nonresp + resp'IN32
33	U	235	=Table5II33	=Table 52'II33	=Table71II33	=C33+D33+E33	=Nonresp + resp'IN33
34	U	238	=Table5II34	=Table 52'II34	=Table71II34	=C34+D34+E34	=Nonresp + resp'IN34

	A	B	F	G	H	L
3	deconvolute mixes					
4						pre-DR
5			mixed	unmix	unmix	unmixed
6			total	Pu239/241		total
7			release		Pu242	release
8	Element	At. No.	Ci	Ci	Ci	Ci
9						
10	Am	241	1.21E-02	3.08E-02	2.52E-04	4.31E-02
11	Am	243	9.68E-04			9.68E-04
12	Ba	133	5.38E-13			5.38E-13
13	Ce	144	1.90E-05			1.90E-05
14	Cf	249	1.27E-05			1.27E-05
15	Cf	252	1.59E-02			1.59E-02
16	Cm	244	2.03E-02			2.03E-02
17	Cm	246	1.00E-03			1.00E-03
18	Co	60	7.19E-01			7.19E-01
19	Cs	137	1.19E+00			1.19E+00
20	H	3	2.14E+04			2.14E+04
21	Np	237	4.20E-05			4.20E-05
22	Pm	147	2.52E-08			2.52E-08
23	Pu	238	5.10E-02	3.33E-03	1.00E-03	5.53E-02
24	Pu	239	1.78E-05	9.25E-02	3.06E-06	9.25E-02
25	Pu mix	239/241	4.56E-01			
26	Pu	240	9.72E-07	2.11E-02	1.51E-04	2.12E-02
27	Pu	241	2.91E-01	3.08E-01	1.14E-02	6.11E-01
28	Pu mix	242	1.28E-02			1.46E-04
29	Sr	90	1.18E+00			1.18E+00
30	Tc	99	3.60E-13			3.60E-13
31	Th	232	1.93E-06			1.93E-06
32	Tl	204	9.00E-10			9.00E-10
33	U	235	1.78E-06			1.78E-06
34	U	238	2.15E-04			2.15E-04
35	Pu	242		1.37E-04	9.45E-06	

	A	B	F	G	H	L
3				deconvolute mixes		
4						pre-DR
5			mixed	unmix	unmix	unmixed
6			total	Pu239/241		total
7			release		Pu242	release
8	Element	At. No.	Ci	Ci	Ci	Ci
9						
10	Am	241	=C10+D10+E10	=C43*F25	=F28*C52	=F10+G10+H10
11	Am	243	=C11+D11+E11			=F11+G11+H11
12	Ba	133	=C12+D12+E12			=F12+G12+H12
13	Ce	144	=C13+D13+E13			=F13+G13+H13
14	Cf	249	=C14+D14+E14			=F14+G14+H14
15	Cf	252	=C15+D15+E15			=F15+G15+H15
16	Cm	244	=C16+D16+E16			=F16+G16+H16
17	Cm	246	=C17+D17+E17			=F17+G17+H17
18	Co	60	=C18+D18+E18			=F18+G18+H18
19	Cs	137	=C19+D19+E19			=F19+G19+H19
20	H	3	=C20+D20+E20			=F20+G20+H20
21	Np	237	=C21+D21+E21			=F21+G21+H21
22	Pm	147	=C22+D22+E22			=F22+G22+H22
23	Pu	238	=C23+D23+E23	=C38*F25	=F28*C47	=F23+G23+H23
24	Pu	239	=C24+D24+E24	=C39*F25	=F28*C48	=F24+G24+H24
25	Pu mix	239/241	=C25+D25+E25			
26	Pu	240	=C26+D26+E26	=F25*C40	=F28*C49	=F26+G26+H26
27	Pu	241	=C27+D27+E27	=F25*C41	=F28*C50	=F27+G27+H27
28	Pu mix	242	=C28+D28+E28			=G35+H35
29	Sr	90	=C29+D29+E29			=F29+G29+H29
30	Tc	99	=C30+D30+E30			=F30+G30+H30
31	Th	232	=C31+D31+E31			=F31+G31+H31
32	Ti	204	=C32+D32+E32			=F32+G32+H32
33	U	235	=C33+D33+E33			=F33+G33+H33
34	U	238	=C34+D34+E34			=F34+G34+H34
35	Pu	242		=F25*C42	=F28*C51	

	A	B	C
36	Pu 239/241 mix activity fractions		
37	nuclide		activity frac
38	Pu	238	0.0073
39	Pu	239	0.2029
40	Pu	240	0.0462
41	Pu	241	0.6761
42	Pu	242	0.0003
43	Am	241	0.0675
44			
45	Pu 242 mix activity fractions		
46	nuclide		activity frac
47	Pu	238	0.0786
48	Pu	239	0.00024
49	Pu	240	0.01184
50	Pu	241	0.88886
51	Pu	242	0.00074
52	Am	241	0.01977

	A	B	L	M	N	O	P
3							
4			pre-DR		DR'd		
5			unmixed		unmixed		
6			total		total	HTO	particulate
7			release		release	release	release
8	Element	At. No.	Ci	DR=0.75	Ci	Ci	Ci
9							
10	Am	241	4.31E-02	0.75	3.23E-02		3.23E-02
11	Am	243	9.68E-04	0.75	7.26E-04		7.26E-04
12	Ba	133	5.38E-13	0.75	4.04E-13		4.04E-13
13	Ce	144	1.90E-05	0.75	1.42E-05		1.42E-05
14	Cf	249	1.27E-05	0.75	9.53E-06		9.53E-06
15	Cf	252	1.59E-02	0.75	1.19E-02		1.19E-02
16	Cm	244	2.03E-02	0.75	1.53E-02		1.53E-02
17	Cm	246	1.00E-03	0.75	7.50E-04		7.50E-04
18	Co	60	7.19E-01	0.75	5.40E-01		5.40E-01
19	Cs	137	1.19E+00	0.75	8.91E-01		8.91E-01
20	H	3	2.14E+04	0.75	1.61E+04	1.61E+04	
21	Np	237	4.20E-05	0.75	3.15E-05		3.15E-05
22	Pm	147	2.52E-08	0.75	1.89E-08		1.89E-08
23	Pu	238	5.53E-02	0.75	4.15E-02		4.15E-02
24	Pu	239	9.25E-02	0.75	6.94E-02		6.94E-02
25	Pu mix	239/241					
26	Pu	240	2.12E-02	0.75	1.59E-02		1.59E-02
27	Pu	241	6.11E-01	0.75	4.58E-01		4.58E-01
28	Pu mix	242	1.46E-04	0.75	1.10E-04		1.10E-04
29	Sr	90	1.18E+00	0.75	8.84E-01		8.84E-01
30	Tc	99	3.60E-13	0.75	2.70E-13		2.70E-13
31	Th	232	1.93E-06	0.75	1.45E-06		1.45E-06
32	Tl	204	9.00E-10	0.75	6.75E-10		6.75E-10
33	U	235	1.78E-06	0.75	1.34E-06		1.34E-06
34	U	238	2.15E-04	0.75	1.62E-04		1.62E-04
35	Pu	242				Sum Ci	2.96E+00

	A	B	L	M	N	O	P
3							
4			pre-DR		DR'd		
5			unmixed		unmixed		
6			total		total	HTO	particulate
7			release		release	release	release
8	Element	At. No.	Ci	DR=0.75	Ci	Ci	Ci
9							
10	Am	241	=F10+G10+H10	0.75	=L10*M10		=N10
11	Am	243	=F11+G11+H11	0.75	=L11*M11		=N11
12	Ba	133	=F12+G12+H12	0.75	=L12*M12		=N12
13	Ce	144	=F13+G13+H13	0.75	=L13*M13		=N13
14	Cf	249	=F14+G14+H14	0.75	=L14*M14		=N14
15	Cf	252	=F15+G15+H15	0.75	=L15*M15		=N15
16	Cm	244	=F16+G16+H16	0.75	=L16*M16		=N16
17	Cm	246	=F17+G17+H17	0.75	=L17*M17		=N17
18	Co	60	=F18+G18+H18	0.75	=L18*M18		=N18
19	Cs	137	=F19+G19+H19	0.75	=L19*M19		=N19
20	H	3	=F20+G20+H20	0.75	=L20*M20	=N20	
21	Np	237	=F21+G21+H21	0.75	=L21*M21		=N21
22	Pm	147	=F22+G22+H22	0.75	=L22*M22		=N22
23	Pu	238	=F23+G23+H23	0.75	=L23*M23		=N23
24	Pu	239	=F24+G24+H24	0.75	=L24*M24		=N24
25	Pu mix	239/241					
26	Pu	240	=F26+G26+H26	0.75	=L26*M26		=N26
27	Pu	241	=F27+G27+H27	0.75	=L27*M27		=N27
28	Pu mix	242	=G35+H35	0.75	=L28*M28		=N28
29	Sr	90	=F29+G29+H29	0.75	=L29*M29		=N29
30	Tc	99	=F30+G30+H30	0.75	=L30*M30		=N30
31	Th	232	=F31+G31+H31	0.75	=L31*M31		=N31
32	Tl	204	=F32+G32+H32	0.75	=L32*M32		=N32
33	U	235	=F33+G33+H33	0.75	=L33*M33		=N33
34	U	238	=F34+G34+H34	0.75	=L34*M34		=N34
35	Pu	242				Sum Ci	=SUM(P10:P34)

	A	B	E	F	G	H	J
3						CEDE	CDE B.S.
4						Inhalation	Inhalation
5					Class	DCF	DCF
6			DCF External			FGR-11	FGR-11
7			Effective Skin	(D,W,Y)		Sv/Bq	Sv/Bq
8	Element	At. No.	mrem/yr	per mrem/yr	per uCi/m^2		
9							
10	Am	241	2.99E+00	6.39E+00	W# BS	1.20E-04	2.17E-03
11	Am	243	6.61E+00	1.06E+01	W#	1.19E-04	2.17E-03
12	Ba	133	4.19E+01	5.82E+01	D	2.11E-09	9.51E-09
13	Ce	144	2.16E+00	2.86E+00	Y	1.01E-07	4.72E-09
14	Cf	249	3.52E+01	4.76E+01	W#	1.56E-04	3.32E-03
15	Cf	252	6.34E-02	4.66E-01	Y *	4.24E-05	1.37E-04
16	Cm	244	8.29E-02	6.56E-01	W#	6.70E-05	1.17E-03
17	Cm	246	7.34E-02	5.84E-01	W#	1.22E-04	2.22E-03
18	Co	60	2.27E+02	3.05E+02	Y	5.91E-08	1.35E-08
19	Cs	137	0.00E+00	2.81E+01	D	8.63E-09	7.94E-09
20	H	3	0.00E+00	0.00E+00	V*	1.73E-11	1.73E-11
21	Np	237	3.24E+00	7.54E+00	W#	1.46E-04	3.27E-03
22	Pm	147	4.10E-04	4.96E-04	Y *	1.06E-08	2.01E-08
23	Pu	238	8.58E-02	7.17E-01	W#	1.06E-04	1.90E-03
24	Pu	239	3.78E-02	2.80E-01	W#	1.16E-04	2.11E-03
25	Pu	239/241					
26	Pu	240	8.20E-02	6.83E-01	W#	1.16E-04	2.11E-03
27	Pu	241	0.00E+00	0.00E+00	W#	2.23E-06	4.20E-05
28	Pu	242	6.82E-02	5.67E-01	W#	1.11E-04	2.01E-03
29	Sr	90	0.00E+00	1.73E+01	Y *	3.51E-07	7.09E-08
30	Tc	99	6.26E-05	7.73E-05	W	2.25E-09	3.99E-11
31	Th	232	6.66E-02	4.85E-01	W	4.43E-04	1.11E-02
32	Tl	204	1.30E-01	1.35E+02	D	6.50E-10	4.15E-10
33	U	235	1.71E+01	2.27E+01	Y *	3.32E-05	1.05E-06
34	U	238	6.46E-02	5.30E-01	Y *	3.20E-05	1.01E-06
35							
36	Ba	137m	6.11E+01	1.91E+02			
37	Y	90	0.00E+00	1.03E+03			
38	Pr	144	2.98E+00	1.49E+03	* = Different limiting organ for different solubility class		
39	Pa	233	2.36E+01	3.28E+01			
40	Th	234	1.01E+00	1.77E+00			
41	Pa	234	1.96E+02	4.04E+02			
42	Np	239	1.92E+01	2.98E+01			
43	Th	231	1.91E+00	6.42E+00			
44	Ra	228	6.67E-08	8.02E-07			
45	Ac	228	9.10E+01	5.03E+02			

	A	B	C	D	E	F	G	H	I	J
1	Relocation calculation for SRTC accident. Particulates ONLY; tritium considered separately.									
2	Calculation of dose from deposited radionuclides (EPA PAG manual 1991, section 7.3.2, p. 7-15) (resuspension and external radiation)									
3		1.00E-06	Resuspension factor (1/m)							2000 Protective Action Guide (PAG) -- Effective Dose (mrem)
4		1.05E+04	BreathRate (m ³ /yr)							20000 PAG -- Organ-specific Dose (mrem)
5		3.70E+04	CF (Bq/microCi)							100000 PAG -- Skin (mrem)
6		1.00E+05	CF (mrem/Sv)							
7		1.00E+00	microCi/m ²							CEDE and BS Dose are based on respirable particulate release
8		1.00E+00	Exposure period (1 year)							External EDE and Skin Dose are based on total particulate release

	A	B	C
9		Total Release (Ci)	Activity fraction (Total)
10	Am-241	3.23E-02	1.09E-02
11	Am-243	7.26E-04	2.45E-04
12	Ba-133	4.04E-13	1.36E-13
13	Ce-144	1.42E-05	4.80E-06
14	Cf-249	9.53E-06	3.22E-06
15	Cf-252	1.19E-02	4.03E-03
16	Cm-244	1.53E-02	5.15E-03
17	Cm-246	7.50E-04	2.53E-04
18	Co-60	5.40E-01	1.82E-01
19	Cs-137	8.91E-01	3.01E-01
20	H-3	0.00E+00	0.00E+00
21	Np-237	3.15E-05	1.06E-05
22	Pm-147	1.89E-08	6.38E-09
23	Pu-238	4.15E-02	1.40E-02
24	Pu-239	6.94E-02	2.34E-02
25	Pu mix-239/241	0.00E+00	0.00E+00
26	Pu-240	1.59E-02	5.37E-03
27	Pu-241	4.58E-01	1.55E-01
28	Pu pure-242	1.10E-04	3.70E-05
29	Sr-90	8.84E-01	2.99E-01
30	Tc-99	2.70E-13	9.12E-14
31	Th-232	1.45E-06	4.90E-07
32	Tl-204	6.75E-10	2.28E-10
33	U-235	1.34E-06	4.52E-07
34	U-238	1.62E-04	5.45E-05
35	Total	2.96E+00	1.00E+00
36	Ba-137m	8.91E-01	3.01E-01
37	Y-90	8.84E-01	2.99E-01
38	Pr-144	1.42E-05	4.80E-06
39	Pa-233	3.15E-05	1.06E-05
40	Th-234	1.62E-04	5.45E-05
41	Pa-234	1.62E-04	5.45E-05
42	Np-239	7.26E-04	2.45E-04
43	Th-231	1.34E-06	4.52E-07
44	Ra-228	1.45E-06	4.90E-07
45	Ac-228	1.45E-06	4.90E-07
46			
47	Total		

A	B	C
9	Total Release (Ci)	Activity fraction (Total)
10	= 'I:\jay.thompson\H att\SourceSRTC.xls)resp sums'!\$H10	=B10/\$B\$35
11	= 'I:\jay.thompson\H att\SourceSRTC.xls)resp sums'!\$H11	=B11/\$B\$35
12	= 'I:\jay.thompson\H att\SourceSRTC.xls)resp sums'!\$H12	=B12/\$B\$35
13	= 'I:\jay.thompson\H att\SourceSRTC.xls)resp sums'!\$H13	=B13/\$B\$35
14	= 'I:\jay.thompson\H att\SourceSRTC.xls)resp sums'!\$H14	=B14/\$B\$35
15	= 'I:\jay.thompson\H att\SourceSRTC.xls)resp sums'!\$H15	=B15/\$B\$35
16	= 'I:\jay.thompson\H att\SourceSRTC.xls)resp sums'!\$H16	=B16/\$B\$35
17	= 'I:\jay.thompson\H att\SourceSRTC.xls)resp sums'!\$H17	=B17/\$B\$35
18	= 'I:\jay.thompson\H att\SourceSRTC.xls)resp sums'!\$H18	=B18/\$B\$35
19	= 'I:\jay.thompson\H att\SourceSRTC.xls)resp sums'!\$H19	=B19/\$B\$35
20	= 0	=B20/\$B\$35
21	= 'I:\jay.thompson\H att\SourceSRTC.xls)resp sums'!\$H21	=B21/\$B\$35
22	= 'I:\jay.thompson\H att\SourceSRTC.xls)resp sums'!\$H22	=B22/\$B\$35
23	= 'I:\jay.thompson\H att\SourceSRTC.xls)resp sums'!\$H23	=B23/\$B\$35
24	= 'I:\jay.thompson\H att\SourceSRTC.xls)resp sums'!\$H24	=B24/\$B\$35
25	= 'I:\jay.thompson\H att\SourceSRTC.xls)resp sums'!\$H25	=B25/\$B\$35
26	= 'I:\jay.thompson\H att\SourceSRTC.xls)resp sums'!\$H26	=B26/\$B\$35
27	= 'I:\jay.thompson\H att\SourceSRTC.xls)resp sums'!\$H27	=B27/\$B\$35
28	= 'I:\jay.thompson\H att\SourceSRTC.xls)resp sums'!\$H28	=B28/\$B\$35
29	= 'I:\jay.thompson\H att\SourceSRTC.xls)resp sums'!\$H29	=B29/\$B\$35
30	= 'I:\jay.thompson\H att\SourceSRTC.xls)resp sums'!\$H30	=B30/\$B\$35
31	= 'I:\jay.thompson\H att\SourceSRTC.xls)resp sums'!\$H31	=B31/\$B\$35
32	= 'I:\jay.thompson\H att\SourceSRTC.xls)resp sums'!\$H32	=B32/\$B\$35
33	= 'I:\jay.thompson\H att\SourceSRTC.xls)resp sums'!\$H33	=B33/\$B\$35
34	= 'I:\jay.thompson\H att\SourceSRTC.xls)resp sums'!\$H34	=B34/\$B\$35
35	=SUM(B10:B34)	=SUM(C10:C34)
36	=B19	=C19
37	=B29	=C29
38	=B13	=C13
39	=B21	=C21
40	=B34	=C34
41	=B34	=C34
42	=B11	=C11
43	=B33	=C33
44	=B31	=C31
45	=B31	=C31
46		
47		

	A	D	E
		Respirable Release (Ci)	Activity fraction (Resp)
9			
10	Am-241	1.49E-02	5.56E-03
11	Am-243	4.55E-04	1.70E-04
12	Ba-133	4.04E-13	1.51E-13
13	Ce-144	1.42E-05	5.32E-06
14	Cf-249	8.24E-06	3.08E-06
15	Cf-252	1.19E-02	4.47E-03
16	Cm-244	1.71E-02	6.40E-03
17	Cm-246	4.99E-04	1.87E-04
18	Co-60	5.40E-01	2.02E-01
19	Cs-137	8.91E-01	3.34E-01
20	H-3	0.00E+00	0.00E+00
21	Np-237	2.44E-05	9.14E-06
22	Pm-147	1.89E-08	7.07E-09
23	Pu-238	1.81E-02	6.77E-03
24	Pu-239	2.35E-02	8.78E-03
25	Pu mix-239/241	0.00E+00	0.00E+00
26	Pu-240	5.34E-03	2.00E-03
27	Pu-241	2.66E-01	9.97E-02
28	Pu pure-242	3.47E-05	1.30E-05
29	Sr-90	8.83E-01	3.30E-01
30	Tc-99	2.70E-13	1.01E-13
31	Th-232	1.44E-06	5.38E-07
32	Tl-204	6.75E-10	2.53E-10
33	U-235	6.88E-07	2.57E-07
34	U-238	5.11E-05	1.91E-05
35	Total	2.67E+00	1.00E+00
36	Ba-137m	8.91E-01	3.34E-01
37	Y-90	8.83E-01	3.30E-01
38	Pr-144	1.42E-05	5.32E-06
39	Pa-233	2.44E-05	9.14E-06
40	Th-234	5.11E-05	1.91E-05
41	Pa-234	5.11E-05	1.91E-05
42	Np-239	4.55E-04	1.70E-04
43	Th-231	6.88E-07	2.57E-07
44	Ra-228	1.44E-06	5.38E-07
45	Ac-228	1.44E-06	5.38E-07
46			
47	Total		

A	D	E
		Activity fraction (Resp)
9	Respirable Release (Ci)	
10	=I:\jay.thompson\H att\SourceSRTC.xls!\$F10	=D10/\$D\$35
11	=I:\jay.thompson\H att\SourceSRTC.xls!\$F11	=D11/\$D\$35
12	=I:\jay.thompson\H att\SourceSRTC.xls!\$F12	=D12/\$D\$35
13	=I:\jay.thompson\H att\SourceSRTC.xls!\$F13	=D13/\$D\$35
14	=I:\jay.thompson\H att\SourceSRTC.xls!\$F14	=D14/\$D\$35
15	=I:\jay.thompson\H att\SourceSRTC.xls!\$F15	=D15/\$D\$35
16	=I:\jay.thompson\H att\SourceSRTC.xls!\$F16	=D16/\$D\$35
17	=I:\jay.thompson\H att\SourceSRTC.xls!\$F17	=D17/\$D\$35
18	=I:\jay.thompson\H att\SourceSRTC.xls!\$F18	=D18/\$D\$35
19	=I:\jay.thompson\H att\SourceSRTC.xls!\$F19	=D19/\$D\$35
20	=0	=D20/\$D\$35
21	=I:\jay.thompson\H att\SourceSRTC.xls!\$F21	=D21/\$D\$35
22	=I:\jay.thompson\H att\SourceSRTC.xls!\$F22	=D22/\$D\$35
23	=I:\jay.thompson\H att\SourceSRTC.xls!\$F23	=D23/\$D\$35
24	=I:\jay.thompson\H att\SourceSRTC.xls!\$F24	=D24/\$D\$35
25	=I:\jay.thompson\H att\SourceSRTC.xls!\$F25	=D25/\$D\$35
26	=I:\jay.thompson\H att\SourceSRTC.xls!\$F26	=D26/\$D\$35
27	=I:\jay.thompson\H att\SourceSRTC.xls!\$F27	=D27/\$D\$35
28	=I:\jay.thompson\H att\SourceSRTC.xls!\$F28	=D28/\$D\$35
29	=I:\jay.thompson\H att\SourceSRTC.xls!\$F29	=D29/\$D\$35
30	=I:\jay.thompson\H att\SourceSRTC.xls!\$F30	=D30/\$D\$35
31	=I:\jay.thompson\H att\SourceSRTC.xls!\$F31	=D31/\$D\$35
32	=I:\jay.thompson\H att\SourceSRTC.xls!\$F32	=D32/\$D\$35
33	=I:\jay.thompson\H att\SourceSRTC.xls!\$F33	=D33/\$D\$35
34	=I:\jay.thompson\H att\SourceSRTC.xls!\$F34	=D34/\$D\$35
35	=SUM(D10:D34)	=SUM(E10:E34)
36	=D19	=E19
37	=D29	=E29
38	=D13	=E13
39	=D21	=E21
40	=D34	=E34
41	=D34	=E34
42	=D11	=E11
43	=D33	=E33
44	=D31	=E31
45	=D31	=E31
46		
47		

	A	G	H
		CEDE	External EDE
9		(mrem per uCi/m ²)	(mrem per uCi/m ²)
10	Am-241	2.59E+01	3.62E-02
11	Am-243	7.87E-01	1.80E-03
12	Ba-133	1.24E-14	6.33E-12
13	Ce-144	2.09E-05	1.15E-05
14	Cf-249	1.87E-02	1.26E-04
15	Cf-252	7.36E+00	2.83E-04
16	Cm-244	1.67E+01	4.73E-04
17	Cm-246	8.85E-01	2.06E-05
18	Co-60	4.64E-01	4.58E+01
19	Cs-137	1.12E-01	0.00E+00
20	H-3	0.00E+00	0.00E+00
21	Np-237	5.19E-02	3.82E-05
22	Pm-147	2.91E-09	2.90E-12
23	Pu-238	2.79E+01	1.33E-03
24	Pu-239	3.96E+01	9.81E-04
25	Pu mix-239/241	0.00E+00	0.00E+00
26	Pu-240	9.01E+00	4.88E-04
27	Pu-241	8.64E+00	0.00E+00
28	Pu pure-242	5.60E-02	2.80E-06
29	Sr-90	4.51E+00	0.00E+00
30	Tc-99	8.83E-15	6.32E-18
31	Th-232	9.26E-03	3.62E-08
32	Tl-204	6.38E-12	3.28E-11
33	U-235	3.32E-04	8.57E-06
34	U-238	2.38E-02	3.90E-06
35	Total		
36	Ba-137m		2.04E+01
37	Y-90		0.00E+00
38	Pr-144		1.59E-05
39	Pa-233		2.78E-04
40	Th-234		6.10E-05
41	Pa-234		1.18E-02
42	Np-239		5.22E-03
43	Th-231		9.57E-07
44	Ra-228		3.62E-14
45	Ac-228		4.94E-05
46			
47	Total	1.42E+02	6.63E+01

	A	G	H
9		CEDE (mrem per uCi/m ²)	External EDE (mrem per uCi/m ²)
10	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E10*Relocation!H10		=\$B\$7*\$B\$8*\$C10*Relocation!E10*\$B\$35/\$D\$35
11	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E11*Relocation!H11		=\$B\$7*\$B\$8*\$C11*Relocation!E11*\$B\$35/\$D\$35
12	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E12*Relocation!H12		=\$B\$7*\$B\$8*\$C12*Relocation!E12*\$B\$35/\$D\$35
13	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E13*Relocation!H13		=\$B\$7*\$B\$8*\$C13*Relocation!E13*\$B\$35/\$D\$35
14	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E14*Relocation!H14		=\$B\$7*\$B\$8*\$C14*Relocation!E14*\$B\$35/\$D\$35
15	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E15*Relocation!H15		=\$B\$7*\$B\$8*\$C15*Relocation!E15*\$B\$35/\$D\$35
16	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E16*Relocation!H16		=\$B\$7*\$B\$8*\$C16*Relocation!E16*\$B\$35/\$D\$35
17	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E17*Relocation!H17		=\$B\$7*\$B\$8*\$C17*Relocation!E17*\$B\$35/\$D\$35
18	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E18*Relocation!H18		=\$B\$7*\$B\$8*\$C18*Relocation!E18*\$B\$35/\$D\$35
19	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E19*Relocation!H19		=\$B\$7*\$B\$8*\$C19*Relocation!E19*\$B\$35/\$D\$35
20	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E20*Relocation!H20		=\$B\$7*\$B\$8*\$C20*Relocation!E20*\$B\$35/\$D\$35
21	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E21*Relocation!H21		=\$B\$7*\$B\$8*\$C21*Relocation!E21*\$B\$35/\$D\$35
22	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E22*Relocation!H22		=\$B\$7*\$B\$8*\$C22*Relocation!E22*\$B\$35/\$D\$35
23	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E23*Relocation!H23		=\$B\$7*\$B\$8*\$C23*Relocation!E23*\$B\$35/\$D\$35
24	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E24*Relocation!H24		=\$B\$7*\$B\$8*\$C24*Relocation!E24*\$B\$35/\$D\$35
25	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E25*Relocation!H25		=\$B\$7*\$B\$8*\$C25*Relocation!E25*\$B\$35/\$D\$35
26	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E26*Relocation!H26		=\$B\$7*\$B\$8*\$C26*Relocation!E26*\$B\$35/\$D\$35
27	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E27*Relocation!H27		=\$B\$7*\$B\$8*\$C27*Relocation!E27*\$B\$35/\$D\$35
28	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E28*Relocation!H28		=\$B\$7*\$B\$8*\$C28*Relocation!E28*\$B\$35/\$D\$35
29	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E29*Relocation!H29		=\$B\$7*\$B\$8*\$C29*Relocation!E29*\$B\$35/\$D\$35
30	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E30*Relocation!H30		=\$B\$7*\$B\$8*\$C30*Relocation!E30*\$B\$35/\$D\$35
31	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E31*Relocation!H31		=\$B\$7*\$B\$8*\$C31*Relocation!E31*\$B\$35/\$D\$35
32	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E32*Relocation!H32		=\$B\$7*\$B\$8*\$C32*Relocation!E32*\$B\$35/\$D\$35
33	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E33*Relocation!H33		=\$B\$7*\$B\$8*\$C33*Relocation!E33*\$B\$35/\$D\$35
34	='=\$B\$7*\$B\$3*\$B\$4*\$B\$5*\$B\$6*\$B\$8*E34*Relocation!H34		=\$B\$7*\$B\$8*\$C34*Relocation!E34*\$B\$35/\$D\$35
35			
36	=R		=\$B\$7*\$B\$8*\$C36*Relocation!E36*\$B\$35/\$D\$35
37	=R		=\$B\$7*\$B\$8*\$C37*Relocation!E37*\$B\$35/\$D\$35
38	=R		=\$B\$7*\$B\$8*\$C38*Relocation!E38*\$B\$35/\$D\$35
39	=R		=\$B\$7*\$B\$8*\$C39*Relocation!E39*\$B\$35/\$D\$35
40	=R		=\$B\$7*\$B\$8*\$C40*Relocation!E40*\$B\$35/\$D\$35
41	=R		=\$B\$7*\$B\$8*\$C41*Relocation!E41*\$B\$35/\$D\$35
42	=R		=\$B\$7*\$B\$8*\$C42*Relocation!E42*\$B\$35/\$D\$35
43	=R		=\$B\$7*\$B\$8*\$C43*Relocation!E43*\$B\$35/\$D\$35
44	=R		=\$B\$7*\$B\$8*\$C44*Relocation!E44*\$B\$35/\$D\$35
45	=R		=\$B\$7*\$B\$8*\$C45*Relocation!E45*\$B\$35/\$D\$35
46			
47	T=SUM(G10:G46)		=SUM(H10:H46)

	A	J	K
9			BS Dose (mrem per uCi/m ²)
		Skin Dose (mrem per uCi/m ²)	
10	Am-241	7.73E-02	4.69E+02
11	Am-243	2.88E-03	1.44E+01
12	Ba-133	8.79E-12	5.58E-14
13	Ce-144	1.52E-05	9.75E-07
14	Cf-249	1.70E-04	3.98E-01
15	Cf-252	2.08E-03	2.38E+01
16	Cm-244	3.74E-03	2.91E+02
17	Cm-246	1.64E-04	1.61E+01
18	Co-60	6.16E+01	1.06E-01
19	Cs-137	9.37E+00	1.03E-01
20	H-3	0.00E+00	0.00E+00
21	Np-237	8.89E-05	1.16E+00
22	Pm-147	3.51E-12	5.52E-09
23	Pu-238	1.11E-02	5.00E+02
24	Pu-239	7.27E-03	7.20E+02
25	Pu mix-239/241	0.00E+00	0.00E+00
26	Pu-240	4.06E-03	1.64E+02
27	Pu-241	0.00E+00	1.63E+02
28	Pu pure-242	2.33E-05	1.01E+00
29	Sr-90	5.72E+00	9.10E-01
30	Tc-99	7.81E-18	1.57E-16
31	Th-232	2.63E-07	2.32E-01
32	Tl-204	3.41E-08	4.07E-12
33	U-235	1.14E-05	1.05E-05
34	U-238	3.20E-05	7.51E-04
35	Total		
36	Ba-137m	6.37E+01	
37	Y-90	3.39E+02	
38	Pr-144	7.93E-03	
39	Pa-233	3.87E-04	
40	Th-234	1.07E-04	
41	Pa-234	2.44E-02	
42	Np-239	8.09E-03	
43	Th-231	3.22E-06	
44	Ra-228	4.35E-13	
45	Ac-228	2.73E-04	
46			
47	Total	4.80E+02	2.37E+03

A	J	K
9	Skin Dose (mrem per uCi/m ²)	BS Dose (mrem per uCi/m ²)
10	=B\$7*B\$8*C10*Relocation!\$F10*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E10*Relocation!\$J10
11	=B\$7*B\$8*C11*Relocation!\$F11*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E11*Relocation!\$J11
12	=B\$7*B\$8*C12*Relocation!\$F12*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E12*Relocation!\$J12
13	=B\$7*B\$8*C13*Relocation!\$F13*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E13*Relocation!\$J13
14	=B\$7*B\$8*C14*Relocation!\$F14*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E14*Relocation!\$J14
15	=B\$7*B\$8*C15*Relocation!\$F15*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E15*Relocation!\$J15
16	=B\$7*B\$8*C16*Relocation!\$F16*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E16*Relocation!\$J16
17	=B\$7*B\$8*C17*Relocation!\$F17*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E17*Relocation!\$J17
18	=B\$7*B\$8*C18*Relocation!\$F18*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E18*Relocation!\$J18
19	=B\$7*B\$8*C19*Relocation!\$F19*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E19*Relocation!\$J19
20	=B\$7*B\$8*C20*Relocation!\$F20*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E20*Relocation!\$J20
21	=B\$7*B\$8*C21*Relocation!\$F21*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E21*Relocation!\$J21
22	=B\$7*B\$8*C22*Relocation!\$F22*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E22*Relocation!\$J22
23	=B\$7*B\$8*C23*Relocation!\$F23*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E23*Relocation!\$J23
24	=B\$7*B\$8*C24*Relocation!\$F24*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E24*Relocation!\$J24
25	=B\$7*B\$8*C25*Relocation!\$F25*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E25*Relocation!\$J25
26	=B\$7*B\$8*C26*Relocation!\$F26*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E26*Relocation!\$J26
27	=B\$7*B\$8*C27*Relocation!\$F27*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E27*Relocation!\$J27
28	=B\$7*B\$8*C28*Relocation!\$F28*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E28*Relocation!\$J28
29	=B\$7*B\$8*C29*Relocation!\$F29*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E29*Relocation!\$J29
30	=B\$7*B\$8*C30*Relocation!\$F30*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E30*Relocation!\$J30
31	=B\$7*B\$8*C31*Relocation!\$F31*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E31*Relocation!\$J31
32	=B\$7*B\$8*C32*Relocation!\$F32*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E32*Relocation!\$J32
33	=B\$7*B\$8*C33*Relocation!\$F33*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E33*Relocation!\$J33
34	=B\$7*B\$8*C34*Relocation!\$F34*\$B\$35/\$D\$35	=B\$7*B\$3*B\$4*B\$5*B\$6*B\$8*\$E34*Relocation!\$J34
35		
36	=R*B\$7*B\$8*C36*Relocation!\$F36*\$B\$35/\$D\$35	
37	=R*B\$7*B\$8*C37*Relocation!\$F37*\$B\$35/\$D\$35	
38	=R*B\$7*B\$8*C38*Relocation!\$F38*\$B\$35/\$D\$35	
39	=R*B\$7*B\$8*C39*Relocation!\$F39*\$B\$35/\$D\$35	
40	=R*B\$7*B\$8*C40*Relocation!\$F40*\$B\$35/\$D\$35	
41	=R*B\$7*B\$8*C41*Relocation!\$F41*\$B\$35/\$D\$35	
42	=R*B\$7*B\$8*C42*Relocation!\$F42*\$B\$35/\$D\$35	
43	=R*B\$7*B\$8*C43*Relocation!\$F43*\$B\$35/\$D\$35	
44	=R*B\$7*B\$8*C44*Relocation!\$F44*\$B\$35/\$D\$35	
45	=R*B\$7*B\$8*C45*Relocation!\$F45*\$B\$35/\$D\$35	
46		
47	=SUM(J10:J46)	=SUM(K10:K46)

	F	G
52	9.60E+00	DRL (uCi/m^2) -- PAG/(CEDE+External)
53	8.23E+00	DRL (uCi/m^2) -- PAG/(BS Dose + External)
54	2.08E+02	DRL (uCi/m^2) -- PAG/(Skin Dose)

	F	G
52	=H3/(G47+H47)	DRL (uCi/m ²) – PAG/(CEDE+External)
53	=H4/(K47+H47)	DRL (uCi/m ²) – PAG/(BS Dose + External)
54	=H5/J47	DRL (uCi/m ²) – PAG/(Skin Dose)

	B	C	D	E	F	G	H	I	J	K	L	N	R	S	T
1	Relocation calculation for SRTC accident. Particulates ONLY; tritium considered separately.														
2	Calculation of dose from deposited radionuclides (EPA PAG manual 1991, section 7.3.2, p. 7-15) (resuspension and external radiation)														
3		1.00E-06	Resuspension factor (1/m)				2000	PAG -- Effective Dose (mrem)				Lambda 2 (1/yr)			
4		1.05E+04	BreathRate (m ³ /yr)				20000	PAG -- Organ-specific Dose (mrem)				1.13	Time (years) for length of exp		
5		3.70E+04	CF (Bq/microCi)				100000	PAG -- Skin (mrem)				Lambda 3 (1/yr)	1	2	50
6		1.00E+05	CF (mrem/Sv)									7.48E-03			
7		1.00E+00	microCi/m ²					CEDE and BS Dose are based on respirable particulate release							
8		1.00E+00	Exposure period (1 year)					External EDE and Skin Dose are based on total particulate release							

	B	C	D	H	I	N	R	S	T
1	Relocation calculation for S								
2	Calculation of dose from de								
3		=Relo_HIB3	=Relo_HIC3	2000	PAG – Effective Dose	Lambda 2 (1/yr)			
4		=Relo_HIB4	=Relo_HIC4	20000	PAG – Organ-specific	1.13	Time (years) for length		
5		=Relo_HIB5	=Relo_HIC5	100000	PAG – Skin (mrem)	Lambda 3 (1/yr)	1	2	50
6		=Relo_HIB6	=Relo_HIC6			0.00748			
7		=Relo_HIB7	=Relo_HIC7	CEDE and BS Dose are					
8		=Relo_HIB8	=Relo_HIC8	External EDE and Skin					

	B	C	D
9	Nuclide	Total Release (Ci)	Activity fraction (Total)
10	Am-241	3.23E-02	1.09E-02
11	Am-243	7.26E-04	2.45E-04
12	Ba-133	4.04E-13	1.36E-13
13	Ce-144	1.42E-05	4.80E-06
14	Cf-249	9.53E-06	3.22E-06
15	Cf-252	1.19E-02	4.03E-03
16	Cm-244	1.53E-02	5.15E-03
17	Cm-246	7.50E-04	2.53E-04
18	Co-60	5.40E-01	1.82E-01
19	Cs-137	8.91E-01	3.01E-01
20	H-3	0.00E+00	0.00E+00
21	Np-237	3.15E-05	1.06E-05
22	Pm-147	1.89E-08	6.38E-09
23	Pu-238	4.15E-02	1.40E-02
24	Pu-239	6.94E-02	2.34E-02
25	Pu mix-239/241	0.00E+00	0.00E+00
26	Pu-240	1.59E-02	5.37E-03
27	Pu-241	4.58E-01	1.55E-01
28	Pu pure-242	1.10E-04	3.70E-05
29	Sr-90	8.84E-01	2.99E-01
30	Tc-99	2.70E-13	9.12E-14
31	Th-232	1.45E-06	4.90E-07
32	Ti-204	6.75E-10	2.28E-10
33	U-235	1.34E-06	4.52E-07
34	U-238	1.62E-04	5.45E-05
35	Total	2.96E+00	1.00E+00
36	Ba-137m	8.91E-01	3.01E-01
37	Y-90	8.84E-01	2.99E-01
38	Pr-144	1.42E-05	4.80E-06
39	Pa-233	3.15E-05	1.06E-05
40	Th-234	1.62E-04	5.45E-05
41	Pa-234	1.62E-04	5.45E-05
42	Np-239	7.26E-04	2.45E-04
43	Th-231	1.34E-06	4.52E-07
44	Ra-228	1.45E-06	4.90E-07
45	Ac-228	1.45E-06	4.90E-07

	B	C	D
9	Nuclide	Total Release (Ci)	Activity fraction (Total)
10	Am-241	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H10	=C10/\$C\$35
11	Am-243	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H11	=C11/\$C\$35
12	Ba-133	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H12	=C12/\$C\$35
13	Ce-144	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H13	=C13/\$C\$35
14	Cf-249	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H14	=C14/\$C\$35
15	Cf-252	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H15	=C15/\$C\$35
16	Cm-244	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H16	=C16/\$C\$35
17	Cm-246	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H17	=C17/\$C\$35
18	Co-60	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H18	=C18/\$C\$35
19	Cs-137	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H19	=C19/\$C\$35
20	H-3	0	=C20/\$C\$35
21	Np-237	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H21	=C21/\$C\$35
22	Pm-147	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H22	=C22/\$C\$35
23	Pu-238	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H23	=C23/\$C\$35
24	Pu-239	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H24	=C24/\$C\$35
25	Pu mix-239/241	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H25	=C25/\$C\$35
26	Pu-240	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H26	=C26/\$C\$35
27	Pu-241	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H27	=C27/\$C\$35
28	Pu pure-242	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H28	=C28/\$C\$35
29	Sr-90	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H29	=C29/\$C\$35
30	Tc-99	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H30	=C30/\$C\$35
31	Th-232	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H31	=C31/\$C\$35
32	Tl-204	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H32	=C32/\$C\$35
33	U-235	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H33	=C33/\$C\$35
34	U-238	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H34	=C34/\$C\$35
35	Total	=SUM(C10:C34)	=SUM(D10:D34)
36	Ba-137m	=C19	=D19
37	Y-90	=C29	=D29
38	Pr-144	=C13	=D13
39	Pa-233	=C21	=D21
40	Th-234	=C34	=D34
41	Pa-234	=C34	=D34
42	Np-239	=C11	=D11
43	Th-231	=C33	=D33
44	Ra-228	=C31	=D31
45	Ac-228	=C31	=D31

	B	E	F
9	Nuclide	Respirable Release (Ci)	Activity fraction (Resp)
10	Am-241	1.49E-02	5.56E-03
11	Am-243	4.55E-04	1.70E-04
12	Ba-133	4.04E-13	1.51E-13
13	Ce-144	1.42E-05	5.32E-06
14	Cf-249	8.24E-06	3.08E-06
15	Cf-252	1.19E-02	4.47E-03
16	Cm-244	1.71E-02	6.40E-03
17	Cm-246	4.99E-04	1.87E-04
18	Co-60	5.40E-01	2.02E-01
19	Cs-137	8.91E-01	3.34E-01
20	H-3	0.00E+00	0.00E+00
21	Np-237	2.44E-05	9.14E-06
22	Pm-147	1.89E-08	7.07E-09
23	Pu-238	1.81E-02	6.77E-03
24	Pu-239	2.35E-02	8.78E-03
25	Pu mix-239	0.00E+00	0.00E+00
26	Pu-240	5.34E-03	2.00E-03
27	Pu-241	2.66E-01	9.97E-02
28	Pu pure-24	3.47E-05	1.30E-05
29	Sr-90	8.83E-01	3.30E-01
30	Tc-99	2.70E-13	1.01E-13
31	Th-232	1.44E-06	5.38E-07
32	Tl-204	6.75E-10	2.53E-10
33	U-235	6.88E-07	2.57E-07
34	U-238	5.11E-05	1.91E-05
35	Total	2.67E+00	1.00E+00
36	Ba-137m	8.91E-01	3.34E-01
37	Y-90	8.83E-01	3.30E-01
38	Pr-144	1.42E-05	5.32E-06
39	Pa-233	2.44E-05	9.14E-06
40	Th-234	5.11E-05	1.91E-05
41	Pa-234	5.11E-05	1.91E-05
42	Np-239	4.55E-04	1.70E-04
43	Th-231	6.88E-07	2.57E-07
44	Ra-228	1.44E-06	5.38E-07
45	Ac-228	1.44E-06	5.38E-07

	B	E	F
9	Nuclide	Respirable Release (Ci)	Activity fraction (Resp)
10	Am-241	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F10 =E10/\$E\$35	
11	Am-243	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F11 =E11/\$E\$35	
12	Ba-133	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F12 =E12/\$E\$35	
13	Ce-144	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F13 =E13/\$E\$35	
14	Cf-249	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F14 =E14/\$E\$35	
15	Cf-252	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F15 =E15/\$E\$35	
16	Cm-244	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F16 =E16/\$E\$35	
17	Cm-246	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F17 =E17/\$E\$35	
18	Co-60	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F18 =E18/\$E\$35	
19	Cs-137	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F19 =E19/\$E\$35	
20	H-3	0	=E20/\$E\$35
21	Np-237	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F21 =E21/\$E\$35	
22	Pm-147	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F22 =E22/\$E\$35	
23	Pu-238	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F23 =E23/\$E\$35	
24	Pu-239	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F24 =E24/\$E\$35	
25	Pu mix-239/241	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F25 =E25/\$E\$35	
26	Pu-240	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F26 =E26/\$E\$35	
27	Pu-241	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F27 =E27/\$E\$35	
28	Pu pure-242	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F28 =E28/\$E\$35	
29	Sr-90	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F29 =E29/\$E\$35	
30	Tc-99	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F30 =E30/\$E\$35	
31	Th-232	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F31 =E31/\$E\$35	
32	Tl-204	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F32 =E32/\$E\$35	
33	U-235	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F33 =E33/\$E\$35	
34	U-238	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F34 =E34/\$E\$35	
35	Total	=SUM(E10:E34)	=SUM(F10:F34)
36	Ba-137m	=E19	=F19
37	Y-90	=E29	=F29
38	Pr-144	=E13	=F13
39	Pa-233	=E21	=F21
40	Th-234	=E34	=F34
41	Pa-234	=E34	=F34
42	Np-239	=E11	=F11
43	Th-231	=E33	=F33
44	Ra-228	=E31	=F31
45	Ac-228	=E31	=F31

	B	H	I
		CEDE (mrem per uCi/m ²)	External EDE (mrem per uCi/m ²)
9	Nuclide		
10	Am-241	1.93E+01	2.70E-02
11	Am-243	5.87E-01	1.34E-03
12	Ba-133	8.96E-15	4.58E-12
13	Ce-144	1.07E-05	5.92E-06
14	Cf-249	1.39E-02	9.36E-05
15	Cf-252	4.89E+00	1.88E-04
16	Cm-244	1.22E+01	3.47E-04
17	Cm-246	6.60E-01	1.54E-05
18	Co-60	3.26E-01	3.22E+01
19	Cs-137	8.26E-02	0.00E+00
20	H-3		
21	Np-237	3.87E-02	2.85E-05
22	Pm-147	1.93E-09	1.92E-12
23	Pu-238	2.07E+01	9.90E-04
24	Pu-239	2.95E+01	7.32E-04
25	Pu mix-239/241		
26	Pu-240	6.72E+00	3.64E-04
27	Pu-241	6.29E+00	0.00E+00
28	Pu pure-242	4.18E-02	2.09E-06
29	Sr-90	3.32E+00	0.00E+00
30	Tc-99	6.59E-15	4.72E-18
31	Th-232	6.91E-03	2.70E-08
32	Ti-204	4.39E-12	2.26E-11
33	U-235	2.48E-04	6.39E-06
34	U-238	1.77E-02	2.91E-06
35	Total		
36	Ba-137m		1.43E-04
37	Y-90		0.00E+00
38	Pr-144		7.52E-10
39	Pa-233		2.77E-05
40	Th-234		5.46E-06
41	Pa-234		1.31E-05
42	Np-239		4.82E-05
43	Th-231		4.01E-09
44	Ra-228		2.56E-14
45	Ac-228		4.98E-08
46			
47	Total	1.05E+02	3.23E+01

	B	H	I
9	Nuclide	CEDE (mrem per uCi/m ²)	External EDE (mrem per uCi/m ²)
10	Am-241	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F10*Relocation!H10*O10	=\$C\$7*\$D10*Relocation!E10*\$C\$35/\$E\$35*O10
11	Am-243	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F11*Relocation!H11*O11	=\$C\$7*\$D11*Relocation!E11*\$C\$35/\$E\$35*O11
12	Ba-133	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F12*Relocation!H12*O12	=\$C\$7*\$D12*Relocation!E12*\$C\$35/\$E\$35*O12
13	Ce-144	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F13*Relocation!H13*O13	=\$C\$7*\$D13*Relocation!E13*\$C\$35/\$E\$35*O13
14	Cf-249	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F14*Relocation!H14*O14	=\$C\$7*\$D14*Relocation!E14*\$C\$35/\$E\$35*O14
15	Cf-252	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F15*Relocation!H15*O15	=\$C\$7*\$D15*Relocation!E15*\$C\$35/\$E\$35*O15
16	Cm-244	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F16*Relocation!H16*O16	=\$C\$7*\$D16*Relocation!E16*\$C\$35/\$E\$35*O16
17	Cm-246	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F17*Relocation!H17*O17	=\$C\$7*\$D17*Relocation!E17*\$C\$35/\$E\$35*O17
18	Co-60	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F18*Relocation!H18*O18	=\$C\$7*\$D18*Relocation!E18*\$C\$35/\$E\$35*O18
19	Cs-137	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F19*Relocation!H19*O19	=\$C\$7*\$D19*Relocation!E19*\$C\$35/\$E\$35*O19
20	H-3		
21	Np-237	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F21*Relocation!H21*O21	=\$C\$7*\$D21*Relocation!E21*\$C\$35/\$E\$35*O21
22	Pm-147	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F22*Relocation!H22*O22	=\$C\$7*\$D22*Relocation!E22*\$C\$35/\$E\$35*O22
23	Pu-238	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F23*Relocation!H23*O23	=\$C\$7*\$D23*Relocation!E23*\$C\$35/\$E\$35*O23
24	Pu-239	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F24*Relocation!H24*O24	=\$C\$7*\$D24*Relocation!E24*\$C\$35/\$E\$35*O24
25	Pu mix-239/241		
26	Pu-240	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F26*Relocation!H26*O26	=\$C\$7*\$D26*Relocation!E26*\$C\$35/\$E\$35*O26
27	Pu-241	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F27*Relocation!H27*O27	=\$C\$7*\$D27*Relocation!E27*\$C\$35/\$E\$35*O27
28	Pu pure-242	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F28*Relocation!H28*O28	=\$C\$7*\$D28*Relocation!E28*\$C\$35/\$E\$35*O28
29	Sr-90	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F29*Relocation!H29*O29	=\$C\$7*\$D29*Relocation!E29*\$C\$35/\$E\$35*O29
30	Tc-99	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F30*Relocation!H30*O30	=\$C\$7*\$D30*Relocation!E30*\$C\$35/\$E\$35*O30
31	Th-232	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F31*Relocation!H31*O31	=\$C\$7*\$D31*Relocation!E31*\$C\$35/\$E\$35*O31
32	Ti-204	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F32*Relocation!H32*O32	=\$C\$7*\$D32*Relocation!E32*\$C\$35/\$E\$35*O32
33	U-235	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F33*Relocation!H33*O33	=\$C\$7*\$D33*Relocation!E33*\$C\$35/\$E\$35*O33
34	U-238	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F34*Relocation!H34*O34	=\$C\$7*\$D34*Relocation!E34*\$C\$35/\$E\$35*O34
35	Total		
36	Ba-137m		=\$C\$7*\$D36*Relocation!E36*\$C\$35/\$E\$35*O36
37	Y-90		=\$C\$7*\$D37*Relocation!E37*\$C\$35/\$E\$35*O37
38	Pr-144		=\$C\$7*\$D38*Relocation!E38*\$C\$35/\$E\$35*O38
39	Pa-233		=\$C\$7*\$D39*Relocation!E39*\$C\$35/\$E\$35*O39
40	Th-234		=\$C\$7*\$D40*Relocation!E40*\$C\$35/\$E\$35*O40
41	Pa-234		=\$C\$7*\$D41*Relocation!E41*\$C\$35/\$E\$35*O41
42	Np-239		=\$C\$7*\$D42*Relocation!E42*\$C\$35/\$E\$35*O42
43	Th-231		=\$C\$7*\$D43*Relocation!E43*\$C\$35/\$E\$35*O43
44	Ra-228		=\$C\$7*\$D44*Relocation!E44*\$C\$35/\$E\$35*O44
45	Ac-228		=\$C\$7*\$D45*Relocation!E45*\$C\$35/\$E\$35*O45
46			
47	Total	=SUM(H10:H46)	=SUM(I10:I46)

	B	K	L
9	Nuclide	Skin Dose (mrem per uCi/m ²)	BS Dose (mrem per uCi/m ²)
10	Am-241	5.77E-02	3.50E+02
11	Am-243	2.15E-03	1.07E+01
12	Ba-133	6.36E-12	4.04E-14
13	Ce-144	7.83E-06	5.02E-07
14	Cf-249	1.27E-04	2.97E-01
15	Cf-252	1.38E-03	1.58E+01
16	Cm-244	2.74E-03	2.13E+02
17	Cm-246	1.22E-04	1.20E+01
18	Co-60	4.33E+01	7.45E-02
19	Cs-137	6.92E+00	7.60E-02
20	H-3		
21	Np-237	6.63E-05	8.67E-01
22	Pm-147	2.33E-12	3.67E-09
23	Pu-238	8.28E-03	3.72E+02
24	Pu-239	5.42E-03	5.37E+02
25	Pu mix-239/241		
26	Pu-240	3.03E-03	1.22E+02
27	Pu-241	0.00E+00	1.19E+02
28	Pu pure-242	1.74E-05	7.56E-01
29	Sr-90	4.22E+00	6.72E-01
30	Tc-99	5.83E-18	1.17E-16
31	Th-232	1.96E-07	1.73E-01
32	Ti-204	2.35E-08	2.80E-12
33	U-235	8.48E-06	7.83E-06
34	U-238	2.39E-05	5.60E-04
35	Total		
36	Ba-137m	4.46E-04	
37	Y-90	3.55E+00	
38	Pr-144	3.76E-07	
39	Pa-233	3.85E-05	
40	Th-234	9.57E-06	
41	Pa-234	2.69E-05	
42	Np-239	7.49E-05	
43	Th-231	1.35E-08	
44	Ra-228	3.08E-13	
45	Ac-228	2.76E-07	
46			
47	Total	5.81E+01	1.75E+03

	B	K	L
9	Nuclide	Skin Dose (mrem per uCi/m ²)	BS Dose (mrem per uCi/m ²)
10	Am-241	=C\$7*\$D10*Relocation!\$F10*\$C\$35/\$E\$35*O10	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F10*Relocation!\$J10*O10
11	Am-243	=C\$7*\$D11*Relocation!\$F11*\$C\$35/\$E\$35*O11	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F11*Relocation!\$J11*O11
12	Ba-133	=C\$7*\$D12*Relocation!\$F12*\$C\$35/\$E\$35*O12	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F12*Relocation!\$J12*O12
13	Ce-144	=C\$7*\$D13*Relocation!\$F13*\$C\$35/\$E\$35*O13	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F13*Relocation!\$J13*O13
14	Cf-249	=C\$7*\$D14*Relocation!\$F14*\$C\$35/\$E\$35*O14	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F14*Relocation!\$J14*O14
15	Cf-252	=C\$7*\$D15*Relocation!\$F15*\$C\$35/\$E\$35*O15	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F15*Relocation!\$J15*O15
16	Cm-244	=C\$7*\$D16*Relocation!\$F16*\$C\$35/\$E\$35*O16	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F16*Relocation!\$J16*O16
17	Cm-246	=C\$7*\$D17*Relocation!\$F17*\$C\$35/\$E\$35*O17	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F17*Relocation!\$J17*O17
18	Co-60	=C\$7*\$D18*Relocation!\$F18*\$C\$35/\$E\$35*O18	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F18*Relocation!\$J18*O18
19	Cs-137	=C\$7*\$D19*Relocation!\$F19*\$C\$35/\$E\$35*O19	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F19*Relocation!\$J19*O19
20	H-3		
21	Np-237	=C\$7*\$D21*Relocation!\$F21*\$C\$35/\$E\$35*O21	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F21*Relocation!\$J21*O21
22	Pm-147	=C\$7*\$D22*Relocation!\$F22*\$C\$35/\$E\$35*O22	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F22*Relocation!\$J22*O22
23	Pu-238	=C\$7*\$D23*Relocation!\$F23*\$C\$35/\$E\$35*O23	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F23*Relocation!\$J23*O23
24	Pu-239	=C\$7*\$D24*Relocation!\$F24*\$C\$35/\$E\$35*O24	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F24*Relocation!\$J24*O24
25	Pu mix-239/241		
26	Pu-240	=C\$7*\$D26*Relocation!\$F26*\$C\$35/\$E\$35*O26	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F26*Relocation!\$J26*O26
27	Pu-241	=C\$7*\$D27*Relocation!\$F27*\$C\$35/\$E\$35*O27	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F27*Relocation!\$J27*O27
28	Pu pure-242	=C\$7*\$D28*Relocation!\$F28*\$C\$35/\$E\$35*O28	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F28*Relocation!\$J28*O28
29	Sr-90	=C\$7*\$D29*Relocation!\$F29*\$C\$35/\$E\$35*O29	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F29*Relocation!\$J29*O29
30	Tc-99	=C\$7*\$D30*Relocation!\$F30*\$C\$35/\$E\$35*O30	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F30*Relocation!\$J30*O30
31	Th-232	=C\$7*\$D31*Relocation!\$F31*\$C\$35/\$E\$35*O31	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F31*Relocation!\$J31*O31
32	Tl-204	=C\$7*\$D32*Relocation!\$F32*\$C\$35/\$E\$35*O32	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F32*Relocation!\$J32*O32
33	U-235	=C\$7*\$D33*Relocation!\$F33*\$C\$35/\$E\$35*O33	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F33*Relocation!\$J33*O33
34	U-238	=C\$7*\$D34*Relocation!\$F34*\$C\$35/\$E\$35*O34	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F34*Relocation!\$J34*O34
35	Total		
36	Ba-137m	=C\$7*\$D36*Relocation!\$F36*\$C\$35/\$E\$35*O36	
37	Y-90	=C\$7*\$D37*Relocation!\$F37*\$C\$35/\$E\$35*O37	
38	Pr-144	=C\$7*\$D38*Relocation!\$F38*\$C\$35/\$E\$35*O38	
39	Pa-233	=C\$7*\$D39*Relocation!\$F39*\$C\$35/\$E\$35*O39	
40	Th-234	=C\$7*\$D40*Relocation!\$F40*\$C\$35/\$E\$35*O40	
41	Pa-234	=C\$7*\$D41*Relocation!\$F41*\$C\$35/\$E\$35*O41	
42	Np-239	=C\$7*\$D42*Relocation!\$F42*\$C\$35/\$E\$35*O42	
43	Th-231	=C\$7*\$D43*Relocation!\$F43*\$C\$35/\$E\$35*O43	
44	Ra-228	=C\$7*\$D44*Relocation!\$F44*\$C\$35/\$E\$35*O44	
45	Ac-228	=C\$7*\$D45*Relocation!\$F45*\$C\$35/\$E\$35*O45	
46			
47	Total	=SUM(K10:K46)	=SUM(L10:L46)

	B	M	N
9	Nuclide	Halfife (years)	Lambda1
10	Am-241	4.580E+02	1.51E-03
11	Am-243	7.950E+03	8.72E-05
12	Ba-133	1.050E+01	6.60E-02
13	Ce-144	7.781E-01	8.91E-01
14	Cf-249	3.600E+02	1.93E-03
15	Cf-252	2.646E+00	2.62E-01
16	Cm-244	1.760E+01	3.94E-02
17	Cm-246	5.500E+03	1.26E-04
18	Co-60	5.260E+00	1.32E-01
19	Cs-137	3.000E+01	2.31E-02
20	H-3	1.230E+01	5.63E-02
21	Np-237	2.140E+06	3.24E-07
22	Pm-147	2.620E+00	2.65E-01
23	Pu-238	8.640E+01	8.02E-03
24	Pu-239	2.439E+04	2.84E-05
25	Pu mix-239/241		
26	Pu-240	6.580E+03	1.05E-04
27	Pu-241	1.320E+01	5.25E-02
28	Pu pure-242	3.790E+05	1.83E-06
29	Sr-90	2.810E+01	2.47E-02
30	Tc-99	2.120E+05	3.27E-06
31	Th-232	1.400E+10	4.95E-11
32	Tl-204	3.800E+00	1.82E-01
33	U-235	7.100E+08	9.76E-10
34	U-238	4.510E+09	1.54E-10
35	Total		
36	Ba-137m	4.855E-06	1.43E+05
37	Y-90	7.317E-03	9.47E+01
38	Pr-144	3.288E-05	2.11E+04
39	Pa-233	7.397E-02	9.37E+00
40	Th-234	6.603E-02	1.05E+01
41	Pa-234	7.648E-04	9.06E+02
42	Np-239	6.452E-03	1.07E+02
43	Th-231	2.913E-03	2.38E+02
44	Ra-228	5.750E+00	1.21E-01
45	Ac-228	6.998E-04	9.90E+02

	B	M	N
9	Nuclide	Halfife (years)	Lambda1
10	Am-241	=T_half!C2	=0.693/M10
11	Am-243	=T_half!C3	=0.693/M11
12	Ba-133	=T_half!C4	=0.693/M12
13	Ce-144	=T_half!C5	=0.693/M13
14	Cf-249	=T_half!C6	=0.693/M14
15	Cf-252	=T_half!C7	=0.693/M15
16	Cm-244	=T_half!C8	=0.693/M16
17	Cm-246	=T_half!C9	=0.693/M17
18	Co-60	=T_half!C10	=0.693/M18
19	Cs-137	=T_half!C11	=0.693/M19
20	H-3	=T_half!C12	=0.693/M20
21	Np-237	=T_half!C13	=0.693/M21
22	Pm-147	=T_half!C14	=0.693/M22
23	Pu-238	=T_half!C15	=0.693/M23
24	Pu-239	=T_half!C16	=0.693/M24
25	Pu mix-239/241		
26	Pu-240	=T_half!C18	=0.693/M26
27	Pu-241	=T_half!C19	=0.693/M27
28	Pu pure-242	=T_half!C20	=0.693/M28
29	Sr-90	=T_half!C21	=0.693/M29
30	Tc-99	=T_half!C22	=0.693/M30
31	Th-232	=T_half!C23	=0.693/M31
32	Ti-204	=T_half!C24	=0.693/M32
33	U-235	=T_half!C25	=0.693/M33
34	U-238	=T_half!C26	=0.693/M34
35	Total		
36	Ba-137m	=T_half!C28	=0.693/M36
37	Y-90	=T_half!C29	=0.693/M37
38	Pr-144	=T_half!C30	=0.693/M38
39	Pa-233	=T_half!C31	=0.693/M39
40	Th-234	=T_half!C32	=0.693/M40
41	Pa-234	=T_half!C33	=0.693/M41
42	Np-239	=T_half!C34	=0.693/M42
43	Th-231	=T_half!C35	=0.693/M43
44	Ra-228	=T_half!C36	=0.693/M44
45	Ac-228	=T_half!C37	=0.693/M45

	B	O
9	Nuclide	Weathering Factor (1 year)
10	Am-241	7.455E-01
11	Am-243	7.460E-01
12	Ba-133	7.242E-01
13	Ce-144	5.146E-01
14	Cf-249	7.454E-01
15	Cf-252	6.644E-01
16	Cm-244	7.329E-01
17	Cm-246	7.460E-01
18	Co-60	7.033E-01
19	Cs-137	7.383E-01
20	H-3	7.273E-01
21	Np-237	7.460E-01
22	Pm-147	6.637E-01
23	Pu-238	7.433E-01
24	Pu-239	7.460E-01
25	Pu mix-239/241	
26	Pu-240	7.460E-01
27	Pu-241	7.286E-01
28	Pu pure-242	7.460E-01
29	Sr-90	7.378E-01
30	Tc-99	7.460E-01
31	Th-232	7.460E-01
32	Tl-204	6.878E-01
33	U-235	7.460E-01
34	U-238	7.460E-01
35	Total	
36	Ba-137m	7.006E-06
37	Y-90	1.048E-02
38	Pr-144	4.744E-05
39	Pa-233	9.947E-02
40	Th-234	8.942E-02
41	Pa-234	1.103E-03
42	Np-239	9.249E-03
43	Th-231	4.191E-03
44	Ra-228	7.068E-01
45	Ac-228	1.009E-03

B		O
9	Nuclide	Weathering Factor (1 year)
10	Am-241	$= (0.63 / (\$N10 + \$N\$4) * (1 - \text{EXP}(-(\$N10 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N10 + \$N\$6)) * (1 - \text{EXP}(-(\$N10 + \$N\$6) * \$R\$5)))$
11	Am-243	$= (0.63 / (\$N11 + \$N\$4) * (1 - \text{EXP}(-(\$N11 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N11 + \$N\$6)) * (1 - \text{EXP}(-(\$N11 + \$N\$6) * \$R\$5)))$
12	Ba-133	$= (0.63 / (\$N12 + \$N\$4) * (1 - \text{EXP}(-(\$N12 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N12 + \$N\$6)) * (1 - \text{EXP}(-(\$N12 + \$N\$6) * \$R\$5)))$
13	Ce-144	$= (0.63 / (\$N13 + \$N\$4) * (1 - \text{EXP}(-(\$N13 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N13 + \$N\$6)) * (1 - \text{EXP}(-(\$N13 + \$N\$6) * \$R\$5)))$
14	Cf-249	$= (0.63 / (\$N14 + \$N\$4) * (1 - \text{EXP}(-(\$N14 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N14 + \$N\$6)) * (1 - \text{EXP}(-(\$N14 + \$N\$6) * \$R\$5)))$
15	Cf-252	$= (0.63 / (\$N15 + \$N\$4) * (1 - \text{EXP}(-(\$N15 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N15 + \$N\$6)) * (1 - \text{EXP}(-(\$N15 + \$N\$6) * \$R\$5)))$
16	Cm-244	$= (0.63 / (\$N16 + \$N\$4) * (1 - \text{EXP}(-(\$N16 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N16 + \$N\$6)) * (1 - \text{EXP}(-(\$N16 + \$N\$6) * \$R\$5)))$
17	Cm-246	$= (0.63 / (\$N17 + \$N\$4) * (1 - \text{EXP}(-(\$N17 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N17 + \$N\$6)) * (1 - \text{EXP}(-(\$N17 + \$N\$6) * \$R\$5)))$
18	Co-60	$= (0.63 / (\$N18 + \$N\$4) * (1 - \text{EXP}(-(\$N18 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N18 + \$N\$6)) * (1 - \text{EXP}(-(\$N18 + \$N\$6) * \$R\$5)))$
19	Cs-137	$= (0.63 / (\$N19 + \$N\$4) * (1 - \text{EXP}(-(\$N19 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N19 + \$N\$6)) * (1 - \text{EXP}(-(\$N19 + \$N\$6) * \$R\$5)))$
20	H-3	$= (0.63 / (\$N20 + \$N\$4) * (1 - \text{EXP}(-(\$N20 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N20 + \$N\$6)) * (1 - \text{EXP}(-(\$N20 + \$N\$6) * \$R\$5)))$
21	Np-237	$= (0.63 / (\$N21 + \$N\$4) * (1 - \text{EXP}(-(\$N21 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N21 + \$N\$6)) * (1 - \text{EXP}(-(\$N21 + \$N\$6) * \$R\$5)))$
22	Pm-147	$= (0.63 / (\$N22 + \$N\$4) * (1 - \text{EXP}(-(\$N22 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N22 + \$N\$6)) * (1 - \text{EXP}(-(\$N22 + \$N\$6) * \$R\$5)))$
23	Pu-238	$= (0.63 / (\$N23 + \$N\$4) * (1 - \text{EXP}(-(\$N23 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N23 + \$N\$6)) * (1 - \text{EXP}(-(\$N23 + \$N\$6) * \$R\$5)))$
24	Pu-239	$= (0.63 / (\$N24 + \$N\$4) * (1 - \text{EXP}(-(\$N24 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N24 + \$N\$6)) * (1 - \text{EXP}(-(\$N24 + \$N\$6) * \$R\$5)))$
25	Pu mix-239/241	
26	Pu-240	$= (0.63 / (\$N26 + \$N\$4) * (1 - \text{EXP}(-(\$N26 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N26 + \$N\$6)) * (1 - \text{EXP}(-(\$N26 + \$N\$6) * \$R\$5)))$
27	Pu-241	$= (0.63 / (\$N27 + \$N\$4) * (1 - \text{EXP}(-(\$N27 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N27 + \$N\$6)) * (1 - \text{EXP}(-(\$N27 + \$N\$6) * \$R\$5)))$
28	Pu pure-242	$= (0.63 / (\$N28 + \$N\$4) * (1 - \text{EXP}(-(\$N28 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N28 + \$N\$6)) * (1 - \text{EXP}(-(\$N28 + \$N\$6) * \$R\$5)))$
29	Sr-90	$= (0.63 / (\$N29 + \$N\$4) * (1 - \text{EXP}(-(\$N29 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N29 + \$N\$6)) * (1 - \text{EXP}(-(\$N29 + \$N\$6) * \$R\$5)))$
30	Tc-99	$= (0.63 / (\$N30 + \$N\$4) * (1 - \text{EXP}(-(\$N30 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N30 + \$N\$6)) * (1 - \text{EXP}(-(\$N30 + \$N\$6) * \$R\$5)))$
31	Th-232	$= (0.63 / (\$N31 + \$N\$4) * (1 - \text{EXP}(-(\$N31 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N31 + \$N\$6)) * (1 - \text{EXP}(-(\$N31 + \$N\$6) * \$R\$5)))$
32	Ti-204	$= (0.63 / (\$N32 + \$N\$4) * (1 - \text{EXP}(-(\$N32 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N32 + \$N\$6)) * (1 - \text{EXP}(-(\$N32 + \$N\$6) * \$R\$5)))$
33	U-235	$= (0.63 / (\$N33 + \$N\$4) * (1 - \text{EXP}(-(\$N33 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N33 + \$N\$6)) * (1 - \text{EXP}(-(\$N33 + \$N\$6) * \$R\$5)))$
34	U-238	$= (0.63 / (\$N34 + \$N\$4) * (1 - \text{EXP}(-(\$N34 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N34 + \$N\$6)) * (1 - \text{EXP}(-(\$N34 + \$N\$6) * \$R\$5)))$
35	Total	
36	Ba-137m	$= (0.63 / (\$N36 + \$N\$4) * (1 - \text{EXP}(-(\$N36 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N36 + \$N\$6)) * (1 - \text{EXP}(-(\$N36 + \$N\$6) * \$R\$5)))$
37	Y-90	$= (0.63 / (\$N37 + \$N\$4) * (1 - \text{EXP}(-(\$N37 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N37 + \$N\$6)) * (1 - \text{EXP}(-(\$N37 + \$N\$6) * \$R\$5)))$
38	Pr-144	$= (0.63 / (\$N38 + \$N\$4) * (1 - \text{EXP}(-(\$N38 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N38 + \$N\$6)) * (1 - \text{EXP}(-(\$N38 + \$N\$6) * \$R\$5)))$
39	Pa-233	$= (0.63 / (\$N39 + \$N\$4) * (1 - \text{EXP}(-(\$N39 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N39 + \$N\$6)) * (1 - \text{EXP}(-(\$N39 + \$N\$6) * \$R\$5)))$
40	Th-234	$= (0.63 / (\$N40 + \$N\$4) * (1 - \text{EXP}(-(\$N40 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N40 + \$N\$6)) * (1 - \text{EXP}(-(\$N40 + \$N\$6) * \$R\$5)))$
41	Pa-234	$= (0.63 / (\$N41 + \$N\$4) * (1 - \text{EXP}(-(\$N41 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N41 + \$N\$6)) * (1 - \text{EXP}(-(\$N41 + \$N\$6) * \$R\$5)))$
42	Np-239	$= (0.63 / (\$N42 + \$N\$4) * (1 - \text{EXP}(-(\$N42 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N42 + \$N\$6)) * (1 - \text{EXP}(-(\$N42 + \$N\$6) * \$R\$5)))$
43	Th-231	$= (0.63 / (\$N43 + \$N\$4) * (1 - \text{EXP}(-(\$N43 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N43 + \$N\$6)) * (1 - \text{EXP}(-(\$N43 + \$N\$6) * \$R\$5)))$
44	Ra-228	$= (0.63 / (\$N44 + \$N\$4) * (1 - \text{EXP}(-(\$N44 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N44 + \$N\$6)) * (1 - \text{EXP}(-(\$N44 + \$N\$6) * \$R\$5)))$
45	Ac-228	$= (0.63 / (\$N45 + \$N\$4) * (1 - \text{EXP}(-(\$N45 + \$N\$4) * \$R\$5))) + ((0.37 / (\$N45 + \$N\$6)) * (1 - \text{EXP}(-(\$N45 + \$N\$6) * \$R\$5)))$

	F	H
52	1.46E+01	DRL (uCi/m^2) -- PAG/(CEDE+External)
53	1.12E+01	DRL (uCi/m^2) -- PAG/(BS Dose + External)
54	1.72E+03	DRL (uCi/m^2) -- PAG/(Skin Dose)

	F	H
52	=H3/(H47+I47)	DRL (uCi/m^2) -- PAG/(CEDE+External)
53	=H4/(L47+I47)	DRL (uCi/m^2) -- PAG/(BS Dose + External)
54	=H5/K47	DRL (uCi/m^2) -- PAG/(Skin Dose)

	B	C	D	E	F	G	H	I	J	K	L	N	O	P
1	Relocation calculation for SRTC accident. Particulates ONLY; tritium considered separately.													
2	Calculation of dose from deposited radionuclides (EPA PAG manual 1991, section 7.3.2, p. 7-15) (resuspension and external radiation)													
3		1.00E-06	Resuspension factor (1/m)			500	PAG -- Effective Dose (mrem)				Lambda 2 (1/yr)			
4		1.05E+04	BreathRate (m^3/yr)			5000	PAG -- Organ-specific Dose (mrem)				1.13	Time (years) for length of exposure		
5		3.70E+04	CF (Bq/microCi)			25000	PAG -- Skin (mrem)				Lambda 3	1	2	50
6		1.00E+05	CF (mrem/Sv)								7.48E-03			
7		1.00E+00	microCi/m^2											
8		1.00E+00	Exposure period (1 year)											

	B	C	D	E	F	G	H	I	J	K	L	N	O	P
1	Relocation calculation for SRTC a													
2	Calculation of dose from deposite													
3		=Relo_HIB3	=Relo_HIC3			500	=Relo_HIH3				Lambda 2 (1/yr)			
4		=Relo_HIB4	=Relo_HIC4			5000	=Relo_HIH4				1.13	Time (		
5		=Relo_HIB5	=Relo_HIC5			25000	=Relo_HIH5				Lambda 3 (1/yr)	1	2	50
6		=Relo_HIB6	=Relo_HIC6								0.00748			
7		=Relo_HIB7	=Relo_HIC7				CEDE and BS							
8		=Relo_HIB8	=Relo_HIC8				External EDE a							

	B	C	D
	Total Release (Ci)		
9	Nuclide	Activity fraction (Total)	
10	Am-241	3.23E-02	1.09E-02
11	Am-243	7.26E-04	2.45E-04
12	Ba-133	4.04E-13	1.36E-13
13	Ce-144	1.42E-05	4.80E-06
14	Cf-249	9.53E-06	3.22E-06
15	Cf-252	1.19E-02	4.03E-03
16	Cm-244	1.53E-02	5.15E-03
17	Cm-246	7.50E-04	2.53E-04
18	Co-60	5.40E-01	1.82E-01
19	Cs-137	8.91E-01	3.01E-01
20	H-3	0.00E+00	0.00E+00
21	Np-237	3.15E-05	1.06E-05
22	Pm-147	1.89E-08	6.38E-09
23	Pu-238	4.15E-02	1.40E-02
24	Pu-239	6.94E-02	2.34E-02
25	Pu mix-239/241	0.00E+00	0.00E+00
26	Pu-240	1.59E-02	5.37E-03
27	Pu-241	4.58E-01	1.55E-01
28	Pu pure-242	1.10E-04	3.70E-05
29	Sr-90	8.84E-01	2.99E-01
30	Tc-99	2.70E-13	9.12E-14
31	Th-232	1.45E-06	4.90E-07
32	Tl-204	6.75E-10	2.28E-10
33	U-235	1.34E-06	4.52E-07
34	U-238	1.62E-04	5.45E-05
35	Total	2.96E+00	1.00E+00
36	Ba-137m	8.91E-01	3.01E-01
37	Y-90	8.84E-01	2.99E-01
38	Pr-144	1.42E-05	4.80E-06
39	Pa-233	3.15E-05	1.06E-05
40	Th-234	1.62E-04	5.45E-05
41	Pa-234	1.62E-04	5.45E-05
42	Np-239	7.26E-04	2.45E-04
43	Th-231	1.34E-06	4.52E-07
44	Ra-228	1.45E-06	4.90E-07
45	Ac-228	1.45E-06	4.90E-07

	B	C	D
9	Nuclide	Total Release (Ci)	Activity fraction (Total)
10	Am-241	=C:\EP_relocation\SourceSRTC.xls!resp sums!\$H10	=C10/\$C\$35
11	Am-243	=C:\EP_relocation\SourceSRTC.xls!resp sums!\$H11	=C11/\$C\$35
12	Ba-133	=C:\EP_relocation\SourceSRTC.xls!resp sums!\$H12	=C12/\$C\$35
13	Ce-144	=C:\EP_relocation\SourceSRTC.xls!resp sums!\$H13	=C13/\$C\$35
14	Cf-249	=C:\EP_relocation\SourceSRTC.xls!resp sums!\$H14	=C14/\$C\$35
15	Cf-252	=C:\EP_relocation\SourceSRTC.xls!resp sums!\$H15	=C15/\$C\$35
16	Cm-244	=C:\EP_relocation\SourceSRTC.xls!resp sums!\$H16	=C16/\$C\$35
17	Cm-246	=C:\EP_relocation\SourceSRTC.xls!resp sums!\$H17	=C17/\$C\$35
18	Co-60	=C:\EP_relocation\SourceSRTC.xls!resp sums!\$H18	=C18/\$C\$35
19	Cs-137	=C:\EP_relocation\SourceSRTC.xls!resp sums!\$H19	=C19/\$C\$35
20	H-3	0	=C20/\$C\$35
21	Np-237	=C:\EP_relocation\SourceSRTC.xls!resp sums!\$H21	=C21/\$C\$35
22	Pm-147	=C:\EP_relocation\SourceSRTC.xls!resp sums!\$H22	=C22/\$C\$35
23	Pu-238	=C:\EP_relocation\SourceSRTC.xls!resp sums!\$H23	=C23/\$C\$35
24	Pu-239	=C:\EP_relocation\SourceSRTC.xls!resp sums!\$H24	=C24/\$C\$35
25	Pu mix-239/241	=C:\EP_relocation\SourceSRTC.xls!resp sums!\$H25	=C25/\$C\$35
26	Pu-240	=C:\EP_relocation\SourceSRTC.xls!resp sums!\$H26	=C26/\$C\$35
27	Pu-241	=C:\EP_relocation\SourceSRTC.xls!resp sums!\$H27	=C27/\$C\$35
28	Pu pure-242	=C:\EP_relocation\SourceSRTC.xls!resp sums!\$H28	=C28/\$C\$35
29	Sr-90	=C:\EP_relocation\SourceSRTC.xls!resp sums!\$H29	=C29/\$C\$35
30	Tc-99	=C:\EP_relocation\SourceSRTC.xls!resp sums!\$H30	=C30/\$C\$35
31	Th-232	=C:\EP_relocation\SourceSRTC.xls!resp sums!\$H31	=C31/\$C\$35
32	Ti-204	=C:\EP_relocation\SourceSRTC.xls!resp sums!\$H32	=C32/\$C\$35
33	U-235	=C:\EP_relocation\SourceSRTC.xls!resp sums!\$H33	=C33/\$C\$35
34	U-238	=C:\EP_relocation\SourceSRTC.xls!resp sums!\$H34	=C34/\$C\$35
35	Total	=SUM(C10:C34)	=SUM(D10:D34)
36	Ba-137m	=C19	=D19
37	Y-90	=C29	=D29
38	Pr-144	=C13	=D13
39	Pa-233	=C21	=D21
40	Th-234	=C34	=D34
41	Pa-234	=C34	=D34
42	Np-239	=C11	=D11
43	Th-231	=C33	=D33
44	Ra-228	=C31	=D31
45	Ac-228	=C31	=D31

	B	E	F
9	Nuclide (Ci)	Respirable Release	Activity fraction (Resp)
10	Am-241	1.49E-02	5.56E-03
11	Am-243	4.55E-04	1.70E-04
12	Ba-133	4.04E-13	1.51E-13
13	Ce-144	1.42E-05	5.32E-06
14	Cf-249	8.24E-06	3.08E-06
15	Cf-252	1.19E-02	4.47E-03
16	Cm-244	1.71E-02	6.40E-03
17	Cm-246	4.99E-04	1.87E-04
18	Co-60	5.40E-01	2.02E-01
19	Cs-137	8.91E-01	3.34E-01
20	H-3	0.00E+00	0.00E+00
21	Np-237	2.44E-05	9.14E-06
22	Pm-147	1.89E-08	7.07E-09
23	Pu-238	1.81E-02	6.77E-03
24	Pu-239	2.35E-02	8.78E-03
25	Pu mix-2	0.00E+00	0.00E+00
26	Pu-240	5.34E-03	2.00E-03
27	Pu-241	2.66E-01	9.97E-02
28	Pu pure-	3.47E-05	1.30E-05
29	Sr-90	8.83E-01	3.30E-01
30	Tc-99	2.70E-13	1.01E-13
31	Th-232	1.44E-06	5.38E-07
32	Tl-204	6.75E-10	2.53E-10
33	U-235	6.88E-07	2.57E-07
34	U-238	5.11E-05	1.91E-05
35	Total	2.67E+00	1.00E+00
36	Ba-137m	8.91E-01	3.34E-01
37	Y-90	8.83E-01	3.30E-01
38	Pr-144	1.42E-05	5.32E-06
39	Pa-233	2.44E-05	9.14E-06
40	Th-234	5.11E-05	1.91E-05
41	Pa-234	5.11E-05	1.91E-05
42	Np-239	4.55E-04	1.70E-04
43	Th-231	6.88E-07	2.57E-07
44	Ra-228	1.44E-06	5.38E-07
45	Ac-228	1.44E-06	5.38E-07

	B	E	F
9	Nuclide	Respirable Release (Ci)	Activity fraction (Resp)
10	Am-241	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$F10	=E10/\$E\$35
11	Am-243	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$F11	=E11/\$E\$35
12	Ba-133	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$F12	=E12/\$E\$35
13	Ce-144	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$F13	=E13/\$E\$35
14	Cf-249	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$F14	=E14/\$E\$35
15	Cf-252	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$F15	=E15/\$E\$35
16	Cm-244	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$F16	=E16/\$E\$35
17	Cm-246	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$F17	=E17/\$E\$35
18	Co-60	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$F18	=E18/\$E\$35
19	Cs-137	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$F19	=E19/\$E\$35
20	H-3	0	=E20/\$E\$35
21	Np-237	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$F21	=E21/\$E\$35
22	Pm-147	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$F22	=E22/\$E\$35
23	Pu-238	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$F23	=E23/\$E\$35
24	Pu-239	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$F24	=E24/\$E\$35
25	Pu mix-239/241	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$F25	=E25/\$E\$35
26	Pu-240	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$F26	=E26/\$E\$35
27	Pu-241	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$F27	=E27/\$E\$35
28	Pu pure-242	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$F28	=E28/\$E\$35
29	Sr-90	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$F29	=E29/\$E\$35
30	Tc-99	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$F30	=E30/\$E\$35
31	Th-232	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$F31	=E31/\$E\$35
32	Ti-204	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$F32	=E32/\$E\$35
33	U-235	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$F33	=E33/\$E\$35
34	U-238	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$F34	=E34/\$E\$35
35	Total	=SUM(E10:E34)	=SUM(F10:F34)
36	Ba-137m	=E19	=F19
37	Y-90	=E29	=F29
38	Pr-144	=E13	=F13
39	Pa-233	=E21	=F21
40	Th-234	=E34	=F34
41	Pa-234	=E34	=F34
42	Np-239	=E11	=F11
43	Th-231	=E33	=F33
44	Ra-228	=E31	=F31
45	Ac-228	=E31	=F31

	B	H	I
9	Nuclide	CEDE (mrem per uCi/m ²)	External EDE (mrem per uCi/m ²)
10	Am-241	3.20E+01	4.46E-02
11	Am-243	9.72E-01	2.22E-03
12	Ba-133	1.44E-14	7.38E-12
13	Ce-144	1.36E-05	7.47E-06
14	Cf-249	2.30E-02	1.55E-04
15	Cf-252	7.34E+00	2.82E-04
16	Cm-244	1.99E+01	5.65E-04
17	Cm-246	1.09E+00	2.54E-05
18	Co-60	5.12E-01	5.07E+01
19	Cs-137	1.35E-01	0.00E+00
20	H-3	0.00E+00	0.00E+00
21	Np-237	6.40E-02	4.71E-05
22	Pm-147	2.90E-09	2.88E-12
23	Pu-238	3.42E+01	1.63E-03
24	Pu-239	4.88E+01	1.21E-03
25	Pu mix-239/241	0.00E+00	0.00E+00
26	Pu-240	1.11E+01	6.02E-04
27	Pu-241	1.02E+01	0.00E+00
28	Pu pure-242	6.91E-02	3.45E-06
29	Sr-90	5.44E+00	0.00E+00
30	Tc-99	1.09E-14	7.80E-18
31	Th-232	1.14E-02	4.46E-08
32	Tl-204	6.77E-12	3.48E-11
33	U-235	4.09E-04	1.06E-05
34	U-238	2.93E-02	4.82E-06
35	Total		
36	Ba-137m		1.43E-04
37	Y-90		0.00E+00
38	Pr-144		7.52E-10
39	Pa-233		2.77E-05
40	Th-234		5.46E-06
41	Pa-234		1.31E-05
42	Np-239		4.82E-05
43	Th-231		4.01E-09
44	Ra-228		4.04E-14
45	Ac-228		4.98E-08
46			
47	Total	1.72E+02	5.07E+01
48			
49	Dose in second year following release:	6.70E+01	1.84E+01

	B	H	I
9	Nuclide	CEDE (mrem per uCi/m ²)	External EDE (mrem per uCi/m ²)
10	Am-241	=C\$7*C\$3*C\$4*C\$5*C\$6*F10*Relocation!H10*P10	=C\$7*D10*Relocation!E10*C\$35/E\$35*P10
11	Am-243	=C\$7*C\$3*C\$4*C\$5*C\$6*F11*Relocation!H11*P11	=C\$7*D11*Relocation!E11*C\$35/E\$35*P11
12	Ba-133	=C\$7*C\$3*C\$4*C\$5*C\$6*F12*Relocation!H12*P12	=C\$7*D12*Relocation!E12*C\$35/E\$35*P12
13	Ce-144	=C\$7*C\$3*C\$4*C\$5*C\$6*F13*Relocation!H13*P13	=C\$7*D13*Relocation!E13*C\$35/E\$35*P13
14	Cf-249	=C\$7*C\$3*C\$4*C\$5*C\$6*F14*Relocation!H14*P14	=C\$7*D14*Relocation!E14*C\$35/E\$35*P14
15	Cf-252	=C\$7*C\$3*C\$4*C\$5*C\$6*F15*Relocation!H15*P15	=C\$7*D15*Relocation!E15*C\$35/E\$35*P15
16	Cm-244	=C\$7*C\$3*C\$4*C\$5*C\$6*F16*Relocation!H16*P16	=C\$7*D16*Relocation!E16*C\$35/E\$35*P16
17	Cm-246	=C\$7*C\$3*C\$4*C\$5*C\$6*F17*Relocation!H17*P17	=C\$7*D17*Relocation!E17*C\$35/E\$35*P17
18	Co-60	=C\$7*C\$3*C\$4*C\$5*C\$6*F18*Relocation!H18*P18	=C\$7*D18*Relocation!E18*C\$35/E\$35*P18
19	Cs-137	=C\$7*C\$3*C\$4*C\$5*C\$6*F19*Relocation!H19*P19	=C\$7*D19*Relocation!E19*C\$35/E\$35*P19
20	H-3	=C\$7*C\$3*C\$4*C\$5*C\$6*F20*Relocation!H20*P20	=C\$7*D20*Relocation!E20*C\$35/E\$35*P20
21	Np-237	=C\$7*C\$3*C\$4*C\$5*C\$6*F21*Relocation!H21*P21	=C\$7*D21*Relocation!E21*C\$35/E\$35*P21
22	Pm-147	=C\$7*C\$3*C\$4*C\$5*C\$6*F22*Relocation!H22*P22	=C\$7*D22*Relocation!E22*C\$35/E\$35*P22
23	Pu-238	=C\$7*C\$3*C\$4*C\$5*C\$6*F23*Relocation!H23*P23	=C\$7*D23*Relocation!E23*C\$35/E\$35*P23
24	Pu-239	=C\$7*C\$3*C\$4*C\$5*C\$6*F24*Relocation!H24*P24	=C\$7*D24*Relocation!E24*C\$35/E\$35*P24
25	Pu mix-239/241	=C\$7*C\$3*C\$4*C\$5*C\$6*F25*Relocation!H25*P25	=C\$7*D25*Relocation!E25*C\$35/E\$35*P25
26	Pu-240	=C\$7*C\$3*C\$4*C\$5*C\$6*F26*Relocation!H26*P26	=C\$7*D26*Relocation!E26*C\$35/E\$35*P26
27	Pu-241	=C\$7*C\$3*C\$4*C\$5*C\$6*F27*Relocation!H27*P27	=C\$7*D27*Relocation!E27*C\$35/E\$35*P27
28	Pu pure-242	=C\$7*C\$3*C\$4*C\$5*C\$6*F28*Relocation!H28*P28	=C\$7*D28*Relocation!E28*C\$35/E\$35*P28
29	Sr-90	=C\$7*C\$3*C\$4*C\$5*C\$6*F29*Relocation!H29*P29	=C\$7*D29*Relocation!E29*C\$35/E\$35*P29
30	Tc-99	=C\$7*C\$3*C\$4*C\$5*C\$6*F30*Relocation!H30*P30	=C\$7*D30*Relocation!E30*C\$35/E\$35*P30
31	Th-232	=C\$7*C\$3*C\$4*C\$5*C\$6*F31*Relocation!H31*P31	=C\$7*D31*Relocation!E31*C\$35/E\$35*P31
32	Tl-204	=C\$7*C\$3*C\$4*C\$5*C\$6*F32*Relocation!H32*P32	=C\$7*D32*Relocation!E32*C\$35/E\$35*P32
33	U-235	=C\$7*C\$3*C\$4*C\$5*C\$6*F33*Relocation!H33*P33	=C\$7*D33*Relocation!E33*C\$35/E\$35*P33
34	U-238	=C\$7*C\$3*C\$4*C\$5*C\$6*F34*Relocation!H34*P34	=C\$7*D34*Relocation!E34*C\$35/E\$35*P34
35	Total		
36	Ba-137m		=C\$7*D36*Relocation!E36*C\$35/E\$35*P36
37	Y-90		=C\$7*D37*Relocation!E37*C\$35/E\$35*P37
38	Pr-144		=C\$7*D38*Relocation!E38*C\$35/E\$35*P38
39	Pa-233		=C\$7*D39*Relocation!E39*C\$35/E\$35*P39
40	Th-234		=C\$7*D40*Relocation!E40*C\$35/E\$35*P40
41	Pa-234		=C\$7*D41*Relocation!E41*C\$35/E\$35*P41
42	Np-239		=C\$7*D42*Relocation!E42*C\$35/E\$35*P42
43	Th-231		=C\$7*D43*Relocation!E43*C\$35/E\$35*P43
44	Ra-228		=C\$7*D44*Relocation!E44*C\$35/E\$35*P44
45	Ac-228		=C\$7*D45*Relocation!E45*C\$35/E\$35*P45
46			
47	Total	=SUM(H10:H46)	=SUM(I10:I46)
48			
49	Dose in seco	=H47-'Relo_SRTC 1yr'!H47	=I47-'Relo_SRTC 1yr'!I47

	B	K	L
9	Nuclide	Skin Dose (mrem per uCi/m ²)	BS Dose (mrem per uCi/m ²)
10	Am-241	9.53E-02	5.78E+02
11	Am-243	3.55E-03	1.77E+01
12	Ba-133	1.03E-11	6.51E-14
13	Ce-144	9.89E-06	6.34E-07
14	Cf-249	2.09E-04	4.90E-01
15	Cf-252	2.08E-03	2.37E+01
16	Cm-244	4.47E-03	3.47E+02
17	Cm-246	2.02E-04	1.99E+01
18	Co-60	6.81E+01	1.17E-01
19	Cs-137	1.13E+01	1.24E-01
20	H-3	0.00E+00	0.00E+00
21	Np-237	1.10E-04	1.43E+00
22	Pm-147	3.49E-12	5.49E-09
23	Pu-238	1.36E-02	6.13E+02
24	Pu-239	8.97E-03	8.88E+02
25	Pu mix-239/241	0.00E+00	0.00E+00
26	Pu-240	5.01E-03	2.02E+02
27	Pu-241	0.00E+00	1.92E+02
28	Pu pure-242	2.87E-05	1.25E+00
29	Sr-90	6.91E+00	1.10E+00
30	Tc-99	9.64E-18	1.93E-16
31	Th-232	3.25E-07	2.86E-01
32	Tl-204	3.62E-08	4.32E-12
33	U-235	1.40E-05	1.29E-05
34	U-238	3.95E-05	9.26E-04
35	Total		
36	Ba-137m	4.46E-04	
37	Y-90	3.55E+00	
38	Pr-144	3.76E-07	
39	Pa-233	3.85E-05	
40	Th-234	9.57E-06	
41	Pa-234	2.69E-05	
42	Np-239	7.49E-05	
43	Th-231	1.35E-08	
44	Ra-228	4.86E-13	
45	Ac-228	2.76E-07	
46			
47	Total	9.00E+01	2.89E+03
48			*** Could be higher -
49	Dose in second year following release:	3.19E+01	1.13E+03

	B	K	L
9	Nuclide	Skin Dose (mrem per uCi/m ²)	BS Dose (mrem per uCi/m ²)
10	Am-241	=C\$7*\$D10*Relocation!\$F10*\$C\$35/\$E\$35*P10	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F10*Relocation!\$J10*P10
11	Am-243	=C\$7*\$D11*Relocation!\$F11*\$C\$35/\$E\$35*P11	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F11*Relocation!\$J11*P11
12	Ba-133	=C\$7*\$D12*Relocation!\$F12*\$C\$35/\$E\$35*P12	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F12*Relocation!\$J12*P12
13	Ce-144	=C\$7*\$D13*Relocation!\$F13*\$C\$35/\$E\$35*P13	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F13*Relocation!\$J13*P13
14	Cf-249	=C\$7*\$D14*Relocation!\$F14*\$C\$35/\$E\$35*P14	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F14*Relocation!\$J14*P14
15	Cf-252	=C\$7*\$D15*Relocation!\$F15*\$C\$35/\$E\$35*P15	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F15*Relocation!\$J15*P15
16	Cm-244	=C\$7*\$D16*Relocation!\$F16*\$C\$35/\$E\$35*P16	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F16*Relocation!\$J16*P16
17	Cm-246	=C\$7*\$D17*Relocation!\$F17*\$C\$35/\$E\$35*P17	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F17*Relocation!\$J17*P17
18	Co-60	=C\$7*\$D18*Relocation!\$F18*\$C\$35/\$E\$35*P18	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F18*Relocation!\$J18*P18
19	Cs-137	=C\$7*\$D19*Relocation!\$F19*\$C\$35/\$E\$35*P19	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F19*Relocation!\$J19*P19
20	H-3	=C\$7*\$D20*Relocation!\$F20*\$C\$35/\$E\$35*P20	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F20*Relocation!\$J20*P20
21	Np-237	=C\$7*\$D21*Relocation!\$F21*\$C\$35/\$E\$35*P21	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F21*Relocation!\$J21*P21
22	Pm-147	=C\$7*\$D22*Relocation!\$F22*\$C\$35/\$E\$35*P22	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F22*Relocation!\$J22*P22
23	Pu-238	=C\$7*\$D23*Relocation!\$F23*\$C\$35/\$E\$35*P23	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F23*Relocation!\$J23*P23
24	Pu-239	=C\$7*\$D24*Relocation!\$F24*\$C\$35/\$E\$35*P24	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F24*Relocation!\$J24*P24
25	Pu mix-239/24	=C\$7*\$D25*Relocation!\$F25*\$C\$35/\$E\$35*P25	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F25*Relocation!\$J25*P25
26	Pu-240	=C\$7*\$D26*Relocation!\$F26*\$C\$35/\$E\$35*P26	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F26*Relocation!\$J26*P26
27	Pu-241	=C\$7*\$D27*Relocation!\$F27*\$C\$35/\$E\$35*P27	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F27*Relocation!\$J27*P27
28	Pu pure-242	=C\$7*\$D28*Relocation!\$F28*\$C\$35/\$E\$35*P28	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F28*Relocation!\$J28*P28
29	Sr-90	=C\$7*\$D29*Relocation!\$F29*\$C\$35/\$E\$35*P29	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F29*Relocation!\$J29*P29
30	Tc-99	=C\$7*\$D30*Relocation!\$F30*\$C\$35/\$E\$35*P30	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F30*Relocation!\$J30*P30
31	Th-232	=C\$7*\$D31*Relocation!\$F31*\$C\$35/\$E\$35*P31	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F31*Relocation!\$J31*P31
32	Ti-204	=C\$7*\$D32*Relocation!\$F32*\$C\$35/\$E\$35*P32	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F32*Relocation!\$J32*P32
33	U-235	=C\$7*\$D33*Relocation!\$F33*\$C\$35/\$E\$35*P33	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F33*Relocation!\$J33*P33
34	U-238	=C\$7*\$D34*Relocation!\$F34*\$C\$35/\$E\$35*P34	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F34*Relocation!\$J34*P34
35	Total		
36	Ba-137m	=C\$7*\$D36*Relocation!\$F36*\$C\$35/\$E\$35*P36	
37	Y-90	=C\$7*\$D37*Relocation!\$F37*\$C\$35/\$E\$35*P37	
38	Pr-144	=C\$7*\$D38*Relocation!\$F38*\$C\$35/\$E\$35*P38	
39	Pa-233	=C\$7*\$D39*Relocation!\$F39*\$C\$35/\$E\$35*P39	
40	Th-234	=C\$7*\$D40*Relocation!\$F40*\$C\$35/\$E\$35*P40	
41	Pa-234	=C\$7*\$D41*Relocation!\$F41*\$C\$35/\$E\$35*P41	
42	Np-239	=C\$7*\$D42*Relocation!\$F42*\$C\$35/\$E\$35*P42	
43	Th-231	=C\$7*\$D43*Relocation!\$F43*\$C\$35/\$E\$35*P43	
44	Ra-228	=C\$7*\$D44*Relocation!\$F44*\$C\$35/\$E\$35*P44	
45	Ac-228	=C\$7*\$D45*Relocation!\$F45*\$C\$35/\$E\$35*P45	
46			
47	Total	=SUM(K10:K46)	=SUM(L10:L46)
48			*** Could be higher -- DCFs were taken based on limiting CED
49	Dose in se =K47-'Relo_SRTC 1yr'!K47		=L47-'Relo_SRTC 1yr'!L47

	B	M	N
9	Nuclide	Halfife (years)	Lambda1
10	Am-241	458	0.0015131
11	Am-243	7950	8.71698E-05
12	Ba-133	10.5	0.066
13	Ce-144	0.778082192	0.890651408
14	Cf-249	360	0.001925
15	Cf-252	2.646	0.261904762
16	Cm-244	17.6	0.039375
17	Cm-246	5500	0.000126
18	Co-60	5.26	0.131749049
19	Cs-137	30	0.0231
20	H-3	12.3	0.056341463
21	Np-237	2140000	3.23832E-07
22	Pm-147	2.62	0.264503817
23	Pu-238	86.4	0.008020833
24	Pu-239	24390	2.84133E-05
25	Pu mix-239/241		
26	Pu-240	6580	0.000105319
27	Pu-241	13.2	0.0525
28	Pu pure-242	379000	1.8285E-06
29	Sr-90	28.1	0.024661922
30	Tc-99	212000	3.26887E-06
31	Th-232	14000000000	4.95E-11
32	Tl-204	3.8	0.182368421
33	U-235	710000000	9.76056E-10
34	U-238	4510000000	1.53659E-10
35	Total		
36	Ba-137m	4.8554E-06	142727.5862
37	Y-90	0.007317352	94.70639626
38	Pr-144	3.28767E-05	21078.75
39	Pa-233	0.073972603	9.368333333
40	Th-234	0.066027397	10.49564315
41	Pa-234	0.00076484	906.0716418
42	Np-239	0.006452055	107.4076433
43	Th-231	0.002913242	237.8793103
44	Ra-228	5.75	0.120521739
45	Ac-228	0.000699772	990.3230016

	B	M	N
9	Nuclide	Halfife (years)	Lambda1
10	Am-241	=T_half!C2	=0.693/M10
11	Am-243	=T_half!C3	=0.693/M11
12	Ba-133	=T_half!C4	=0.693/M12
13	Ce-144	=T_half!C5	=0.693/M13
14	Cf-249	=T_half!C6	=0.693/M14
15	Cf-252	=T_half!C7	=0.693/M15
16	Cm-244	=T_half!C8	=0.693/M16
17	Cm-246	=T_half!C9	=0.693/M17
18	Co-60	=T_half!C10	=0.693/M18
19	Cs-137	=T_half!C11	=0.693/M19
20	H-3	=T_half!C12	=0.693/M20
21	Np-237	=T_half!C13	=0.693/M21
22	Pm-147	=T_half!C14	=0.693/M22
23	Pu-238	=T_half!C15	=0.693/M23
24	Pu-239	=T_half!C16	=0.693/M24
25	Pu mix-239/241		
26	Pu-240	=T_half!C18	=0.693/M26
27	Pu-241	=T_half!C19	=0.693/M27
28	Pu pure-242	=T_half!C20	=0.693/M28
29	Sr-90	=T_half!C21	=0.693/M29
30	Tc-99	=T_half!C22	=0.693/M30
31	Th-232	=T_half!C23	=0.693/M31
32	Tl-204	=T_half!C24	=0.693/M32
33	U-235	=T_half!C25	=0.693/M33
34	U-238	=T_half!C26	=0.693/M34
35	Total		
36	Ba-137m	=T_half!C28	=0.693/M36
37	Y-90	=T_half!C29	=0.693/M37
38	Pr-144	=T_half!C30	=0.693/M38
39	Pa-233	=T_half!C31	=0.693/M39
40	Th-234	=T_half!C32	=0.693/M40
41	Pa-234	=T_half!C33	=0.693/M41
42	Np-239	=T_half!C34	=0.693/M42
43	Th-231	=T_half!C35	=0.693/M43
44	Ra-228	=T_half!C36	=0.693/M44
45	Ac-228	=T_half!C37	=0.693/M45

	B	P
	Weathering	
9	Nuclide	Factor (2 years)
10	Am-241	1.232E+00
11	Am-243	1.234E+00
12	Ba-133	1.167E+00
13	Ce-144	6.499E-01
14	Cf-249	1.232E+00
15	Cf-252	9.968E-01
16	Cm-244	1.193E+00
17	Cm-246	1.234E+00
18	Co-60	1.105E+00
19	Cs-137	1.210E+00
20	H-3	1.176E+00
21	Np-237	1.234E+00
22	Pm-147	9.948E-01
23	Pu-238	1.225E+00
24	Pu-239	1.234E+00
25	Pu mix-239/241	
26	Pu-240	1.234E+00
27	Pu-241	1.180E+00
28	Pu pure-242	1.234E+00
29	Sr-90	1.208E+00
30	Tc-99	1.234E+00
31	Th-232	1.234E+00
32	Tl-204	1.061E+00
33	U-235	1.234E+00
34	U-238	1.234E+00
35	Total	
36	Ba-137m	7.006E-06
37	Y-90	1.048E-02
38	Pr-144	4.744E-05
39	Pa-233	9.947E-02
40	Th-234	8.942E-02
41	Pa-234	1.103E-03
42	Np-239	9.249E-03
43	Th-231	4.191E-03
44	Ra-228	1.115E+00
45	Ac-228	1.009E-03

	B	P
9	Nuclide	Weathering Factor (2 years)
10	Am-241	$= (0.63 / (\$N10 + \$L\$4) * (1 - \text{EXP}(-(\$N10 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N10 + \$L\$6)) * (1 - \text{EXP}(-(\$N10 + \$L\$6) * \$O\$5)))$
11	Am-243	$= (0.63 / (\$N11 + \$L\$4) * (1 - \text{EXP}(-(\$N11 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N11 + \$L\$6)) * (1 - \text{EXP}(-(\$N11 + \$L\$6) * \$O\$5)))$
12	Ba-133	$= (0.63 / (\$N12 + \$L\$4) * (1 - \text{EXP}(-(\$N12 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N12 + \$L\$6)) * (1 - \text{EXP}(-(\$N12 + \$L\$6) * \$O\$5)))$
13	Ce-144	$= (0.63 / (\$N13 + \$L\$4) * (1 - \text{EXP}(-(\$N13 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N13 + \$L\$6)) * (1 - \text{EXP}(-(\$N13 + \$L\$6) * \$O\$5)))$
14	Cf-249	$= (0.63 / (\$N14 + \$L\$4) * (1 - \text{EXP}(-(\$N14 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N14 + \$L\$6)) * (1 - \text{EXP}(-(\$N14 + \$L\$6) * \$O\$5)))$
15	Cf-252	$= (0.63 / (\$N15 + \$L\$4) * (1 - \text{EXP}(-(\$N15 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N15 + \$L\$6)) * (1 - \text{EXP}(-(\$N15 + \$L\$6) * \$O\$5)))$
16	Cm-244	$= (0.63 / (\$N16 + \$L\$4) * (1 - \text{EXP}(-(\$N16 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N16 + \$L\$6)) * (1 - \text{EXP}(-(\$N16 + \$L\$6) * \$O\$5)))$
17	Cm-246	$= (0.63 / (\$N17 + \$L\$4) * (1 - \text{EXP}(-(\$N17 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N17 + \$L\$6)) * (1 - \text{EXP}(-(\$N17 + \$L\$6) * \$O\$5)))$
18	Co-60	$= (0.63 / (\$N18 + \$L\$4) * (1 - \text{EXP}(-(\$N18 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N18 + \$L\$6)) * (1 - \text{EXP}(-(\$N18 + \$L\$6) * \$O\$5)))$
19	Cs-137	$= (0.63 / (\$N19 + \$L\$4) * (1 - \text{EXP}(-(\$N19 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N19 + \$L\$6)) * (1 - \text{EXP}(-(\$N19 + \$L\$6) * \$O\$5)))$
20	H-3	$= (0.63 / (\$N20 + \$L\$4) * (1 - \text{EXP}(-(\$N20 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N20 + \$L\$6)) * (1 - \text{EXP}(-(\$N20 + \$L\$6) * \$O\$5)))$
21	Np-237	$= (0.63 / (\$N21 + \$L\$4) * (1 - \text{EXP}(-(\$N21 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N21 + \$L\$6)) * (1 - \text{EXP}(-(\$N21 + \$L\$6) * \$O\$5)))$
22	Pm-147	$= (0.63 / (\$N22 + \$L\$4) * (1 - \text{EXP}(-(\$N22 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N22 + \$L\$6)) * (1 - \text{EXP}(-(\$N22 + \$L\$6) * \$O\$5)))$
23	Pu-238	$= (0.63 / (\$N23 + \$L\$4) * (1 - \text{EXP}(-(\$N23 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N23 + \$L\$6)) * (1 - \text{EXP}(-(\$N23 + \$L\$6) * \$O\$5)))$
24	Pu-239	$= (0.63 / (\$N24 + \$L\$4) * (1 - \text{EXP}(-(\$N24 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N24 + \$L\$6)) * (1 - \text{EXP}(-(\$N24 + \$L\$6) * \$O\$5)))$
25	Pu mix-239/241	
26	Pu-240	$= (0.63 / (\$N26 + \$L\$4) * (1 - \text{EXP}(-(\$N26 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N26 + \$L\$6)) * (1 - \text{EXP}(-(\$N26 + \$L\$6) * \$O\$5)))$
27	Pu-241	$= (0.63 / (\$N27 + \$L\$4) * (1 - \text{EXP}(-(\$N27 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N27 + \$L\$6)) * (1 - \text{EXP}(-(\$N27 + \$L\$6) * \$O\$5)))$
28	Pu pure-242	$= (0.63 / (\$N28 + \$L\$4) * (1 - \text{EXP}(-(\$N28 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N28 + \$L\$6)) * (1 - \text{EXP}(-(\$N28 + \$L\$6) * \$O\$5)))$
29	Sr-90	$= (0.63 / (\$N29 + \$L\$4) * (1 - \text{EXP}(-(\$N29 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N29 + \$L\$6)) * (1 - \text{EXP}(-(\$N29 + \$L\$6) * \$O\$5)))$
30	Tc-99	$= (0.63 / (\$N30 + \$L\$4) * (1 - \text{EXP}(-(\$N30 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N30 + \$L\$6)) * (1 - \text{EXP}(-(\$N30 + \$L\$6) * \$O\$5)))$
31	Th-232	$= (0.63 / (\$N31 + \$L\$4) * (1 - \text{EXP}(-(\$N31 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N31 + \$L\$6)) * (1 - \text{EXP}(-(\$N31 + \$L\$6) * \$O\$5)))$
32	Tl-204	$= (0.63 / (\$N32 + \$L\$4) * (1 - \text{EXP}(-(\$N32 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N32 + \$L\$6)) * (1 - \text{EXP}(-(\$N32 + \$L\$6) * \$O\$5)))$
33	U-235	$= (0.63 / (\$N33 + \$L\$4) * (1 - \text{EXP}(-(\$N33 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N33 + \$L\$6)) * (1 - \text{EXP}(-(\$N33 + \$L\$6) * \$O\$5)))$
34	U-238	$= (0.63 / (\$N34 + \$L\$4) * (1 - \text{EXP}(-(\$N34 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N34 + \$L\$6)) * (1 - \text{EXP}(-(\$N34 + \$L\$6) * \$O\$5)))$
35	Total	
36	Ba-137m	$= (0.63 / (\$N36 + \$L\$4) * (1 - \text{EXP}(-(\$N36 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N36 + \$L\$6)) * (1 - \text{EXP}(-(\$N36 + \$L\$6) * \$O\$5)))$
37	Y-90	$= (0.63 / (\$N37 + \$L\$4) * (1 - \text{EXP}(-(\$N37 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N37 + \$L\$6)) * (1 - \text{EXP}(-(\$N37 + \$L\$6) * \$O\$5)))$
38	Pr-144	$= (0.63 / (\$N38 + \$L\$4) * (1 - \text{EXP}(-(\$N38 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N38 + \$L\$6)) * (1 - \text{EXP}(-(\$N38 + \$L\$6) * \$O\$5)))$
39	Pa-233	$= (0.63 / (\$N39 + \$L\$4) * (1 - \text{EXP}(-(\$N39 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N39 + \$L\$6)) * (1 - \text{EXP}(-(\$N39 + \$L\$6) * \$O\$5)))$
40	Th-234	$= (0.63 / (\$N40 + \$L\$4) * (1 - \text{EXP}(-(\$N40 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N40 + \$L\$6)) * (1 - \text{EXP}(-(\$N40 + \$L\$6) * \$O\$5)))$
41	Pa-234	$= (0.63 / (\$N41 + \$L\$4) * (1 - \text{EXP}(-(\$N41 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N41 + \$L\$6)) * (1 - \text{EXP}(-(\$N41 + \$L\$6) * \$O\$5)))$
42	Np-239	$= (0.63 / (\$N42 + \$L\$4) * (1 - \text{EXP}(-(\$N42 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N42 + \$L\$6)) * (1 - \text{EXP}(-(\$N42 + \$L\$6) * \$O\$5)))$
43	Th-231	$= (0.63 / (\$N43 + \$L\$4) * (1 - \text{EXP}(-(\$N43 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N43 + \$L\$6)) * (1 - \text{EXP}(-(\$N43 + \$L\$6) * \$O\$5)))$
44	Ra-228	$= (0.63 / (\$N44 + \$L\$4) * (1 - \text{EXP}(-(\$N44 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N44 + \$L\$6)) * (1 - \text{EXP}(-(\$N44 + \$L\$6) * \$O\$5)))$
45	Ac-228	$= (0.63 / (\$N45 + \$L\$4) * (1 - \text{EXP}(-(\$N45 + \$L\$4) * \$O\$5))) + ((0.37 / (\$N45 + \$L\$6)) * (1 - \text{EXP}(-(\$N45 + \$L\$6) * \$O\$5)))$

	G	H
53	5.85E+00	DRL (uCi/m ²) – PAG/(CEDE+External)
54	4.34E+00	DRL (uCi/m ²) – PAG/(BS Dose + External)
55	7.83E+02	DRL (uCi/m ²) – PAG/(Skin Dose)

	G	H
53	=G3/(H49+I49)	DRL (uCi/m^2) – PAG/(CEDE+External)
54	=G4/(L49+I49)	DRL (uCi/m^2) – PAG/(BS Dose + External)
55	=G5/K49	DRL (uCi/m^2) – PAG/(Skin Dose)

	B	C	D	E	F	G	H	I	J	K	L	N	O	P
1	Relocation calculation for SRTC accident. Particulates ONLY; tritium considered separately.													
2	Calculation of dose from deposited radionuclides (EPA PAG manual 1991, section 7.3.2, p. 7-15) (resuspension and external radiation)													
3		1.00E-06	Resuspension factor (1/m)			5000	PAG -- Effective Dose (mrem)				Lambda 2 (1/yr)			
4		1.05E+04	BreathRate (m^3/yr)			50000	PAG -- Organ-specific Dose (mrem)				1.13	Time (years) for length of exposure		
5		3.70E+04	CF (Bq/microCi)			250000	PAG -- Skin (mrem)				Lambda 3	1	2	50
6		1.00E+05	CF (mrem/Sv)								7.48E-03			
7		1.00E+00	microCi/m^2								CEDE and BS Dose are based on respirable particulate release			
8		1.00E+00	Exposure period (1 year)								External EDE and Skin Dose are based on total particulate release			

	B	C	D	G	H	L	N	O	P
1	Relocation calculation for SRTC a								
2	Calculation of dose from deposite								
3		=Relo_HIB3	=Relo_HIC3	5000	=Relo_HIH3	Lambda 2 (1/yr)			
4		=Relo_HIB4	=Relo_HIC4	50000	=Relo_HIH4	1.13	Time (years) for length		
5		=Relo_HIB5	=Relo_HIC5	250000	=Relo_HIH5	Lambda 3 (1/yr) 1		2	50
6		=Relo_HIB6	=Relo_HIC6			0.00748			
7		=Relo_HIB7	=Relo_HIC7		CEDE and BS Dose a				
8		=Relo_HIB8	=Relo_HIC8		External EDE and Ski				

	B	C	D
		Total Release (Ci)	Activity fraction (Total)
9	Nuclide		
10	Am-241	3.23E-02	1.09E-02
11	Am-243	7.26E-04	2.45E-04
12	Ba-133	4.04E-13	1.36E-13
13	Ce-144	1.42E-05	4.80E-06
14	Cf-249	9.53E-06	3.22E-06
15	Cf-252	1.19E-02	4.03E-03
16	Cm-244	1.53E-02	5.15E-03
17	Cm-246	7.50E-04	2.53E-04
18	Co-60	5.40E-01	1.82E-01
19	Cs-137	8.91E-01	3.01E-01
20	H-3	0.00E+00	0.00E+00
21	Np-237	3.15E-05	1.06E-05
22	Pm-147	1.89E-08	6.38E-09
23	Pu-238	4.15E-02	1.40E-02
24	Pu-239	6.94E-02	2.34E-02
25	Pu mix-239/241	0.00E+00	0.00E+00
26	Pu-240	1.59E-02	5.37E-03
27	Pu-241	4.58E-01	1.55E-01
28	Pu pure-242	1.10E-04	3.70E-05
29	Sr-90	8.84E-01	2.99E-01
30	Tc-99	2.70E-13	9.12E-14
31	Th-232	1.45E-06	4.90E-07
32	Tl-204	6.75E-10	2.28E-10
33	U-235	1.34E-06	4.52E-07
34	U-238	1.62E-04	5.45E-05
35	Total	2.96E+00	1.00E+00
36	Ba-137m	8.91E-01	3.01E-01
37	Y-90	8.84E-01	2.99E-01
38	Pr-144	1.42E-05	4.80E-06
39	Pa-233	3.15E-05	1.06E-05
40	Th-234	1.62E-04	5.45E-05
41	Pa-234	1.62E-04	5.45E-05
42	Np-239	7.26E-04	2.45E-04
43	Th-231	1.34E-06	4.52E-07
44	Ra-228	1.45E-06	4.90E-07
45	Ac-228	1.45E-06	4.90E-07

	B	C	D
9	Nuclide	Total Release (Ci)	Activity fraction (Total)
10	Am-241	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H10	=C10/\$C\$35
11	Am-243	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H11	=C11/\$C\$35
12	Ba-133	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H12	=C12/\$C\$35
13	Ce-144	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H13	=C13/\$C\$35
14	Cf-249	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H14	=C14/\$C\$35
15	Cf-252	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H15	=C15/\$C\$35
16	Cm-244	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H16	=C16/\$C\$35
17	Cm-246	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H17	=C17/\$C\$35
18	Co-60	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H18	=C18/\$C\$35
19	Cs-137	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H19	=C19/\$C\$35
20	H-3	0	=C20/\$C\$35
21	Np-237	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H21	=C21/\$C\$35
22	Pm-147	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H22	=C22/\$C\$35
23	Pu-238	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H23	=C23/\$C\$35
24	Pu-239	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H24	=C24/\$C\$35
25	Pu mix-239/241	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H25	=C25/\$C\$35
26	Pu-240	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H26	=C26/\$C\$35
27	Pu-241	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H27	=C27/\$C\$35
28	Pu pure-242	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H28	=C28/\$C\$35
29	Sr-90	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H29	=C29/\$C\$35
30	Tc-99	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H30	=C30/\$C\$35
31	Th-232	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H31	=C31/\$C\$35
32	Ti-204	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H32	=C32/\$C\$35
33	U-235	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H33	=C33/\$C\$35
34	U-238	=C:\EP_relocation\SourceSRTC.xls]resp sums!\$H34	=C34/\$C\$35
35	Total	=SUM(C10:C34)	=SUM(D10:D34)
36	Ba-137m	=C19	=D19
37	Y-90	=C29	=D29
38	Pr-144	=C13	=D13
39	Pa-233	=C21	=D21
40	Th-234	=C34	=D34
41	Pa-234	=C34	=D34
42	Np-239	=C11	=D11
43	Th-231	=C33	=D33
44	Ra-228	=C31	=D31
45	Ac-228	=C31	=D31

	B	E	F
9	Nuclide	Respirable Activity Release (Ci)	fraction (Resp)
10	Am-241	1.49E-02	5.56E-03
11	Am-243	4.55E-04	1.70E-04
12	Ba-133	4.04E-13	1.51E-13
13	Ce-144	1.42E-05	5.32E-06
14	Cf-249	8.24E-06	3.08E-06
15	Cf-252	1.19E-02	4.47E-03
16	Cm-244	1.71E-02	6.40E-03
17	Cm-246	4.99E-04	1.87E-04
18	Co-60	5.40E-01	2.02E-01
19	Cs-137	8.91E-01	3.34E-01
20	H-3	0.00E+00	0.00E+00
21	Np-237	2.44E-05	9.14E-06
22	Pm-147	1.89E-08	7.07E-09
23	Pu-238	1.81E-02	6.77E-03
24	Pu-239	2.35E-02	8.78E-03
25	Pu mix-239/241	0.00E+00	0.00E+00
26	Pu-240	5.34E-03	2.00E-03
27	Pu-241	2.66E-01	9.97E-02
28	Pu pure-242	3.47E-05	1.30E-05
29	Sr-90	8.83E-01	3.30E-01
30	Tc-99	2.70E-13	1.01E-13
31	Th-232	1.44E-06	5.38E-07
32	Tl-204	6.75E-10	2.53E-10
33	U-235	6.88E-07	2.57E-07
34	U-238	5.11E-05	1.91E-05
35	Total	2.67E+00	1.00E+00
36	Ba-137m	8.91E-01	3.34E-01
37	Y-90	8.83E-01	3.30E-01
38	Pr-144	1.42E-05	5.32E-06
39	Pa-233	2.44E-05	9.14E-06
40	Th-234	5.11E-05	1.91E-05
41	Pa-234	5.11E-05	1.91E-05
42	Np-239	4.55E-04	1.70E-04
43	Th-231	6.88E-07	2.57E-07
44	Ra-228	1.44E-06	5.38E-07
45	Ac-228	1.44E-06	5.38E-07

	B	E	F
9	Nuclide	Respirable Release (Ci)	Activity fraction (Resp)
10	Am-241	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F10	=E10/\$E\$35
11	Am-243	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F11	=E11/\$E\$35
12	Ba-133	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F12	=E12/\$E\$35
13	Ce-144	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F13	=E13/\$E\$35
14	Cf-249	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F14	=E14/\$E\$35
15	Cf-252	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F15	=E15/\$E\$35
16	Cm-244	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F16	=E16/\$E\$35
17	Cm-246	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F17	=E17/\$E\$35
18	Co-60	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F18	=E18/\$E\$35
19	Cs-137	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F19	=E19/\$E\$35
20	H-3	0	=E20/\$E\$35
21	Np-237	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F21	=E21/\$E\$35
22	Pm-147	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F22	=E22/\$E\$35
23	Pu-238	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F23	=E23/\$E\$35
24	Pu-239	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F24	=E24/\$E\$35
25	Pu mix-239/241	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F25	=E25/\$E\$35
26	Pu-240	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F26	=E26/\$E\$35
27	Pu-241	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F27	=E27/\$E\$35
28	Pu pure-242	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F28	=E28/\$E\$35
29	Sr-90	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F29	=E29/\$E\$35
30	Tc-99	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F30	=E30/\$E\$35
31	Th-232	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F31	=E31/\$E\$35
32	Tl-204	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F32	=E32/\$E\$35
33	U-235	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F33	=E33/\$E\$35
34	U-238	=C:\EP_relocation\SourceSRTC.xls]resp sums'!\$F34	=E34/\$E\$35
35	Total	=SUM(E10:E34)	=SUM(F10:F34)
36	Ba-137m	=E19	=F19
37	Y-90	=E29	=F29
38	Pr-144	=E13	=F13
39	Pa-233	=E21	=F21
40	Th-234	=E34	=F34
41	Pa-234	=E34	=F34
42	Np-239	=E11	=F11
43	Th-231	=E33	=F33
44	Ra-228	=E31	=F31
45	Ac-228	=E31	=F31

	B	H	I
9	Nuclide	CEDE (mrem per uCi/m^2)	External EDE (mrem per uCi/m^2)
10	Am-241	4.01E+02	5.59E-01
11	Am-243	1.26E+01	2.87E-02
12	Ba-133	6.73E-14	3.44E-11
13	Ce-144	1.51E-05	8.32E-06
14	Cf-249	2.86E+01	1.92E-03
15	Cf-252	1.34E+01	5.17E-04
16	Cm-244	1.28E+02	3.63E-03
17	Cm-246	1.41E+01	3.29E-04
18	Co-60	1.46E+00	1.45E+02
19	Cs-137	1.12E+00	0.00E+00
20	H-3	0.00E+00	0.00E+00
21	Np-237	8.30E-01	6.11E-04
22	Pm-147	5.28E-09	5.25E-12
23	Pu-238	3.75E+02	1.79E-02
24	Pu-239	6.33E+02	1.57E-02
25	Pu mix-239/241		
26	Pu-240	1.44E+02	7.79E-03
27	Pu-241	5.52E+01	0.00E+00
28	Pu pure-242	8.95E-01	4.47E-05
29	Sr-90	4.39E+01	0.00E+00
30	Tc-99	1.41E-13	1.01E-16
31	Th-232	1.48E-01	5.78E-07
32	Tl-204	1.55E-11	7.98E-11
33	U-235	5.31E-03	1.37E-04
34	U-238	3.80E-01	6.24E-05
35	Total		
36	Ba-137m		1.43E-04
37	Y-90		0.00E+00
38	Pr-144		7.52E-10
39	Pa-233		2.77E-05
40	Th-234		5.46E-06
41	Pa-234		1.31E-05
42	Np-239		4.82E-05
43	Th-231		4.01E-09
44	Ra-228		1.23E-13
45	Ac-228		4.98E-08
46			
47	Total	1.82E+03	1.45E+02

	B	H	I
9	Nuclide	CEDE (mrem per uCi/m ²)	External EDE (mrem per uCi/m ²)
10	Am-241	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F10*Relocation!H10*Q10	=\$C\$7*\$D10*Relocation!E10*\$C\$35/\$E\$35*Q10
11	Am-243	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F11*Relocation!H11*Q11	=\$C\$7*\$D11*Relocation!E11*\$C\$35/\$E\$35*Q11
12	Ba-133	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F12*Relocation!H12*Q12	=\$C\$7*\$D12*Relocation!E12*\$C\$35/\$E\$35*Q12
13	Ce-144	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F13*Relocation!H13*Q13	=\$C\$7*\$D13*Relocation!E13*\$C\$35/\$E\$35*Q13
14	Cf-249	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F14*Relocation!H14*Q14	=\$C\$7*\$D14*Relocation!E14*\$C\$35/\$E\$35*Q14
15	Cf-252	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F15*Relocation!H15*Q15	=\$C\$7*\$D15*Relocation!E15*\$C\$35/\$E\$35*Q15
16	Cm-244	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F16*Relocation!H16*Q16	=\$C\$7*\$D16*Relocation!E16*\$C\$35/\$E\$35*Q16
17	Cm-246	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F17*Relocation!H17*Q17	=\$C\$7*\$D17*Relocation!E17*\$C\$35/\$E\$35*Q17
18	Co-60	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F18*Relocation!H18*Q18	=\$C\$7*\$D18*Relocation!E18*\$C\$35/\$E\$35*Q18
19	Cs-137	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F19*Relocation!H19*Q19	=\$C\$7*\$D19*Relocation!E19*\$C\$35/\$E\$35*Q19
20	H-3	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F20*Relocation!H20*Q20	=\$C\$7*\$D20*Relocation!E20*\$C\$35/\$E\$35*Q20
21	Np-237	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F21*Relocation!H21*Q21	=\$C\$7*\$D21*Relocation!E21*\$C\$35/\$E\$35*Q21
22	Pm-147	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F22*Relocation!H22*Q22	=\$C\$7*\$D22*Relocation!E22*\$C\$35/\$E\$35*Q22
23	Pu-238	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F23*Relocation!H23*Q23	=\$C\$7*\$D23*Relocation!E23*\$C\$35/\$E\$35*Q23
24	Pu-239	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F24*Relocation!H24*Q24	=\$C\$7*\$D24*Relocation!E24*\$C\$35/\$E\$35*Q24
25	Pu mix-239/241		
26	Pu-240	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F26*Relocation!H26*Q26	=\$C\$7*\$D26*Relocation!E26*\$C\$35/\$E\$35*Q26
27	Pu-241	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F27*Relocation!H27*Q27	=\$C\$7*\$D27*Relocation!E27*\$C\$35/\$E\$35*Q27
28	Pu pure-242	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F28*Relocation!H28*Q28	=\$C\$7*\$D28*Relocation!E28*\$C\$35/\$E\$35*Q28
29	Sr-90	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F29*Relocation!H29*Q29	=\$C\$7*\$D29*Relocation!E29*\$C\$35/\$E\$35*Q29
30	Tc-99	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F30*Relocation!H30*Q30	=\$C\$7*\$D30*Relocation!E30*\$C\$35/\$E\$35*Q30
31	Th-232	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F31*Relocation!H31*Q31	=\$C\$7*\$D31*Relocation!E31*\$C\$35/\$E\$35*Q31
32	Tl-204	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F32*Relocation!H32*Q32	=\$C\$7*\$D32*Relocation!E32*\$C\$35/\$E\$35*Q32
33	U-235	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F33*Relocation!H33*Q33	=\$C\$7*\$D33*Relocation!E33*\$C\$35/\$E\$35*Q33
34	U-238	=\$C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*F34*Relocation!H34*Q34	=\$C\$7*\$D34*Relocation!E34*\$C\$35/\$E\$35*Q34
35	Total		
36	Ba-137m		=\$C\$7*\$D36*Relocation!E36*\$C\$35/\$E\$35*Q36
37	Y-90		=\$C\$7*\$D37*Relocation!E37*\$C\$35/\$E\$35*Q37
38	Pr-144		=\$C\$7*\$D38*Relocation!E38*\$C\$35/\$E\$35*Q38
39	Pa-233		=\$C\$7*\$D39*Relocation!E39*\$C\$35/\$E\$35*Q39
40	Th-234		=\$C\$7*\$D40*Relocation!E40*\$C\$35/\$E\$35*Q40
41	Pa-234		=\$C\$7*\$D41*Relocation!E41*\$C\$35/\$E\$35*Q41
42	Np-239		=\$C\$7*\$D42*Relocation!E42*\$C\$35/\$E\$35*Q42
43	Th-231		=\$C\$7*\$D43*Relocation!E43*\$C\$35/\$E\$35*Q43
44	Ra-228		=\$C\$7*\$D44*Relocation!E44*\$C\$35/\$E\$35*Q44
45	Ac-228		=\$C\$7*\$D45*Relocation!E45*\$C\$35/\$E\$35*Q45
46			
47	Total	=SUM(H10:H46)	=SUM(I10:I46)

	B	K	L
9	Nuclide	Skin Dose (mrem per uCi/m ²)	BS Dose (mrem per uCi/m ²)
10	Am-241	1.20E+00	7.25E+03
11	Am-243	4.60E-02	2.29E+02
12	Ba-133	4.78E-11	3.03E-13
13	Ce-144	1.10E-05	7.06E-07
14	Cf-249	2.60E-03	6.09E+00
15	Cf-252	3.80E-03	4.34E+01
16	Cm-244	2.87E-02	2.23E+03
17	Cm-246	2.61E-03	2.57E+02
18	Co-60	1.94E+02	3.34E-01
19	Cs-137	9.40E+01	1.03E+00
20	H-3	0.00E+00	0.00E+00
21	Np-237	1.42E-03	1.86E+01
22	Pm-147	6.36E-12	1.00E-08
23	Pu-238	1.50E-01	6.71E+03
24	Pu-239	1.16E-01	1.15E+04
25	Pu mix-239/241		
26	Pu-240	6.48E-02	2.61E+03
27	Pu-241	0.00E+00	1.04E+03
28	Pu pure-242	3.72E-04	1.62E+01
29	Sr-90	5.58E+01	8.87E+00
30	Tc-99	1.25E-16	2.50E-15
31	Th-232	4.21E-06	3.71E+00
32	Tl-204	8.28E-08	9.89E-12
33	U-235	1.82E-04	1.68E-04
34	U-238	5.12E-04	1.20E-02
35	Total		
36	Ba-137m	4.46E-04	
37	Y-90	3.55E+00	
38	Pr-144	3.76E-07	
39	Pa-233	3.85E-05	
40	Th-234	9.57E-06	
41	Pa-234	2.69E-05	
42	Np-239	7.49E-05	
43	Th-231	1.35E-08	
44	Ra-228	1.48E-12	
45	Ac-228	2.76E-07	
46			
47	Total	3.49E+02	3.19E+04

	B	K	L
9	Nuclide	Skin Dose (mrem per uCi/m ²)	BS Dose (mrem per uCi/m ²)
10	Am-241	=C\$7*\$D10*Relocation!\$F10*\$C\$35/\$E\$35*Q10	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F10*Relocation!\$J10*Q10
11	Am-243	=C\$7*\$D11*Relocation!\$F11*\$C\$35/\$E\$35*Q11	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F11*Relocation!\$J11*Q11
12	Ba-133	=C\$7*\$D12*Relocation!\$F12*\$C\$35/\$E\$35*Q12	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F12*Relocation!\$J12*Q12
13	Ce-144	=C\$7*\$D13*Relocation!\$F13*\$C\$35/\$E\$35*Q13	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F13*Relocation!\$J13*Q13
14	Cf-249	=C\$7*\$D14*Relocation!\$F14*\$C\$35/\$E\$35*Q14	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F14*Relocation!\$J14*Q14
15	Cf-252	=C\$7*\$D15*Relocation!\$F15*\$C\$35/\$E\$35*Q15	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F15*Relocation!\$J15*Q15
16	Cm-244	=C\$7*\$D16*Relocation!\$F16*\$C\$35/\$E\$35*Q16	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F16*Relocation!\$J16*Q16
17	Cm-246	=C\$7*\$D17*Relocation!\$F17*\$C\$35/\$E\$35*Q17	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F17*Relocation!\$J17*Q17
18	Co-60	=C\$7*\$D18*Relocation!\$F18*\$C\$35/\$E\$35*Q18	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F18*Relocation!\$J18*Q18
19	Cs-137	=C\$7*\$D19*Relocation!\$F19*\$C\$35/\$E\$35*Q19	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F19*Relocation!\$J19*Q19
20	H-3	=C\$7*\$D20*Relocation!\$F20*\$C\$35/\$E\$35*Q20	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F20*Relocation!\$J20*Q20
21	Np-237	=C\$7*\$D21*Relocation!\$F21*\$C\$35/\$E\$35*Q21	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F21*Relocation!\$J21*Q21
22	Pm-147	=C\$7*\$D22*Relocation!\$F22*\$C\$35/\$E\$35*Q22	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F22*Relocation!\$J22*Q22
23	Pu-238	=C\$7*\$D23*Relocation!\$F23*\$C\$35/\$E\$35*Q23	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F23*Relocation!\$J23*Q23
24	Pu-239	=C\$7*\$D24*Relocation!\$F24*\$C\$35/\$E\$35*Q24	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F24*Relocation!\$J24*Q24
25	Pu mix-239/241		
26	Pu-240	=C\$7*\$D26*Relocation!\$F26*\$C\$35/\$E\$35*Q26	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F26*Relocation!\$J26*Q26
27	Pu-241	=C\$7*\$D27*Relocation!\$F27*\$C\$35/\$E\$35*Q27	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F27*Relocation!\$J27*Q27
28	Pu pure-242	=C\$7*\$D28*Relocation!\$F28*\$C\$35/\$E\$35*Q28	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F28*Relocation!\$J28*Q28
29	Sr-90	=C\$7*\$D29*Relocation!\$F29*\$C\$35/\$E\$35*Q29	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F29*Relocation!\$J29*Q29
30	Tc-99	=C\$7*\$D30*Relocation!\$F30*\$C\$35/\$E\$35*Q30	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F30*Relocation!\$J30*Q30
31	Th-232	=C\$7*\$D31*Relocation!\$F31*\$C\$35/\$E\$35*Q31	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F31*Relocation!\$J31*Q31
32	Ti-204	=C\$7*\$D32*Relocation!\$F32*\$C\$35/\$E\$35*Q32	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F32*Relocation!\$J32*Q32
33	U-235	=C\$7*\$D33*Relocation!\$F33*\$C\$35/\$E\$35*Q33	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F33*Relocation!\$J33*Q33
34	U-238	=C\$7*\$D34*Relocation!\$F34*\$C\$35/\$E\$35*Q34	=C\$7*\$C\$3*\$C\$4*\$C\$5*\$C\$6*\$F34*Relocation!\$J34*Q34
35	Total		
36	Ba-137m	=C\$7*\$D36*Relocation!\$F36*\$C\$35/\$E\$35*Q36	
37	Y-90	=C\$7*\$D37*Relocation!\$F37*\$C\$35/\$E\$35*Q37	
38	Pr-144	=C\$7*\$D38*Relocation!\$F38*\$C\$35/\$E\$35*Q38	
39	Pa-233	=C\$7*\$D39*Relocation!\$F39*\$C\$35/\$E\$35*Q39	
40	Th-234	=C\$7*\$D40*Relocation!\$F40*\$C\$35/\$E\$35*Q40	
41	Pa-234	=C\$7*\$D41*Relocation!\$F41*\$C\$35/\$E\$35*Q41	
42	Np-239	=C\$7*\$D42*Relocation!\$F42*\$C\$35/\$E\$35*Q42	
43	Th-231	=C\$7*\$D43*Relocation!\$F43*\$C\$35/\$E\$35*Q43	
44	Ra-228	=C\$7*\$D44*Relocation!\$F44*\$C\$35/\$E\$35*Q44	
45	Ac-228	=C\$7*\$D45*Relocation!\$F45*\$C\$35/\$E\$35*Q45	
46			
47	Total	=SUM(K10:K46)	=SUM(L10:L46)

	B	M	N
9	Nuclide	Halflife (years)	Lambda1
10	Am-241	458	0.0015131
11	Am-243	7950	8.71698E-05
12	Ba-133	10.5	0.066
13	Ce-144	0.7780822	0.890651408
14	Cf-249	360	0.001925
15	Cf-252	2.646	0.261904762
16	Cm-244	17.6	0.039375
17	Cm-246	5500	0.000126
18	Co-60	5.26	0.131749049
19	Cs-137	30	0.0231
20	H-3	12.3	0.056341463
21	Np-237	2140000	3.23832E-07
22	Pm-147	2.62	0.264503817
23	Pu-238	86.4	0.008020833
24	Pu-239	24390	2.84133E-05
25	Pu mix-239/241		
26	Pu-240	6580	0.000105319
27	Pu-241	13.2	0.0525
28	Pu pure-242	379000	1.8285E-06
29	Sr-90	28.1	0.024661922
30	Tc-99	212000	3.26887E-06
31	Th-232	1.4E+10	4.95E-11
32	Tl-204	3.8	0.182368421
33	U-235	710000000	9.76056E-10
34	U-238	4.51E+09	1.53659E-10
35	Total		
36	Ba-137m	4.855E-06	142727.5862
37	Y-90	0.0073174	94.70639626
38	Pr-144	3.288E-05	21078.75
39	Pa-233	0.0739726	9.368333333
40	Th-234	0.0660274	10.49564315
41	Pa-234	0.0007648	906.0716418
42	Np-239	0.0064521	107.4076433
43	Th-231	0.0029132	237.8793103
44	Ra-228	5.75	0.120521739
45	Ac-228	0.0006998	990.3230016

	B	M	N
9	Nuclide	Halflife (years)	Lambda1
10	Am-241	=T_half!C2	=0.693/M10
11	Am-243	=T_half!C3	=0.693/M11
12	Ba-133	=T_half!C4	=0.693/M12
13	Ce-144	=T_half!C5	=0.693/M13
14	Cf-249	=T_half!C6	=0.693/M14
15	Cf-252	=T_half!C7	=0.693/M15
16	Cm-244	=T_half!C8	=0.693/M16
17	Cm-246	=T_half!C9	=0.693/M17
18	Co-60	=T_half!C10	=0.693/M18
19	Cs-137	=T_half!C11	=0.693/M19
20	H-3	=T_half!C12	=0.693/M20
21	Np-237	=T_half!C13	=0.693/M21
22	Pm-147	=T_half!C14	=0.693/M22
23	Pu-238	=T_half!C15	=0.693/M23
24	Pu-239	=T_half!C16	=0.693/M24
25	Pu mix-239/241		
26	Pu-240	=T_half!C18	=0.693/M26
27	Pu-241	=T_half!C19	=0.693/M27
28	Pu pure-242	=T_half!C20	=0.693/M28
29	Sr-90	=T_half!C21	=0.693/M29
30	Tc-99	=T_half!C22	=0.693/M30
31	Th-232	=T_half!C23	=0.693/M31
32	Tl-204	=T_half!C24	=0.693/M32
33	U-235	=T_half!C25	=0.693/M33
34	U-238	=T_half!C26	=0.693/M34
35	Total		
36	Ba-137m	=T_half!C28	=0.693/M36
37	Y-90	=T_half!C29	=0.693/M37
38	Pr-144	=T_half!C30	=0.693/M38
39	Pa-233	=T_half!C31	=0.693/M39
40	Th-234	=T_half!C32	=0.693/M40
41	Pa-234	=T_half!C33	=0.693/M41
42	Np-239	=T_half!C34	=0.693/M42
43	Th-231	=T_half!C35	=0.693/M43
44	Ra-228	=T_half!C36	=0.693/M44
45	Ac-228	=T_half!C37	=0.693/M45

	B	Q
9	Nuclide	Weathering Factor (50 years)
10	Am-241	1.546E+01
11	Am-243	1.596E+01
12	Ba-133	5.434E+00
13	Ce-144	7.237E-01
14	Cf-249	1.532E+01
15	Cf-252	1.826E+00
16	Cm-244	7.677E+00
17	Cm-246	1.595E+01
18	Co-60	3.154E+00
19	Cs-137	1.002E+01
20	H-3	6.090E+00
21	Np-237	1.599E+01
22	Pm-147	1.812E+00
23	Pu-238	1.343E+01
24	Pu-239	1.598E+01
25	Pu mix-239/241	
26	Pu-240	1.595E+01
27	Pu-241	6.394E+00
28	Pu pure-242	1.599E+01
29	Sr-90	9.749E+00
30	Tc-99	1.599E+01
31	Th-232	1.599E+01
32	Tl-204	2.429E+00
33	U-235	1.599E+01
34	U-238	1.599E+01
35	Total	
36	Ba-137m	7.006E-06
37	Y-90	1.048E-02
38	Pr-144	4.744E-05
39	Pa-233	9.947E-02
40	Th-234	8.942E-02
41	Pa-234	1.103E-03
42	Np-239	9.249E-03
43	Th-231	4.191E-03
44	Ra-228	3.390E+00
45	Ac-228	1.009E-03

	B	Q
9	Nuclide	Weathering Factor (50 years)
10	Am-241	$= (0.63/(\$N10+\$L\$4) * (1-EXP(-(\$N10+\$L\$4)*\$P\$5))) + ((0.37/(\$N10+\$L\$6)) * (1-EXP(-(\$N10+\$L\$6)*\$P\$5)))$
11	Am-243	$= (0.63/(\$N11+\$L\$4) * (1-EXP(-(\$N11+\$L\$4)*\$P\$5))) + ((0.37/(\$N11+\$L\$6)) * (1-EXP(-(\$N11+\$L\$6)*\$P\$5)))$
12	Ba-133	$= (0.63/(\$N12+\$L\$4) * (1-EXP(-(\$N12+\$L\$4)*\$P\$5))) + ((0.37/(\$N12+\$L\$6)) * (1-EXP(-(\$N12+\$L\$6)*\$P\$5)))$
13	Ce-144	$= (0.63/(\$N13+\$L\$4) * (1-EXP(-(\$N13+\$L\$4)*\$P\$5))) + ((0.37/(\$N13+\$L\$6)) * (1-EXP(-(\$N13+\$L\$6)*\$P\$5)))$
14	Cf-249	$= (0.63/(\$N14+\$L\$4) * (1-EXP(-(\$N14+\$L\$4)*\$P\$5))) + ((0.37/(\$N14+\$L\$6)) * (1-EXP(-(\$N14+\$L\$6)*\$P\$5)))$
15	Cf-252	$= (0.63/(\$N15+\$L\$4) * (1-EXP(-(\$N15+\$L\$4)*\$P\$5))) + ((0.37/(\$N15+\$L\$6)) * (1-EXP(-(\$N15+\$L\$6)*\$P\$5)))$
16	Cm-244	$= (0.63/(\$N16+\$L\$4) * (1-EXP(-(\$N16+\$L\$4)*\$P\$5))) + ((0.37/(\$N16+\$L\$6)) * (1-EXP(-(\$N16+\$L\$6)*\$P\$5)))$
17	Cm-246	$= (0.63/(\$N17+\$L\$4) * (1-EXP(-(\$N17+\$L\$4)*\$P\$5))) + ((0.37/(\$N17+\$L\$6)) * (1-EXP(-(\$N17+\$L\$6)*\$P\$5)))$
18	Co-60	$= (0.63/(\$N18+\$L\$4) * (1-EXP(-(\$N18+\$L\$4)*\$P\$5))) + ((0.37/(\$N18+\$L\$6)) * (1-EXP(-(\$N18+\$L\$6)*\$P\$5)))$
19	Cs-137	$= (0.63/(\$N19+\$L\$4) * (1-EXP(-(\$N19+\$L\$4)*\$P\$5))) + ((0.37/(\$N19+\$L\$6)) * (1-EXP(-(\$N19+\$L\$6)*\$P\$5)))$
20	H-3	$= (0.63/(\$N20+\$L\$4) * (1-EXP(-(\$N20+\$L\$4)*\$P\$5))) + ((0.37/(\$N20+\$L\$6)) * (1-EXP(-(\$N20+\$L\$6)*\$P\$5)))$
21	Np-237	$= (0.63/(\$N21+\$L\$4) * (1-EXP(-(\$N21+\$L\$4)*\$P\$5))) + ((0.37/(\$N21+\$L\$6)) * (1-EXP(-(\$N21+\$L\$6)*\$P\$5)))$
22	Pm-147	$= (0.63/(\$N22+\$L\$4) * (1-EXP(-(\$N22+\$L\$4)*\$P\$5))) + ((0.37/(\$N22+\$L\$6)) * (1-EXP(-(\$N22+\$L\$6)*\$P\$5)))$
23	Pu-238	$= (0.63/(\$N23+\$L\$4) * (1-EXP(-(\$N23+\$L\$4)*\$P\$5))) + ((0.37/(\$N23+\$L\$6)) * (1-EXP(-(\$N23+\$L\$6)*\$P\$5)))$
24	Pu-239	$= (0.63/(\$N24+\$L\$4) * (1-EXP(-(\$N24+\$L\$4)*\$P\$5))) + ((0.37/(\$N24+\$L\$6)) * (1-EXP(-(\$N24+\$L\$6)*\$P\$5)))$
25	Pu mix-239/241	
26	Pu-240	$= (0.63/(\$N26+\$L\$4) * (1-EXP(-(\$N26+\$L\$4)*\$P\$5))) + ((0.37/(\$N26+\$L\$6)) * (1-EXP(-(\$N26+\$L\$6)*\$P\$5)))$
27	Pu-241	$= (0.63/(\$N27+\$L\$4) * (1-EXP(-(\$N27+\$L\$4)*\$P\$5))) + ((0.37/(\$N27+\$L\$6)) * (1-EXP(-(\$N27+\$L\$6)*\$P\$5)))$
28	Pu pure-242	$= (0.63/(\$N28+\$L\$4) * (1-EXP(-(\$N28+\$L\$4)*\$P\$5))) + ((0.37/(\$N28+\$L\$6)) * (1-EXP(-(\$N28+\$L\$6)*\$P\$5)))$
29	Sr-90	$= (0.63/(\$N29+\$L\$4) * (1-EXP(-(\$N29+\$L\$4)*\$P\$5))) + ((0.37/(\$N29+\$L\$6)) * (1-EXP(-(\$N29+\$L\$6)*\$P\$5)))$
30	Tc-99	$= (0.63/(\$N30+\$L\$4) * (1-EXP(-(\$N30+\$L\$4)*\$P\$5))) + ((0.37/(\$N30+\$L\$6)) * (1-EXP(-(\$N30+\$L\$6)*\$P\$5)))$
31	Th-232	$= (0.63/(\$N31+\$L\$4) * (1-EXP(-(\$N31+\$L\$4)*\$P\$5))) + ((0.37/(\$N31+\$L\$6)) * (1-EXP(-(\$N31+\$L\$6)*\$P\$5)))$
32	Tl-204	$= (0.63/(\$N32+\$L\$4) * (1-EXP(-(\$N32+\$L\$4)*\$P\$5))) + ((0.37/(\$N32+\$L\$6)) * (1-EXP(-(\$N32+\$L\$6)*\$P\$5)))$
33	U-235	$= (0.63/(\$N33+\$L\$4) * (1-EXP(-(\$N33+\$L\$4)*\$P\$5))) + ((0.37/(\$N33+\$L\$6)) * (1-EXP(-(\$N33+\$L\$6)*\$P\$5)))$
34	U-238	$= (0.63/(\$N34+\$L\$4) * (1-EXP(-(\$N34+\$L\$4)*\$P\$5))) + ((0.37/(\$N34+\$L\$6)) * (1-EXP(-(\$N34+\$L\$6)*\$P\$5)))$
35	Total	
36	Ba-137m	$= (0.63/(\$N36+\$L\$4) * (1-EXP(-(\$N36+\$L\$4)*\$P\$5))) + ((0.37/(\$N36+\$L\$6)) * (1-EXP(-(\$N36+\$L\$6)*\$P\$5)))$
37	Y-90	$= (0.63/(\$N37+\$L\$4) * (1-EXP(-(\$N37+\$L\$4)*\$P\$5))) + ((0.37/(\$N37+\$L\$6)) * (1-EXP(-(\$N37+\$L\$6)*\$P\$5)))$
38	Pr-144	$= (0.63/(\$N38+\$L\$4) * (1-EXP(-(\$N38+\$L\$4)*\$P\$5))) + ((0.37/(\$N38+\$L\$6)) * (1-EXP(-(\$N38+\$L\$6)*\$P\$5)))$
39	Pa-233	$= (0.63/(\$N39+\$L\$4) * (1-EXP(-(\$N39+\$L\$4)*\$P\$5))) + ((0.37/(\$N39+\$L\$6)) * (1-EXP(-(\$N39+\$L\$6)*\$P\$5)))$
40	Th-234	$= (0.63/(\$N40+\$L\$4) * (1-EXP(-(\$N40+\$L\$4)*\$P\$5))) + ((0.37/(\$N40+\$L\$6)) * (1-EXP(-(\$N40+\$L\$6)*\$P\$5)))$
41	Pa-234	$= (0.63/(\$N41+\$L\$4) * (1-EXP(-(\$N41+\$L\$4)*\$P\$5))) + ((0.37/(\$N41+\$L\$6)) * (1-EXP(-(\$N41+\$L\$6)*\$P\$5)))$
42	Np-239	$= (0.63/(\$N42+\$L\$4) * (1-EXP(-(\$N42+\$L\$4)*\$P\$5))) + ((0.37/(\$N42+\$L\$6)) * (1-EXP(-(\$N42+\$L\$6)*\$P\$5)))$
43	Th-231	$= (0.63/(\$N43+\$L\$4) * (1-EXP(-(\$N43+\$L\$4)*\$P\$5))) + ((0.37/(\$N43+\$L\$6)) * (1-EXP(-(\$N43+\$L\$6)*\$P\$5)))$
44	Ra-228	$= (0.63/(\$N44+\$L\$4) * (1-EXP(-(\$N44+\$L\$4)*\$P\$5))) + ((0.37/(\$N44+\$L\$6)) * (1-EXP(-(\$N44+\$L\$6)*\$P\$5)))$
45	Ac-228	$= (0.63/(\$N45+\$L\$4) * (1-EXP(-(\$N45+\$L\$4)*\$P\$5))) + ((0.37/(\$N45+\$L\$6)) * (1-EXP(-(\$N45+\$L\$6)*\$P\$5)))$

	G	H
52	2.54E+00	DRL (uCi/m^2) – PAG/(CEDE+External)
53	1.56E+00	DRL (uCi/m^2) – PAG/(BS Dose + External)
54	7.16E+02	DRL (uCi/m^2) – PAG/(Skin Dose)

	G	H
52	=G3/(H47+I47)	DRL (uCi/m^2) -- PAG/(CEDE+External)
53	=G4/(L47+I47)	DRL (uCi/m^2) -- PAG/(BS Dose + External)
54	=G5/K47	DRL (uCi/m^2) -- PAG/(Skin Dose)

	B	C
1	Nuclide	Half-life (years)
2	Am-241	458
3	Am-243	7950
4	Ba-133	10.5
5	Ce-144	0.778082192
6	Cf-249	360
7	Cf-252	2.646
8	Cm-244	17.6
9	Cm-246	5500
10	Co-60	5.26
11	Cs-137	30
12	H-3	12.3
13	Np-237	2140000
14	Pm-147	2.62
15	Pu-238	86.4
16	Pu-239	24390
17	Pu mix-239/241	
18	Pu-240	6580
19	Pu-241	13.2
20	Pu pure-242	379000
21	Sr-90	28.1
22	Tc-99	212000
23	Th-232	14000000000
24	Ti-204	3.8
25	U-235	710000000
26	U-238	4510000000
27		
28	Ba-137m	4.8554E-06
29	Y-90	0.007317352
30	Pr-144	3.28767E-05
31	Pa-233	0.073972603
32	Th-234	0.066027397
33	Pa-234	0.00076484
34	Np-239	0.006452055
35	Th-231	0.002913242
36	Ra-228	5.75
37	Ac-228	0.000699772
38		

half

Attachment B

HOTSPOT results - average meteorology, 0.1 cm s^{-1}

Footprint plot not available.

Attachment C

HOTSPOT results - average meteorology, 1.0 cm s^{-1}

Attachment D

HOTSPOT results - average meteorology, 10 cm s^{-1}

Attachment E

HOTSPOT results - adverse meteorology, 0.1 cm s^{-1}

Attachment F

HOTSPOT results - adverse meteorology, 1.0 cm s^{-1}

Attachment G

HOTSPOT results - adverse meteorology, 10 cm s^{-1}