BPRG Calculator [Scenario = IW, Media = Dust, BPRG Type = Site-Specific, Risk Output = Yes, Units = pCi]

Output files:

DCGLw (dpm/100 $cm^2$)
DCGLw (pCi/$cm^2$)
Ingestion DCGLw (pCi/$cm^2$)
Yield
Equilibrium fraction
BPRG Output Option
Half-life (yr)
Ingestion Input Concentration (pCi/$cm^2$)
External Input Concentration (pCi/$cm^2$)
Target risk
Frequency of hand to mouth - adult, FQa
Surface area of fingers - resident child, SAres-c (cm2)
Surface area of fingers - resident adult, SAres-a (cm2)
*Ingestion risk*
*External exposure risk*
*Total chain risk*
*Cumulative risk*

Indoor_Worker_bprg_01OCT2019_Co Cs Eu H Sr at 20 pct RG_adjust HL FQa SAa_progeny with decay.pdf
Indoor_Worker_bprg_01OCT2019_Am Pu Ra Th U at 20 pct RG_adjust FQa SAa SAc_sec eq no decay.pdf
Indoor_Worker_bprg_01OCT2019_Co Cs Eu H Sr at RG_adjust HL FQa SAa_progeny with decay.pdf
Indoor_Worker_bprg_01OCT2019_Am Pu Ra Th U at RG_adjust FQa SAa SAc_sec eq no decay.pdf

| Default | Am-241 | Co-60 | Eu-152 | Eu-154 | H-3 | Cs-137 | *Ba-137m* | Sr-90 | *Y-90* |
|---|---|---|---|---|---|---|---|---|---|
| | 100 | 5000 | 5000 | 5000 | 5000 | 5000 | | 1000 | |
| | 0.45 | 22.52 | 22.52 | 22.52 | 22.52 | 22.52 | 22.52 | 4.50 | 4.50 |
| | 0.090 | 4.505 | 4.505 | 4.505 | 4.505 | 4.505 | 4.505 | 0.901 | 0.901 |
| | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | *0.944* | 1 | *0.998* |
| | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | *1.0* | 1 | *1.0* |
| 1 | 1 | 2 | 2 | 2 | 2 | | 2 | | 2 |
| | | | | | | | 30.2 | | 28.8 |
| . | 0.0901 | 4.5045 | 4.5045 | 4.5045 | 4.5045 | 4.5045 | 4.2523 | 0.9009 | 0.8991 |
| . | 0.4505 | 22.523 | 22.523 | 22.523 | 22.523 | 22.5225 | 21.2613 | 4.5045 | 4.4955 |
| 1.00E-06 | | | | | | | | 1.00E-04 | |
| 3 | | | | | | | | 1.64 | |
| 49 | | | | | | | | 11.5 | |
| 16 | | | | | | | | 3.7 | |
| | 1.16E-06 | 1.36E-06 | 1.03E-06 | 1.23E-06 | 1.37E-08 | 1.54E-05 | 0.00E+00 | 4.92E-07 | 6.95E-07 |
| | 4.80E-08 | 8.21E-05 | 7.46E-05 | 6.08E-05 | 0.00E+00 | 5.41E-08 | 4.95E-05 | 7.23E-09 | 3.22E-07 |
| | 1.21E-06 | 8.35E-05 | 7.56E-05 | 6.20E-05 | 1.37E-08 | *6.50E-05* | | *1.52E-06* | |
| *3.35E-04* | | | | | | | | | |

| Pu-239 | *U-235m* | U-235 | *Th-231* | Ra-226 | Th-232 | |
|---|---|---|---|---|---|---|
| 100 | | 488 | | 100 | 36.5 | |
| 0.45 | 0.45 | 2.20 | 2.20 | 0.45 | 0.16 | |
| 0.090 | 0.090 | 0.440 | 0.440 | 0.090 | 0.033 | |
| 1 | *0.997* | 1.0 | *1.0* | 1.0 | 1.0 | |
| 1 | *1.0* | 1.0 | *1.0* | 1.0 | 1.0 | |
| 1 | | 1 | | 1 | 1 | 4 |
| | | | | | | |
| 0.0901 | 0.0898 | 0.4396 | 0.4396 | 0.0901 | 0.0329 | |
| 0.4505 | 0.4489 | 2.1982 | 2.1982 | 0.4505 | 0.1644 | |

| | | | | | |
|---|---|---|---|---|---|
| 1.54E-06 | 7.24E-14 | 3.06E-06 | 5.63E-08 | 2.97E-05 | 4.26E-06 |
| 5.28E-10 | 0.00E+00 | 1.74E-06 | 1.55E-07 | 3.91E-06 | 1.87E-06 |
| *1.54E-06* | | *5.01E-06* | | 3.36E-05 | 6.13E-06 |

BPRG Calculator [Scenario = Resident, Media = Dust, BPRG Type = Site-Specific, Risk Output = Yes, Units = pCi]

Output files:

DCGLw (dpm/100 $cm^2$)
DCGLw (pCi/$cm^2$)
Ingestion DCGLw (pCi/$cm^2$)
Yield
Equilibrium fraction
BPRG Output Option
Half-life (yr)
Ingestion Input Concentration (pCi/$cm^2$)
External Input Concentration (pCi/$cm^2$)
Target risk
Frequency of hand to mouth - adult, FQa
Surface area of fingers - resident child, SAres-c (cm2)
Surface area of fingers - resident adult, SAres-a (cm2)
*Ingestion risk*
*External exposure risk (ground plane)*
*Total chain risk*
*Cumulative risk*

Resident_bprg_01OCT2019_Co Cs Eu H Sr at 20 pct RG_adjust HL FQa SAa SAc_progeny with decay.pdf
Resident_bprg_01OCT2019_Am Pu Ra Th U at 20 pct RG_adjust FQa SAa SAc_sec eq no decay.pdf
Resident_bprg_01OCT2019_Co Cs Eu H Sr at RG_adjust HL FQa SAa SAc_progeny with decay.pdf
Resident_bprg_01OCT2019_Am Pu Ra Th U at RG_adjust FQa SAa SAc_sec eq no decay.pdf

| Default | Am-241 | Co-60 | Eu-152 | Eu-154 | H-3 | Cs-137 | *Ba-137m* | Sr-90 | *Y-90* | Pu-239 |
|---|---|---|---|---|---|---|---|---|---|---|
| | 100 | 5000 | 5000 | 5000 | 5000 | 5000 | | 1000 | | 100 |
| | 0.4505 | 22.52 | 22.52 | 22.52 | 22.52 | 22.52 | 22.52 | 4.50 | 4.50 | 0.4505 |
| | 0.0901 | 4.5045 | 4.5045 | 4.5045 | 4.5045 | 4.5045 | 4.5045 | 0.9009 | 0.9009 | 0.0901 |
| | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | *0.944* | 1 | *0.998* | 1 |
| | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | *1.0* | 1 | *1.0* | 1 |
| 1 | 1 | 2 | 2 | 2 | 2 | | 2 | | 2 | |
| | | | | | | | 30.2 | | 28.8 | |
| . | *0.0901* | *4.505* | *4.505* | *4.505* | *4.505* | *4.505* | *4.252* | *0.9009* | *0.8991* | *0.0901* |
| . | 0.4505 | 22.523 | 22.523 | 22.523 | 22.523 | 22.523 | 21.261 | 4.505 | 4.495 | 0.4505 |
| 1.00E-06 | | | | | | | | 1.00E-04 | | |
| 3 | | | | | | | | 1.64 | | |
| 49 | | | | | | | | 11.5 | | |
| 16 | | | | | | | | 3.7 | | |
| | 8.8E-06 | 2.6E-05 | 1.9E-05 | 2.5E-05 | 1.1E-07 | 7.6E-05 | 0.0E+00 | 3.1E-06 | 1.7E-05 | 1.1E-05 |
| | 2.10E-07 | 3.5E-04 | 3.2E-04 | 2.6E-04 | 0.0E+00 | 2.3E-07 | 2.1E-04 | 3.1E-08 | 1.4E-06 | 2.31E-09 |
| | 8.98E-06 | 3.72E-04 | 3.38E-04 | 2.83E-04 | 1.12E-07 | *2.9E-04* | | *2.2E-05* | | *1.1E-05* |
| *1.72E-03* | | | | | | | | | | |

| *U-235m* | U-235 | *Th-231* | Ra-226 | Th-232 |
|---|---|---|---|---|
| | 488 | | 100 | 36.5 |
| 0.4505 | 2.1982 | 2.1982 | 0.4505 | 0.1644 |
| 0.0901 | 0.4396 | 0.4396 | 0.0901 | 0.0329 |
| *0.997* | 1.0 | *1.0* | 1.0 | 1.0 |
| *1.0* | 1.0 | *1.0* | 1.0 | 1.0 |
| l | | 1 | 1 | 1 |
| | | | | |
| *0.0898* | *0.4396* | *0.4396* | *0.0901* | *0.0329* |
| 0.4489 | 2.198 | 2.198 | 0.4505 | 0.1644 |

| | | | | |
|---|---|---|---|---|
| 7.9E-13 | 3.4E-05 | 1.4E-06 | 2.7E-04 | 5.0E-05 |
| 0.00E+00 | 7.61E-06 | 6.78E-07 | 1.71E-05 | 8.18E-06 |
| | *4.4E-05* | | 2.88E-04 | 5.86E-05 |

| | | Default |
|---|---|---|
| BPRG Calculator [Scenario = Resident, Media = Dust, BPRG Type = Site-Specific, Risk Output = Yes, Units = pCi] | DCGLw (dpm/100 $cm^2$) | |
| | DCGLw (pCi/$cm^2$) | |
| | Ingestion DCGLw (pCi/$cm^2$) | |
| | Yield | |
| | Equilibrium fraction | |
| | BPRG Output Option | 1 |
| | Half-life (yr) | |
| | Ingestion Input Concentration (pCi/$cm^2$) | . |
| | External Input Concentration (pCi/$cm^2$) | . |
| | Target risk | 1.00E-06 |
| | Frequency of hand to mouth - adult, FQa | 3 |
| | Surface area of fingers - resident child, SAres-c (cm2) | 49 |
| | Surface area of fingers - resident adult, SAres-a (cm2) | 16 |
| | *Ingestion risk* | |
| | *External exposure risk (ground plane)* | |
| | *Total chain risk* | |
| | *Cumulative risk* | *4.15E-02* |

Output files: Resident_bprg_01OCT2019_All ROCs_EPA defaults_sec eq no decay

| Am-241 | Co-60 | Eu-152 | Eu-154 | H-3 | Cs-137 | *Ba-137m* | Sr-90 | *Y-90* | Pu-239 | *U-235m* |
|---|---|---|---|---|---|---|---|---|---|---|
| 100 | 5000 | 5000 | 5000 | 5000 | 5000 | | 1000 | | 100 | |
| 0.45 | 22.52 | 22.52 | 22.52 | 22.52 | 22.52 | 22.52 | 4.50 | 4.50 | 0.45 | 0.45 |
| 0.45 | 22.52 | 22.52 | 22.52 | 22.52 | 22.52 | 22.52 | 4.50 | 4.50 | 0.45 | 0.45 |
| 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | *0.944* | 1 | *0.998* | 1 | *0.997* |
| 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | *1.000* | 1 | *1.0* | 1 | *1.0* |
| 1 | 1 | 1 | 1 | 1 | 1 | | 1 | | 1 | |
| | | | | | | | | | | |
| *0.4505* | *22.5225* | *22.5225* | *22.5225* | *22.5225* | *22.5225* | *21.2613* | *4.5045* | *4.4955* | *0.4505* | *0.4489* |
| 0.4505 | 22.523 | 22.523 | 22.523 | 22.523 | 22.5225 | 21.2613 | 4.5045 | 4.4955 | 0.4505 | 0.4489 |
| | | | | | | | 1.00E-04 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2.30E-03 | 2.8E-03 | 4.4E-03 | 1.8E-03 | 6.5E-06 | 3.1E-03 | 2.0E-03 | 2.45E-03 |
| 5.67E-06 | 1.2E-03 | 5.8E-04 | 6.2E-04 | 0.0E+00 | 2.8E-04 | 1.9E-06 | 6.46E-06 |
| 2.31E-03 | 3.98E-03 | 4.93E-03 | 2.45E-03 | 6.48E-06 | *3.35E-03* | *1.95E-03* | *2.46E-03* |

| U-235 | *Th-231* | Ra-226 | Th-232 |
|---|---|---|---|
| 488 | | 100 | 36.5 |
| 2.20 | 2.20 | 0.45 | 0.16 |
| 2.20 | 2.20 | 0.45 | 0.16 |
| 1.0 | *1.0* | 1.0 | 1.00 |
| 1.0 | *1.0* | 1.0 | 1.00 |
| 1 | | 1 | 1 |
| | | | |
| *2.1982* | *2.1982* | *0.4505* | *0.1644* |
| 2.1982 | 2.1982 | 0.4505 | 0.1644 |

| | | |
|---|---|---|
| 1.03E-02 | 8.21E-03 | 1.53E-03 |
| 3.15E-05 | 1.71E-05 | 8.18E-06 |
| *1.03E-02* | 8.23E-03 | 1.54E-03 |

| ROC | 2006 AM Structures RG, Total (dpm/100 cm2) | Navy Structures CSM (Indoor Worker Dust) | | | Navy Structures CSM (Resident Dust) | | | EPA Structures CSM (Resident Dust) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *External Risk* | *Ingestion Risk* | Total Risk | *External Risk* | *Ingestion Risk* | Total Risk | *External Risk* | *Ingestion Risk* | Total Risk |
| **Am-241** | 100 | *4.8E-08* | *1.2E-06* | 1.2E-06 | *2.1E-07* | *8.8E-06* | 9.0E-06 | *5.7E-06* | *2.3E-03* | 2.3E-03 |
| **Cs-137** | 5000 | *5.0E-05* | *1.5E-05* | 6.5E-05 | *2.1E-04* | *7.6E-05* | 2.9E-04 | *2.8E-04* | *3.1E-03* | 3.4E-03 |
| **Co-60** | 5000 | *8.2E-05* | *1.4E-06* | 8.3E-05 | *3.5E-04* | *2.6E-05* | 3.7E-04 | *1.2E-03* | *2.8E-03* | 4.0E-03 |
| **Eu-152** | 5000 | *7.5E-05* | *1.0E-06* | 7.6E-05 | *3.2E-04* | *1.9E-05* | 3.4E-04 | *5.8E-04* | *4.4E-03* | 4.9E-03 |
| **Eu-154** | 5000 | *6.1E-05* | *1.2E-06* | 6.2E-05 | *2.6E-04* | *2.5E-05* | 2.8E-04 | *6.2E-04* | *1.8E-03* | 2.4E-03 |
| **H-3** | 5000 | *0.0E+00* | *1.4E-08* | 1.4E-08 | *0.0E+00* | *1.1E-07* | 1.1E-07 | *0.0E+00* | *6.5E-06* | 6.5E-06 |
| **Pu-239** | 100 | *5.3E-10* | *1.5E-06* | 1.5E-06 | *2.3E-09* | *1.1E-05* | 1.1E-05 | *6.5E-06* | *2.5E-03* | 2.5E-03 |
| **Ra-226** | 100 | *3.9E-06* | *3.0E-05* | 3.4E-05 | *1.7E-05* | *2.7E-04* | 2.9E-04 | *1.7E-05* | *8.2E-03* | 8.2E-03 |
| **Sr-90** | 1000 | *3.3E-07* | *1.2E-06* | 1.5E-06 | *1.4E-06* | *2.0E-05* | 2.2E-05 | *1.9E-06* | *2.0E-03* | 2.0E-03 |
| **Th-232** | 36.5 | *1.9E-06* | *4.3E-06* | 6.1E-06 | *8.2E-06* | *5.0E-05* | 5.9E-05 | *8.2E-06* | *1.5E-03* | 1.5E-03 |
| **U-235** | 488 | *1.9E-06* | *3.1E-06* | 5.0E-06 | *8.3E-06* | *3.6E-05* | 4.4E-05 | *3.2E-05* | *1.0E-02* | 1.0E-02 |

| Parameter | Default Value | Input Value (if not default) | |
|---|---|---|---|
| Select BPRG Type | Defaults | Site-specific | |
| Select Isotope Info Type | Database hierarchy defaults | User-provided for Cs, Co, Eu, H and Sr (to account for ingrowth of short half-life progeny of Cs and Sr) | |
| Select Risk Output | No | Yes | |
| Source and decay output | Secular equilibrium, without decay | Secular equilibrium (no decay)/Show individual progeny' for long-lived ROCs (Am, Pu, Ra, Th, U); 'Provide results for progeny (with decay)' for short-lived ROCs (Cs, Co, Eu, H, Sr) | |
| Radioactive Half-life | | | |
| *Ba-137m* | 4.86E-06 yr | 30.2 yr (accounts for continual ingrowth over exposure period) | |
| *Y-90* | 7.32E-03 yr | 28.8 yr (accounts for continual ingrowth over exposure period) | |
| Radionuclide concentrations (pCi/cm2) | | Ingestion input concentrations are 20% of RG consistent with assumptions in 2006 | |
| *Am-241* | 0.450 | 0.0901 | 0.090 |
| *Cs-137* | 22.523 | 4.505 | 4.505 |
| *Ba-137m (94.4%)* | 21.261 | 4.252 | 4.252 |
| *Co-60* | 22.523 | 4.505 | 4.505 |
| *Eu-152* | 22.523 | 4.505 | 4.505 |
| *Eu-154* | 22.523 | 4.505 | 4.505 |
| *H-3* | 22.523 | 4.505 | 4.505 |
| *Pu-329* | 0.450 | 0.0901 | 0.090 |
| *U-235m (99.7%)* | 0.450 | 0.0901 | 0.090 |
| *Ra-226+D* | 0.450 | 0.0901 | 0.090 |

| | | | | |
|---|---|---|---|---|
| *Sr-90* | 4.505 | 0.9009 | 0.901 | |
| *Y-90 (99.8%)* | 4.505 | 0.9009 | 0.901 | |
| *Th-232+D* | 0.164 | 0.0329 | 0.033 | |
| *U-235* | 2.198 | 0.4396 | 0.440 | |
| *Th-231 (100%)* | 2.198 | 0.4396 | 0.440 | |
| Frequency of hand to mouth - adult, FQa | 3 | 1.64 (Average for Age 7-26 from EPA 2000 page D-4). The BPRG default values for FQ (17 events/hr child and 3 events/hr adult) are based on the 2011 Exposure Factors Handbook Table 4-1. However, there is no data for adults older than 11 years and | | |
| Surface area of fingers - resident adult, SAres-a and indoor worker, Saiw | 49 cm2 | 11.5 cm2 (Area of three fingertips from Sahmel et al.,2014 rather than full area of three fingers). The EPA default for saliva extraction factor is 50% based on pesticide studies in 1994. A 2014 study (Sahmel et al.) of transfer of lead to three fingers found the factor is 24% and is more applicable to the Navy contaminants. The authors note similar in 3rd para of their introduction. See | | |
| Surface area of fingers - resident child, SAres-c | 16 cm2 | 3.7 cm2 (Area of three fingertips calculated from ratio of adult fingertip to finger areas). | | |
| Risks | | Sum of ingestion and external exposure risks | | |
| | | Am risks from Am-241 only | | |
| | | Cs risks include Ba-137m (in secular equilbrium and half-life forced to that of parent) | | |
| | | Co risks from Co-60 only | | |
| | | Eu risks from Eu-152 or Eu-154 only | | |
| | | H risks from H-3 only | | |
| | | Pu risks include U-235m | | |
| | | Ra and Th risks come from full secular equilibrium | | |
| | | Sr risks include Y-90 (in secular equilbrium and half-life forced to that of parent) | | |
| | | U risks include Th-231 | | |