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APPENDIX I: SUPPORTING INFORMATION: PERFORMANCE EVALUATION

This appendix contains supporting information and key data for Chapter 9. Topics addressed in this appendix are as follows:

- Basis of 2065 projected closure compositional vectors for each DU
- Distribution parameters for uncertainty quantification analysis
- Bias and uncertainty in CWTS parent radionuclide inventories
- Closure Analysis Toolkit
- Closure analysis supporting material
- Closure analysis deterministic results
- Closure analysis stochastic results

I.1 PROJECTED CLOSURE COMPOSITIONAL VECTORS FOR DISPOSAL UNITS

As stated in Section 9.1.2.2, a final inventory of parent radionuclides is projected for every DU at the time of facility operational closure in 2065. These final closure inventories are upper-bound estimates wherein each DU is assumed to reach its activity capacity. Composition vectors based on existing DU inventories are employed to estimate the final compositions of all existing and future DUs. Specifically, (1) the existing DU compositions are assumed to remain constant; (2) future DUs are assigned averaged existing compositions based on appropriately averaged DUs. This information is detailed in Appendix H, Section H.7. In addition, the variability in composition among existing DUs is used to generate log-normal distributions for uncertainty quantification, which is detailed in Section I.1.1.

I.1.1 Distribution Parameters for Uncertainty Quantification Analysis

Log-normal distribution parameters for MC simulation of all projected future parent radionuclide inventories in all DUs are detailed below.

I.1.1.1. Distribution Parameters for Slit and Engineered Trenches

Table I-1 presents the statistical parameters for ST06. In addition to U-233D, STs are also used for disposal of NR coolant pumps, which are represented by the C-14N SWF. Like U-233D, C-14N is highlighted in blue[1]. Two other SWF radionuclides are unique to ST06: Ra-226T and Th-230T. These two SWF radionuclides represent 285-F Cooling Tower debris and are highlighted in orange[1] because no future disposals and, unlike most other SWFs, their disposal limits are the same as those for generic waste forms. Three of the parent radionuclides listed (Be-10, U-233D, and C-14N) are not found in the current inventory for ST06 and therefore have zero projected inventory at closure. However, the "Closed and Open STs Only" average inventories from Table 9-2 (Chapter 9) are used instead for the uncertainty quantification analysis to accommodate potential future burial of these radionuclides. Because the inventories of Ra-226T and Th-230T are existing only (i.e., no future disposals), they have been assigned infinitesimally small, but nonzero,

[1] Appendix H, Table H-8 provides shading legend for SWF radionuclides.

inventories of 1.0E-50 Ci with zero standard deviation to produce zero future inventories (exp(1.0E-50) ≈ 0) in stochastic modeling.

Table I-1. Distribution Parameters for Estimated Closure Inventories for ST06

Radionuclide	ST06			
	Normal		Log-Normal	
	Average (Ci) [a]	Std Dev (Ci)	Average (-)	Std Dev (-)
Ag-108m	3.744E-04	1.230E-03	-9.12416	1.57101
Am-241	4.443E+00	4.655E+00	1.12110	0.86061
Am-242m	2.354E+00	5.090E+00	-0.01160	1.31748
Am-243	1.000E+00	2.899E+00	-1.11996	1.49688
Be-10	1.179E-07	4.080E-07	-17.23474	1.60086
C-14	5.231E-02	3.229E-02	-3.11204	0.56825
Cf-249	5.574E-01	1.321E+00	-1.52934	1.37461
Cf-251	5.066E-01	1.199E+00	-1.62365	1.37379
Cl-36	1.096E-11	2.992E-11	-26.30469	1.46124
Cm-245	7.873E-03	1.564E-02	-5.64385	1.26450
Cm-247	7.906E-03	1.626E-02	-5.66759	1.28641
Cm-248	2.720E-03	7.690E-03	-7.00516	1.48200
Cs-135	3.934E-07	1.017E-06	-15.76817	1.42810
Cs-137	1.789E+02	1.532E+02	4.91152	0.74185
H-3	1.307E+00	1.899E+00	-0.30020	1.06556
I-129	4.815E-04	6.005E-04	-8.10777	0.96865
K-40	2.849E-07	8.244E-07	-16.19024	1.49602
Nb-94	1.375E-05	1.082E-05	-11.43494	0.69386
Ni-59	1.371E-01	1.247E-01	-2.28863	0.77636
Ni-63	3.877E-01	3.881E-01	-1.29454	0.83315
Np-237	2.647E-02	2.526E-02	-3.95565	0.80467
Pa-231	1.872E-09	3.769E-09	-20.90618	1.27279
Pd-107	1.096E-07	2.364E-07	-16.89316	1.31637
Pu-239	6.562E+00	5.963E+00	1.58032	0.77589
Pu-240	1.809E+00	1.564E+00	0.31353	0.74729
Pu-241	3.590E+01	2.877E+01	3.33261	0.70429
Ra-226	3.732E-04	7.368E-04	-8.68770	1.26043
Rb-87	8.386E-11	2.905E-10	-24.48440	1.60154
Sn-126	7.142E-03	2.070E-02	-6.06202	1.49686
Sr-90	1.811E+02	2.132E+02	4.76425	0.93245
Tc-99	1.401E-01	1.134E-01	-2.21677	0.70951
Th-229	8.199E-03	1.695E-02	-5.63522	1.28960
Th-230	1.567E-03	2.717E-03	-7.15263	1.17816
Th-231	1.554E-01	2.419E-01	-2.47737	1.10948
U-232	4.310E-02	7.148E-02	-3.80532	1.14978
U-233	3.044E+00	4.790E+00	0.49002	1.11631
U-234	1.735E+00	1.850E+00	0.17145	0.87140
U-236	6.042E-02	6.185E-02	-3.16476	0.84660
U-233D	3.563E-03	7.732E-03	-6.50829	1.31991
C-14N	2.116E-02	2.418E-02	-4.27331	0.91407
Ra-226T	1.000E-50	0	-115.12925	0
Th-230T	1.000E-50	0	-115.12925	0

Notes:

Refer to Table H-8 for legend that defines the highlighting colors for shaded radionuclides.

[a] Values shaded in green represent radionuclides with zero projected inventory at closure. However, "Closed and Open STs Only" average inventories from Table 9-2 are used instead in the uncertainty quantification analysis to allow for potential future burial of these radionuclides.

In addition to U-233D and C-14N, currently open ST07 also contains three unique SWF radionuclides for which there can be no additional emplacements: H-3C, I-129C (in activated carbon waste), and I-129J (in F-Area GW filter cake waste). These radionuclides are shaded yellow[1] in Table I-2 and have infinitesimally small, nonzero assigned inventories of 1.0E-50 Ci with zero standard deviation for stochastic modeling purposes. Eight of the parent radionuclides listed (Ag-108m, Be-10, Cl-36, Cs-135, K-40, Pa-231, Pd-107, and Rb-87) are not found in the current inventory for ST07 and therefore have zero projected inventory at closure. However, the "Closed and Open STs Only" average inventories from Table 9-2 are again used instead for the uncertainty quantification analysis.

Like ST07, ST08 is currently open and already contains some SWFs for which no future disposals are planned. This includes NR coolant pumps (C-14N) and waste packed in tall boxes (Am-241B through U-233B), all shaded yellow[1] in Table I-3. Because the currently emplaced inventory of these parent radionuclides is known and fixed, they have been assigned infinitesimally small but nonzero inventories of 1.0E-50 Ci with zero standard deviation for stochastic modeling purposes. Parent radionuclides Ag-108m, Be-10, Cl-36, Cs-135, K-40, Pa-231, Pd-107, Ra-226, Rb-87, Th-229, and U-233D are not found in the current inventory for ST08. Consequently, they have zero projected inventory at closure. However, the "Closed and Open STs Only" average inventories from Table 9-2 are used here as well for the uncertainty quantification analysis.

ST09 is also currently open and already contains tall box (Am-241B, C-14B, Cs-137B, H-3B, I-129B, Ni-59B, Np-237B, Pu-239B, Pu-240B, Pu-241B, Sr-90B, Tc-99B, U-233B, U-233E,[2] and U-234B) and depleted uranium (U-233D) SWF radionuclides. Unlike ST08, disposal of tall boxes will continue for this DU, and future disposal of U-233D and C-14N is possible. Consequently, the 17 parent radionuclides corresponding to these three SWFs are shaded blue[1] in Table I-4. Contaminated heat exchangers from the former Savannah River Plant production reactors are disposed in ST09, giving two additional SWF radionuclides, C-14X and H-3X. Because no future disposals of these two radionuclides are possible, their inventories are fixed, and they are shaded yellow[1] in Table I-4. Eight radionuclides have zero projected inventory at closure. Six of these (Ag-108m, Be-10, Cs-135, Pd-107, Rb-87, and C-14N) use "Closed and Open STs Only" average inventories from Table 9-2 for the uncertainty quantification analysis. Ni-59B should not be present in any future tall box disposals, so it is assigned an infinitesimally small, nonzero inventory of 1.0E-50 Ci with zero standard deviation for stochastic calculations. In the absence of any alternatives, tall box depleted uranium (U-233E) substituted "Closed and Open STs Only" average inventory for U-233D from Table 9-2 for stochastic modeling. C-14X and H-3X inventories are fixed at their current levels; therefore, they are each assigned an infinitesimally small, nonzero inventory of 1.0E-50 Ci with zero standard deviation for stochastics. All but two of the tall box radionuclides' standard deviations in Table I-4 are shaded aqua to indicate that they are calculated using the corresponding generic waste form radionuclides' "Closed and Open STs & ETs Combined" Std Dev/Average ratios. The exceptions are Ni-59B, for reasons already discussed, and U-233E which uses the ratio for the SWF radionuclide U-233D.

[2] U-233E is depleted uranium associated with tall boxes.

Table I-2. Distribution Parameters for Estimated Closure Inventories for ST07

Radionuclide	ST07			
	Normal		Log-Normal	
	Average (Ci) [a]	Std Dev (Ci)	Average (-)	Std Dev (-)
Ag-108m	3.744E-05	1.230E-04	-11.42673	1.57101
Am-241	1.225E+00	1.283E+00	-0.16761	0.86061
Am-242m	5.091E-04	1.101E-03	-8.45066	1.31748
Am-243	3.640E-03	1.055E-02	-6.73620	1.49688
Be-10	1.179E-07	4.080E-07	-17.23474	1.60086
C-14	4.795E-02	2.960E-02	-3.19900	0.56825
Cf-249	5.982E-04	1.418E-03	-8.36631	1.37461
Cf-251	4.952E-04	1.172E-03	-8.55425	1.37379
Cl-36	1.730E-06	4.726E-06	-14.33474	1.46124
Cm-245	2.432E-04	4.833E-04	-9.12095	1.26450
Cm-247	5.383E-04	1.107E-03	-8.35447	1.28641
Cm-248	6.790E-05	1.920E-04	-10.69565	1.48200
Cs-135	5.258E-08	1.360E-07	-17.78066	1.42810
Cs-137	5.712E+01	4.893E+01	3.76994	0.74185
H-3	8.986E-01	1.306E+00	-0.67462	1.06556
I-129	6.339E-05	7.907E-05	-10.13527	0.96865
K-40	4.443E-04	1.286E-03	-8.83794	1.49602
Nb-94	5.715E-04	4.494E-04	-7.70800	0.69386
Ni-59	2.226E-01	2.024E-01	-1.80379	0.77636
Ni-63	1.050E+00	1.051E+00	-0.29807	0.83315
Np-237	9.847E-03	9.397E-03	-4.94432	0.80467
Pa-231	7.047E-07	1.419E-06	-14.97550	1.27279
Pd-107	2.373E-08	5.121E-08	-18.42296	1.31637
Pu-239	4.606E+00	4.185E+00	1.22628	0.77589
Pu-240	1.055E+00	9.124E-01	-0.22573	0.74729
Pu-241	2.830E+01	2.268E+01	3.09498	0.70429
Ra-226	3.347E-06	6.607E-06	-13.40192	1.26043
Rb-87	9.699E-12	3.360E-11	-26.64148	1.60154
Sn-126	1.715E-05	4.969E-05	-12.09405	1.49686
Sr-90	1.222E+01	1.438E+01	2.06800	0.93245
Tc-99	1.733E-02	1.402E-02	-4.30690	0.70951
Th-229	4.043E-04	8.360E-04	-8.64483	1.28960
Th-230	5.306E-05	9.202E-05	-10.53807	1.17816
Th-231	1.402E-03	2.183E-03	-7.18513	1.10948
U-232	2.158E-03	3.580E-03	-6.79945	1.14978
U-233	1.882E-01	2.961E-01	-2.29356	1.11631
U-234	1.731E-01	1.846E-01	-2.13335	0.87140
U-236	5.196E-03	5.319E-03	-5.61820	0.84660
U-233D	2.108E-04	4.575E-04	-9.33554	1.31991
C-14N	2.493E-02	2.849E-02	-4.10963	0.91407
H-3C	1.000E-50	0	-115.12925	0
I-129C	1.000E-50	0	-115.12925	0
I-129J	1.000E-50	0	-115.12925	0

Notes:

Refer to Table H-8 for legend that defines the highlighting colors for shaded radionuclides.

[a] Values shaded in green represent radionuclides with zero projected inventory at closure. However, "Closed and Open STs Only" average inventories from Table 9-2 are used instead in the uncertainty quantification analysis to allow for potential future burial of these radionuclides.

Table I-3. Distribution Parameters for Estimated Closure Inventories for ST08

Radionuclide	ST08			
	Normal		Log-Normal	
	Average (Ci) [a]	Std Dev (Ci)	Average (-)	Std Dev (-)
Ag-108m	3.744E-05	1.230E-04	-11.42673	1.57101
Am-241	1.229E+00	1.287E+00	-0.16422	0.86061
Am-242m	9.161E-01	1.980E+00	-0.95553	1.31748
Am-243	1.090E-01	3.158E-01	-3.33717	1.49688
Be-10	1.179E-07	4.080E-07	-17.23474	1.60086
C-14	4.541E-02	2.803E-02	-3.25355	0.56825
Cf-249	2.159E-01	5.118E-01	-2.47752	1.37461
Cf-251	1.965E-01	4.651E-01	-2.57073	1.37379
Cl-36	1.730E-06	4.726E-06	-14.33474	1.46124
Cm-245	3.736E-03	7.424E-03	-6.38914	1.26450
Cm-247	8.165E-03	1.680E-02	-5.63534	1.28641
Cm-248	6.019E-05	1.702E-04	-10.81614	1.48200
Cs-135	5.258E-08	1.360E-07	-17.78066	1.42810
Cs-137	8.813E+01	7.549E+01	4.20363	0.74185
H-3	6.917E-01	1.005E+00	-0.93636	1.06556
I-129	2.315E-04	2.888E-04	-8.83990	0.96865
K-40	4.443E-04	1.286E-03	-8.83794	1.49602
Nb-94	8.291E-05	6.520E-05	-9.63850	0.69386
Ni-59	1.023E-01	9.308E-02	-2.58075	0.77636
Ni-63	1.429E-01	1.431E-01	-2.29238	0.83315
Np-237	1.121E-03	1.070E-03	-7.11702	0.80467
Pa-231	7.047E-07	1.419E-06	-14.97550	1.27279
Pd-107	2.373E-08	5.121E-08	-18.42296	1.31637
Pu-239	3.350E+00	3.045E+00	0.90807	0.77589
Pu-240	8.794E-01	7.605E-01	-0.40772	0.74729
Pu-241	1.096E+01	8.785E+00	2.14651	0.70429
Ra-226	4.116E-04	8.125E-04	-8.58982	1.26043
Rb-87	9.699E-12	3.360E-11	-26.64148	1.60154
Sn-126	1.758E-06	5.095E-06	-14.37152	1.49686
Sr-90	9.379E+00	1.104E+01	1.80374	0.93245
Tc-99	1.249E-02	1.010E-02	-4.63481	0.70951
Th-229	1.047E-03	2.165E-03	-7.69317	1.28960
Th-230	7.909E-06	1.371E-05	-12.44155	1.17816
Th-231	2.179E-02	3.393E-02	-4.44168	1.10948
U-232	1.112E-07	1.845E-07	-16.67262	1.14978
U-233	4.446E-01	6.996E-01	-1.43376	1.11631
U-234	4.778E-01	5.095E-01	-1.11816	0.87140
U-236	1.104E-03	1.130E-03	-7.16724	0.84660
U-233D	3.563E-03	7.732E-03	-6.50829	1.31991
C-14N	1.000E-50	0	-115.12925	0
Am-241B	1.000E-50	0	-115.12925	0
C-14B	1.000E-50	0	-115.12925	0
Cs-137B	1.000E-50	0	-115.12925	0
H-3B	1.000E-50	0	-115.12925	0
I-129B	1.000E-50	0	-115.12925	0
Ni-59B	1.000E-50	0	-115.12925	0
Sr-90B	1.000E-50	0	-115.12925	0
Tc-99B	1.000E-50	0	-115.12925	0
U-233B	1.000E-50	0	-115.12925	0

Notes: Refer to Table H-8 for legend that defines the highlighting colors for shaded radionuclides.

[a] Values shaded in green represent radionuclides with zero projected inventory at closure. However, “Closed and Open STs Only” average inventories from Table 9-2 are used instead in the uncertainty quantification analysis to allow for potential future burial of these radionuclides.

Table I-4. Distribution Parameters for Estimated Closure Inventories for ST09 and ST10

Radionuclide	ST09				ST10			
	Normal		Log-normal		Normal		Log-normal	
	Average (Ci) [a]	Std Dev (Ci) [b]	Average (-)	Std Dev (-)	Average (Ci)	Std Dev (Ci)	Average (-)	Std Dev (-)
Ag-108m	3.744E-05	1.230E-04	-11.42673	1.57101	3.744E-05	1.230E-04	-11.42673	1.57101
Am-241	9.905E-01	1.038E+00	-0.37990	0.86061	9.905E-01	1.038E+00	-0.37990	0.86061
Am-242m	1.419E-02	3.067E-02	-5.12330	1.31748	1.419E-02	3.067E-02	-5.12330	1.31748
Am-243	4.389E-04	1.272E-03	-8.85156	1.49688	4.389E-04	1.272E-03	-8.85156	1.49688
Be-10	1.179E-07	4.080E-07	-17.23474	1.60086	1.179E-07	4.080E-07	-17.23474	1.60086
C-14	1.617E-02	9.983E-03	-4.28601	0.56825	1.617E-02	9.983E-03	-4.28601	0.56825
Cf-249	2.592E-04	6.142E-04	-9.20278	1.37461	2.592E-04	6.142E-04	-9.20278	1.37461
Cf-251	7.862E-05	1.861E-04	-10.39459	1.37379	7.862E-05	1.861E-04	-10.39459	1.37379
Cl-36	2.051E-06	5.600E-06	-14.16503	1.46124	2.051E-06	5.600E-06	-14.16503	1.46124
Cm-245	2.462E-05	4.893E-05	-11.41125	1.26450	2.462E-05	4.893E-05	-11.41125	1.26450
Cm-247	4.827E-06	9.931E-06	-13.06863	1.28641	4.827E-06	9.931E-06	-13.06863	1.28641
Cm-248	1.056E-05	2.984E-05	-12.55687	1.48200	1.056E-05	2.984E-05	-12.55687	1.48200
Cs-135	5.258E-08	1.360E-07	-17.78066	1.42810	5.258E-08	1.360E-07	-17.78066	1.42810
Cs-137	3.917E+01	3.356E+01	3.39276	0.74185	3.917E+01	3.356E+01	3.39276	0.74185
H-3	1.555E-01	2.260E-01	-2.42886	1.06556	1.555E-01	2.260E-01	-2.42886	1.06556
I-129	2.044E-05	2.549E-05	-11.26720	0.96865	2.044E-05	2.549E-05	-11.26720	0.96865
K-40	1.414E-05	4.092E-05	-12.28551	1.49602	1.414E-05	4.092E-05	-12.28551	1.49602
Nb-94	3.407E-04	2.679E-04	-8.22514	0.69386	3.407E-04	2.679E-04	-8.22514	0.69386
Ni-59	1.866E-02	1.697E-02	-4.28249	0.77636	1.866E-02	1.697E-02	-4.28249	0.77636
Ni-63	3.403E-01	3.407E-01	-1.42493	0.83315	3.403E-01	3.407E-01	-1.42493	0.83315
Np-237	6.488E-03	6.192E-03	-5.36157	0.80467	6.488E-03	6.192E-03	-5.36157	0.80467
Pa-231	7.045E-06	1.418E-05	-12.67322	1.27279	7.045E-06	1.418E-05	-12.67322	1.27279
Pd-107	2.373E-08	5.121E-08	-18.42296	1.31637	2.373E-08	5.121E-08	-18.42296	1.31637
Pu-239	2.572E+00	2.337E+00	0.64371	0.77589	2.572E+00	2.337E+00	0.64371	0.77589
Pu-240	5.911E-01	5.112E-01	-0.80493	0.74729	5.911E-01	5.112E-01	-0.80493	0.74729
Pu-241	1.554E+01	1.245E+01	2.49516	0.70429	1.554E+01	1.245E+01	2.49516	0.70429
Ra-226	5.928E-05	1.170E-04	-10.52756	1.26043	5.928E-05	1.170E-04	-10.52756	1.26043
Rb-87	9.699E-12	3.360E-11	-26.64148	1.60154	9.699E-12	3.360E-11	-26.64148	1.60154
Sn-126	1.835E-09	5.319E-09	-21.23629	1.49686	1.835E-09	5.319E-09	-21.23629	1.49686
Sr-90	1.256E+01	1.479E+01	2.09618	0.93245	1.256E+01	1.479E+01	2.09618	0.93245
Tc-99	2.340E-02	1.893E-02	-4.00676	0.70951	2.340E-02	1.893E-02	-4.00676	0.70951
Th-229	1.659E-04	3.430E-04	-9.53585	1.28960	1.659E-04	3.430E-04	-9.53585	1.28960
Th-230	1.815E-04	3.148E-04	-9.30812	1.17816	1.815E-04	3.148E-04	-9.30812	1.17816
Th-231	2.444E-03	3.805E-03	-6.62977	1.10948	2.444E-03	3.805E-03	-6.62977	1.10948
U-232	8.113E-04	1.346E-03	-7.77791	1.14978	8.113E-04	1.346E-03	-7.77791	1.14978
U-233	2.211E-01	3.480E-01	-2.13226	1.11631	2.211E-01	3.480E-01	-2.13226	1.11631
U-234	1.983E-01	2.114E-01	-1.99769	0.87140	1.983E-01	2.114E-01	-1.99769	0.87140
U-236	2.212E-03	2.264E-03	-6.47226	0.84660	2.212E-03	2.264E-03	-6.47226	0.84660
U-233D	1.154E-13	2.505E-13	-30.66112	1.31991	1.154E-13	2.505E-13	-30.66112	1.31991
C-14N	2.116E-02	2.418E-02	-4.27331	0.91407	2.116E-02	2.418E-02	-4.27331	0.91407
Am-241B	1.078E-02	1.129E-02	-4.90026	0.86061	1.078E-02	1.129E-02	-4.90026	0.86061
C-14B	9.703E-05	5.990E-05	-9.40196	0.56825	9.703E-05	5.990E-05	-9.40196	0.56825
Cs-137B	1.462E+01	1.252E+01	2.40698	0.74185	1.462E+01	1.252E+01	2.40698	0.74185
H-3B	5.862E-02	8.520E-02	-3.40435	1.06556	5.862E-02	8.520E-02	-3.40435	1.06556
I-129B	3.227E-06	4.025E-06	-13.11296	0.96865	3.227E-06	4.025E-06	-13.11296	0.96865
Ni-59B	1.000E-50	0	-115.12925	0	1.000E-50	0	-115.12925	0
Np-237B	2.021E-06	1.928E-06	-13.43588	0.80467	2.021E-06	1.928E-06	-13.43588	0.80467
Pu-239B	2.230E-02	2.027E-02	-4.10395	0.77589	2.230E-02	2.027E-02	-4.10395	0.77589
Pu-240B	5.617E-03	4.858E-03	-5.46116	0.74729	5.617E-03	4.858E-03	-5.46116	0.74729

Radionuclide	ST09				ST10			
	Normal		Log-normal		Normal		Log-normal	
	Average (Ci) [a]	Std Dev (Ci) [b]	Average (-)	Std Dev (-)	Average (Ci)	Std Dev (Ci)	Average (-)	Std Dev (-)
Pu-241B	1.322E-01	1.059E-01	-2.27148	0.70429	1.322E-01	1.059E-01	-2.27148	0.70429
Sr-90B	7.189E-02	8.462E-02	-3.06738	0.93245	7.189E-02	8.462E-02	-3.06738	0.93245
Tc-99B	2.706E-03	2.189E-03	-6.16411	0.70951	2.706E-03	2.189E-03	-6.16411	0.70951
U-233B	7.604E-05	1.197E-04	-10.10733	1.11631	7.604E-05	1.197E-04	-10.10733	1.11631
U-233E	3.563E-03	7.732E-03	-6.50829	1.31991	3.563E-03	7.732E-03	-6.50829	1.31991
U-234B	2.759E-05	2.942E-05	-10.87771	0.87140	2.759E-05	2.942E-05	-10.87771	0.87140
C-14X	1.000E-50	0	-115.12925	0	--	--	--	--
H-3X	1.000E-50	0	-115.12925	0	--	--	--	--

Notes:

Refer to Table H-8 for legend that defines the highlighting colors for shaded radionuclides.

[a] Values shaded in green represent radionuclides with zero projected inventory at closure; however, "Closed and Open STs Only" average inventories from Table 9-2 are used instead in the uncertainty quantification analysis to allow for potential future burial of these radionuclides. Value shaded in lavender for U-233E represents a radionuclide with zero projected inventory at closure; however, in this case, the "Closed and Open STs Only" average inventory for U-233D from Table 9-2 is used instead in the uncertainty quantification analysis to allow for potential future burial of U-233E.

[b] Std Dev values shaded in aqua are calculated using "Closed and Open STs & ETs Combined" Std Dev/Avg ratios from Table 9-2 for the corresponding generic waste form parent radionuclides. U-233E uses the Std Dev value for U-233D.

Table I-4 includes distribution parameters for future ST10, which is projected to have a closure inventory close to ST09's. In fact, its projected final inventory is identical to ST09's except for the absence of the contaminated production reactor heat exchangers unique to ST10. Consequently, statistical parameters for ST10 are identical to ST09's except that C-14X and H-3X are excluded.

ST11, ST17-22, and ST24 are future DUs with no current inventory. All are projected to contain generic waste and the depleted uranium SWF at closure. Except for ST24, all are projected to contain NR coolant pumps as well. For the uncertainty quantification analysis, their inventories are assumed to equal "Closed and Open STs Only" average inventories from Table 9-2 as shown in Table I-5. Note that the ratio of standard deviation to arithmetic average for "Closed and Open STs & ETs Combined" is used to scale their standard deviations.

Table I-6 displays the statistical parameters for currently open ST14. SWFs U-233D and C-14N are highlighted in blue[1] because future disposals are anticipated. The HWCTR SWF radionuclides (Ag-108mH, C-14H, Nb-94H, Ni-59H, Ni-63H, and Tc-99H) represent a unique waste form already emplaced in ST14 with no possible future additions. Consequently, they are shaded in yellow[1] and are each assigned an infinitesimally small, nonzero inventory of 1.0E-50 Ci with zero standard deviation for stochastic modeling. Except for Ag-108m, closure inventories of all other radionuclides are projected using the current inventory. The zero projected inventory for Ag-108m is replaced with the "Closed and Open STs Only" average value from Table 9-2 for the uncertainty quantification analysis.

Table I-5. Distribution Parameters for Estimated Closure Inventories for ST11, ST17-22, and ST24

Radionuclide	ST11, ST17-22				ST24			
	Normal		Log-Normal		Normal		Log-Normal	
	Average (Ci) [a]	Std Dev (Ci)	Average (-)	Std Dev (-)	Average (Ci) [a]	Std Dev (Ci)	Average (-)	Std Dev (-)
Ag-108m	3.744E-05	1.230E-04	-11.42673	1.57101	3.744E-05	1.230E-04	-11.42673	1.57101
Am-241	9.885E-01	1.036E+00	-0.38187	0.86061	9.885E-01	1.036E+00	-0.38187	0.86061
Am-242m	3.379E-01	7.306E-01	-1.95276	1.31748	3.379E-01	7.306E-01	-1.95276	1.31748
Am-243	1.135E-01	3.290E-01	-3.29623	1.49688	1.135E-01	3.290E-01	-3.29623	1.49688
Be-10	1.179E-07	4.080E-07	-17.23474	1.60086	1.179E-07	4.080E-07	-17.23474	1.60086
C-14	3.685E-02	2.275E-02	-3.46246	0.56825	3.685E-02	2.275E-02	-3.46246	0.56825
Cf-249	7.868E-02	1.865E-01	-3.48710	1.37461	7.868E-02	1.865E-01	-3.48710	1.37461
Cf-251	7.161E-02	1.695E-01	-3.58019	1.37379	7.161E-02	1.695E-01	-3.58019	1.37379
Cl-36	1.730E-06	4.726E-06	-14.33474	1.46124	1.730E-06	4.726E-06	-14.33474	1.46124
Cm-245	1.281E-03	2.545E-03	-7.45957	1.26450	1.281E-03	2.545E-03	-7.45957	1.26450
Cm-247	1.744E-03	3.588E-03	-7.17910	1.28641	1.744E-03	3.588E-03	-7.17910	1.28641
Cm-248	3.301E-04	9.331E-04	-9.11440	1.48200	3.301E-04	9.331E-04	-9.11440	1.48200
Cs-135	5.258E-08	1.360E-07	-17.78066	1.42810	5.258E-08	1.360E-07	-17.78066	1.42810
Cs-137	5.841E+01	5.004E+01	3.79233	0.74185	5.841E+01	5.004E+01	3.79233	0.74185
H-3	1.502E+00	2.184E+00	-0.16062	1.06556	1.502E+00	2.184E+00	-0.16062	1.06556
I-129	9.935E-05	1.239E-04	-9.68604	0.96865	9.935E-05	1.239E-04	-9.68604	0.96865
K-40	4.443E-04	1.286E-03	-8.83794	1.49602	4.443E-04	1.286E-03	-8.83794	1.49602
Nb-94	8.238E-04	6.478E-04	-7.34235	0.69386	8.238E-04	6.478E-04	-7.34235	0.69386
Ni-59	6.192E-02	5.631E-02	-3.08332	0.77636	6.192E-02	5.631E-02	-3.08332	0.77636
Ni-63	1.665E+00	1.666E+00	0.16260	0.83315	1.665E+00	1.666E+00	0.16260	0.83315
Np-237	8.468E-03	8.082E-03	-5.09518	0.80467	8.468E-03	8.082E-03	-5.09518	0.80467
Pa-231	7.047E-07	1.419E-06	-14.97550	1.27279	7.047E-07	1.419E-06	-14.97550	1.27279
Pd-107	2.373E-08	5.121E-08	-18.42296	1.31637	2.373E-08	5.121E-08	-18.42296	1.31637
Pu-239	2.154E+00	1.957E+00	0.46627	0.77589	2.154E+00	1.957E+00	0.46627	0.77589
Pu-240	5.586E-01	4.831E-01	-0.86148	0.74729	5.586E-01	4.831E-01	-0.86148	0.74729
Pu-241	1.212E+01	9.711E+00	2.24670	0.70429	1.212E+01	9.711E+00	2.24670	0.70429
Ra-226	4.116E-04	8.125E-04	-8.58982	1.26043	4.116E-04	8.125E-04	-8.58982	1.26043
Rb-87	9.699E-12	3.360E-11	-26.64148	1.60154	9.699E-12	3.360E-11	-26.64148	1.60154
Sn-126	7.957E-04	2.306E-03	-8.25663	1.49686	7.957E-04	2.306E-03	-8.25663	1.49686
Sr-90	3.542E+01	4.169E+01	3.13243	0.93245	3.542E+01	4.169E+01	3.13243	0.93245
Tc-99	3.797E-02	3.072E-02	-3.52258	0.70951	3.797E-02	3.072E-02	-3.52258	0.70951
Th-229	1.047E-03	2.165E-03	-7.69317	1.28960	1.047E-03	2.165E-03	-7.69317	1.28960
Th-230	3.045E-04	5.280E-04	-8.79100	1.17816	3.045E-04	5.280E-04	-8.79100	1.17816
Th-231	3.771E-02	5.872E-02	-3.89324	1.10948	3.771E-02	5.872E-02	-3.89324	1.10948
U-232	9.447E-03	1.567E-02	-5.32306	1.14978	9.447E-03	1.567E-02	-5.32306	1.14978
U-233	6.535E-01	1.028E+00	-1.04853	1.11631	6.535E-01	1.028E+00	-1.04853	1.11631
U-234	1.115E+00	1.189E+00	-0.27074	0.87140	1.115E+00	1.189E+00	-0.27074	0.87140
U-236	1.750E-02	1.791E-02	-4.40395	0.84660	1.750E-02	1.791E-02	-4.40395	0.84660
U-233D	3.563E-03	7.732E-03	-6.50829	1.31991	3.563E-03	7.732E-03	-6.50829	1.31991
C-14N	2.116E-02	2.418E-02	-4.27331	0.91407	--	--	--	--

Notes:

Refer to Table H-8 for legend that defines the highlighting colors for shaded radionuclides.

[a] Values shaded in green represent radionuclides with zero projected inventory at closure. However, "Closed and Open STs Only" average inventories from Table 9-2 are used instead in the uncertainty quantification analysis to allow for potential future burial of these radionuclides.

Table I-6. Distribution Parameters for Estimated Closure Inventories for ST14

Radionuclide	ST14			
	Normal		Log-Normal	
	Average (Ci) [a]	Std Dev (Ci)	Average (-)	Std Dev (-)
Ag-108m	3.744E-05	1.230E-04	-11.42673	1.57101
Am-241	4.423E-01	4.634E-01	-1.18601	0.86061
Am-242m	2.747E-03	5.939E-03	-6.76500	1.31748
Am-243	4.293E-03	1.244E-02	-6.57113	1.49688
Be-10	1.179E-06	4.078E-06	-14.93256	1.60086
C-14	6.000E-02	3.704E-02	-2.97488	0.56825
Cf-249	3.629E-05	8.601E-05	-11.16867	1.37461
Cf-251	1.208E-04	2.860E-04	-9.96468	1.37379
Cl-36	3.411E-07	9.317E-07	-15.95855	1.46124
Cm-245	1.037E-05	2.060E-05	-12.27610	1.26450
Cm-247	5.576E-07	1.147E-06	-15.22700	1.28641
Cm-248	3.267E-15	9.236E-15	-34.45308	1.48200
Cs-135	6.136E-08	1.587E-07	-17.62631	1.42810
Cs-137	1.080E+02	9.251E+01	4.40685	0.74185
H-3	2.562E-01	3.723E-01	-1.92962	1.06556
I-129	1.927E-05	2.404E-05	-11.32591	0.96865
K-40	3.694E-06	1.069E-05	-13.62796	1.49602
Nb-94	1.384E-03	1.088E-03	-6.82350	0.69386
Ni-59	3.488E-02	3.173E-02	-3.65708	0.77636
Ni-63	2.063E+00	2.065E+00	0.37727	0.83315
Np-237	5.659E-03	5.401E-03	-5.49820	0.80467
Pa-231	2.956E-10	5.952E-10	-22.75192	1.27279
Pd-107	1.707E-08	3.683E-08	-18.75256	1.31637
Pu-239	5.263E-01	4.783E-01	-0.94284	0.77589
Pu-240	1.538E-01	1.330E-01	-2.15150	0.74729
Pu-241	4.417E+00	3.540E+00	1.23743	0.70429
Ra-226	8.407E-05	1.660E-04	-10.17818	1.26043
Rb-87	1.305E-11	4.520E-11	-26.34492	1.60154
Sn-126	3.483E-04	1.009E-03	-9.08267	1.49686
Sr-90	4.080E+01	4.803E+01	3.27406	0.93245
Tc-99	2.553E-02	2.065E-02	-3.91975	0.70951
Th-229	1.209E-04	2.500E-04	-9.85223	1.28960
Th-230	2.379E-04	4.126E-04	-9.03754	1.17816
Th-231	4.039E-03	6.289E-03	-6.12716	1.10948
U-232	5.601E-04	9.290E-04	-8.14838	1.14978
U-233	4.891E-02	7.697E-02	-3.64091	1.11631
U-234	2.993E-01	3.192E-01	-1.58590	0.87140
U-236	4.983E-04	5.101E-04	-7.96262	0.84660
U-233D	5.841E-06	1.268E-05	-12.92161	1.31991
C-14N	2.110E-02	2.411E-02	-4.27624	0.91407
Ag-108mH	1.000E-50	0	-115.12925	0
C-14H	1.000E-50	0	-115.12925	0
Nb-94H	1.000E-50	0	-115.12925	0
Ni-59H	1.000E-50	0	-115.12925	0
Ni-63H	1.000E-50	0	-115.12925	0
Tc-99H	1.000E-50	0	-115.12925	0

Notes: Refer to Table H-8 for legend that defines the highlighting colors for shaded radionuclides.

[a] Values shaded in green represent radionuclides with zero projected inventory at closure. However, "Closed and Open STs Only" average inventories from Table 9-2 are used instead in the uncertainty quantification analysis to allow for potential future burial of these radionuclides.

Distribution parameters for the only remaining slit trench, ST23, are listed in Table I-7. Although currently open, it does not yet contain generic waste. Radionuclides from two SWFs comprise its current inventory: CIG (indicated with the suffix A) and K- and L-Basin Resin waste (indicated with the suffix K). There will be no future additions of these SWFs, so their future inventories have zero uncertainty. Consequently, they are shaded yellow[1] and have been assigned an infinitesimally small, nonzero inventory of 1.0E-50 Ci with zero standard deviation for stochastic modeling. Future emplacement of generic waste and the depleted uranium SWF are planned. "Closed and Open STs Only" average values from Table 9-2 are used for the projected inventory of these radionuclides as indicated by the green shading.[1]

Table I-7. Distribution Parameters for Estimated Closure Inventories for ST23

Radionuclide	ST23			
	Normal		Log-Normal	
	Average (Ci) [a]	Std Dev (Ci)	Average (-)	Std Dev (-)
Ag-108m	3.744E-05	1.230E-04	-11.42673	1.57101
Am-241	9.885E-01	1.036E+00	-0.38187	0.86061
Am-242m	3.379E-01	7.306E-01	-1.95276	1.31748
Am-243	1.135E-01	3.290E-01	-3.29623	1.49688
Be-10	1.179E-07	4.080E-07	-17.23474	1.60086
C-14	3.685E-02	2.275E-02	-3.46246	0.56825
Cf-249	7.868E-02	1.865E-01	-3.48710	1.37461
Cf-251	7.161E-02	1.695E-01	-3.58019	1.37379
Cl-36	1.730E-06	4.726E-06	-14.33474	1.46124
Cm-245	1.281E-03	2.545E-03	-7.45957	1.26450
Cm-247	1.744E-03	3.588E-03	-7.17910	1.28641
Cm-248	3.301E-04	9.331E-04	-9.11440	1.48200
Cs-135	5.258E-08	1.360E-07	-17.78066	1.42810
Cs-137	5.841E+01	5.004E+01	3.79233	0.74185
H-3	1.502E+00	2.184E+00	-0.16062	1.06556
I-129	9.935E-05	1.239E-04	-9.68604	0.96865
K-40	4.443E-04	1.286E-03	-8.83794	1.49602
Nb-94	8.238E-04	6.478E-04	-7.34235	0.69386
Ni-59	6.192E-02	5.631E-02	-3.08332	0.77636
Ni-63	1.665E+00	1.666E+00	0.16260	0.83315
Np-237	8.468E-03	8.082E-03	-5.09518	0.80467
Pa-231	7.047E-07	1.419E-06	-14.97550	1.27279
Pd-107	2.373E-08	5.121E-08	-18.42296	1.31637
Pu-239	2.154E+00	1.957E+00	0.46627	0.77589
Pu-240	5.586E-01	4.831E-01	-0.86148	0.74729
Pu-241	1.212E+01	9.711E+00	2.24670	0.70429
Ra-226	4.116E-04	8.125E-04	-8.58982	1.26043
Rb-87	9.699E-12	3.360E-11	-26.64148	1.60154
Sn-126	7.957E-04	2.306E-03	-8.25663	1.49686
Sr-90	3.542E+01	4.169E+01	3.13243	0.93245
Tc-99	3.797E-02	3.072E-02	-3.52258	0.70951
Th-229	1.047E-03	2.165E-03	-7.69317	1.28960
Th-230	3.045E-04	5.280E-04	-8.79100	1.17816
Th-231	3.771E-02	5.872E-02	-3.89324	1.10948
U-232	9.447E-03	1.567E-02	-5.32306	1.14978
U-233	6.535E-01	1.028E+00	-1.04853	1.11631
U-234	1.115E+00	1.189E+00	-0.27074	0.87140

Radionuclide	ST23			
	Normal		Log-Normal	
	Average (Ci) [a]	Std Dev (Ci)	Average (-)	Std Dev (-)
U-236	1.750E-02	1.791E-02	-4.40395	0.84660
U-233D	3.563E-03	7.732E-03	-6.50829	1.31991
C-14K	1.000E-50	0	-115.12925	0
I-129K	1.000E-50	0	-115.12925	0
Tc-99K	1.000E-50	0	-115.12925	0
Am-241A	1.000E-50	0	-115.12925	0
Am-242mA	1.000E-50	0	-115.12925	0
Am-243A	1.000E-50	0	-115.12925	0
C-14A	1.000E-50	0	-115.12925	0
Cf-249A	1.000E-50	0	-115.12925	0
Cf-251A	1.000E-50	0	-115.12925	0
Cm-245A	1.000E-50	0	-115.12925	0
Cm-247A	1.000E-50	0	-115.12925	0
Cm-248A	1.000E-50	0	-115.12925	0
Cs-135A	1.000E-50	0	-115.12925	0
Cs-137A	1.000E-50	0	-115.12925	0
H-3A	1.000E-50	0	-115.12925	0
I-129A	1.000E-50	0	-115.12925	0
K-40A	1.000E-50	0	-115.12925	0
Nb-94A	1.000E-50	0	-115.12925	0
Ni-59A	1.000E-50	0	-115.12925	0
Ni-63A	1.000E-50	0	-115.12925	0
Np-237A	1.000E-50	0	-115.12925	0
Pd-107A	1.000E-50	0	-115.12925	0
Pu-239A	1.000E-50	0	-115.12925	0
Pu-240A	1.000E-50	0	-115.12925	0
Pu-241A	1.000E-50	0	-115.12925	0
Ra-226A	1.000E-50	0	-115.12925	0
Rb-87A	1.000E-50	0	-115.12925	0
Sn-126A	1.000E-50	0	-115.12925	0
Sr-90A	1.000E-50	0	-115.12925	0
Tc-99A	1.000E-50	0	-115.12925	0
Th-231A	1.000E-50	0	-115.12925	0
U-232A	1.000E-50	0	-115.12925	0
U-233A	1.000E-50	0	-115.12925	0
U-233E	1.000E-50	0	-115.12925	0
U-234A	1.000E-50	0	-115.12925	0
U-236A	1.000E-50	0	-115.12925	0

Notes:

Refer to Table H-8 for legend that defines the highlighting colors for shaded radionuclides.

[a] Values shaded in green represent radionuclides with zero projected inventory at closure. However, "Closed and Open STs Only" average inventories from Table 9-2 are used instead in the uncertainty quantification analysis to allow for potential future burial of these radionuclides.

Table I-8 lists the statistical parameters for ET02 and ET03. The depleted uranium SWF (U-233D) is highlighted in blue.[1] Three of the parent radionuclides listed (Be-10, Pd-107, and Rb-87) are not found in the current inventory for ET02 and so have zero projected inventory at closure. However, the "Closed and Open ETs Only" average inventories in Table 9-2 are employed for Be-10, Pd-107, and Rb-87 in the uncertainty quantification analysis to allow for potential future burial of these three radionuclides.

Table I-8. Distribution Parameters for Estimated Closure Inventories for ET02 and ET03

Radionuclide	ET02				ET03			
	Normal		Log-Normal		Normal		Log-Normal	
	Average (Ci) [a]	Std Dev (Ci)	Average (-)	Std Dev (-)	Average (Ci)	Std Dev (Ci)	Average (-)	Std Dev (-)
Ag-108m	4.175E-08	1.372E-07	-18.22548	1.57101	1.889E-05	6.207E-05	-12.11100	1.57101
Am-241	2.037E+00	2.133E+00	0.34099	0.86061	1.217E+00	1.274E+00	-0.17429	0.86061
Am-242m	2.588E-01	5.595E-01	-2.21961	1.31748	2.156E-01	4.661E-01	-2.40214	1.31748
Am-243	3.639E-02	1.055E-01	-4.43391	1.49688	1.094E-02	3.169E-02	-5.63609	1.49688
Be-10	2.722E-10	9.417E-10	-23.30597	1.60086	8.165E-10	2.825E-09	-22.20735	1.60086
C-14	4.872E-02	3.008E-02	-3.18308	0.56825	7.056E-02	4.356E-02	-2.81269	0.56825
Cf-249	5.463E-02	1.295E-01	-3.85196	1.37461	1.320E-05	3.128E-05	-12.18014	1.37461
Cf-251	4.971E-02	1.177E-01	-3.94514	1.37379	2.410E-05	5.704E-05	-11.57697	1.37379
Cl-36	1.513E-08	4.131E-08	-19.07444	1.46124	5.666E-07	1.548E-06	-15.45113	1.46124
Cm-245	1.184E-03	2.352E-03	-7.53855	1.26450	1.193E-05	2.371E-05	-12.13554	1.26450
Cm-247	5.380E-04	1.107E-03	-8.35505	1.28641	4.877E-06	1.003E-05	-13.05842	1.28641
Cm-248	4.754E-07	1.344E-06	-15.65728	1.48200	1.075E-07	3.039E-07	-17.14405	1.48200
Cs-135	1.381E-12	3.571E-12	-28.32786	1.42810	1.349E-10	3.489E-10	-23.74610	1.42810
Cs-137	7.852E+01	6.727E+01	4.08823	0.74185	2.208E+02	1.891E+02	5.12191	0.74185
H-3	5.883E-01	8.550E-01	-1.09828	1.06556	1.045E+00	1.519E+00	-0.52335	1.06556
I-129	8.536E-05	1.065E-04	-9.83772	0.96865	1.497E-04	1.867E-04	-9.27630	0.96865
K-40	5.482E-05	1.586E-04	-10.93053	1.49602	2.412E-04	6.981E-04	-9.44877	1.49602
Nb-94	1.668E-03	1.311E-03	-6.63711	0.69386	1.070E-03	8.411E-04	-7.08125	0.69386
Ni-59	7.728E-02	7.028E-02	-2.86174	0.77636	5.201E-02	4.730E-02	-3.25768	0.77636
Ni-63	1.254E+00	1.256E+00	-0.12043	0.83315	4.422E+00	4.426E+00	1.13953	0.83315
Np-237	4.085E-02	3.898E-02	-3.52169	0.80467	2.694E-02	2.571E-02	-3.93796	0.80467
Pa-231	9.202E-06	1.853E-05	-12.40604	1.27279	2.921E-06	5.880E-06	-13.55370	1.27279
Pd-107	5.487E-14	1.184E-13	-31.40030	1.31637	1.646E-13	3.552E-13	-30.30169	1.31637
Pu-239	8.241E+00	7.489E+00	1.80817	0.77589	3.583E+00	3.256E+00	0.97508	0.77589
Pu-240	1.867E+00	1.614E+00	0.34501	0.74729	1.188E+00	1.028E+00	-0.10668	0.74729
Pu-241	2.952E+01	2.365E+01	3.13692	0.70429	1.422E+01	1.140E+01	2.40669	0.70429
Ra-226	1.069E-04	2.110E-04	-9.93827	1.26043	1.587E-04	3.134E-04	-9.54258	1.26043
Rb-87	1.007E-05	3.490E-05	-12.78805	1.60154	3.022E-05	1.047E-04	-11.68944	1.60154
Sn-126	4.097E-04	1.187E-03	-8.92031	1.49686	8.920E-09	2.585E-08	-19.65528	1.49686
Sr-90	1.372E+02	1.615E+02	4.48661	0.93245	5.935E+01	6.987E+01	3.64876	0.93245
Tc-99	9.416E-02	7.617E-02	-2.61445	0.70951	6.543E-02	5.292E-02	-2.97853	0.70951
Th-229	2.202E-02	4.552E-02	-4.64752	1.28960	2.614E-06	5.406E-06	-13.68606	1.28960
Th-230	4.627E-03	8.024E-03	-6.06983	1.17816	6.805E-04	1.180E-03	-7.98669	1.17816
Th-231	6.088E-03	9.480E-03	-5.71684	1.10948	9.805E-04	1.527E-03	-7.54295	1.10948
U-232	1.006E-01	1.668E-01	-2.95799	1.14978	5.681E-05	9.422E-05	-10.43678	1.14978
U-233	7.870E+00	1.239E+01	1.43994	1.11631	9.186E-01	1.446E+00	-0.70795	1.11631
U-234	6.714E-01	7.159E-01	-0.77800	0.87140	1.390E+00	1.482E+00	-0.05030	0.87140
U-236	2.265E-02	2.318E-02	-4.14612	0.84660	7.516E-05	7.693E-05	-9.85427	0.84660
U-233D	3.653E-06	7.928E-06	-13.39098	1.31991	1.251E-09	2.715E-09	-21.37038	1.31991

Notes:

Refer to Table H-8 for legend that defines the highlighting colors for shaded radionuclides.

[a] Values shaded in green represent radionuclides with zero projected inventory at closure. However, "Closed and Open ETs Only" average inventories from Table 9-2 are used instead in the uncertainty quantification analysis to allow for potential future burial of these radionuclides.

Trenches ET04 through ET09 are future DUs with no current inventory. For the uncertainty quantification analysis, their inventories are assumed to be equal to the "Closed and Open ETs Only" average inventories in Table 9-2 as shown in Table I-9. Note that the ratio of standard

deviation to arithmetic average for "Closed and Open STs & ETs Combined" is still used to scale standard deviations here and elsewhere.

Table I-9. Distribution Parameters for Estimated Closure Inventories for ET04 through ET09

Radionuclide	ET04 through ET09			
	Normal		Log-Normal	
	Average (Ci) [a]	Std Dev (Ci)	Average (-)	Std Dev (-)
Ag-108m	6.360E-06	2.090E-05	-13.19946	1.57101
Am-241	1.303E+00	1.365E+00	-0.10563	0.86061
Am-242m	1.599E-01	3.457E-01	-2.70104	1.31748
Am-243	1.644E-02	4.765E-02	-5.22835	1.49688
Be-10	2.722E-10	9.417E-10	-23.30597	1.60086
C-14	8.341E-02	5.149E-02	-2.64550	0.56825
Cf-249	1.822E-02	4.317E-02	-4.95018	1.37461
Cf-251	1.660E-02	3.928E-02	-5.04212	1.37379
Cl-36	2.353E-05	6.427E-05	-11.72474	1.46124
Cm-245	4.961E-04	9.857E-04	-8.40818	1.26450
Cm-247	1.810E-04	3.723E-04	-9.44464	1.28641
Cm-248	1.943E-07	5.493E-07	-16.55205	1.48200
Cs-135	4.985E-11	1.289E-10	-24.74174	1.42810
Cs-137	1.175E+02	1.007E+02	4.49134	0.74185
H-3	1.280E+00	1.860E+00	-0.32089	1.06556
I-129	1.023E-04	1.276E-04	-9.65639	0.96865
K-40	1.445E-04	4.181E-04	-9.96153	1.49602
Nb-94	1.987E-03	1.563E-03	-6.46165	0.69386
Ni-59	8.216E-02	7.472E-02	-2.80043	0.77636
Ni-63	4.374E+00	4.379E+00	1.12868	0.83315
Np-237	2.516E-02	2.401E-02	-4.00631	0.80467
Pa-231	4.041E-06	8.136E-06	-13.22901	1.27279
Pd-107	5.487E-14	1.184E-13	-31.40030	1.31637
Pu-239	4.423E+00	4.020E+00	1.18589	0.77589
Pu-240	1.147E+00	9.916E-01	-0.14248	0.74729
Pu-241	1.756E+01	1.407E+01	2.61781	0.70429
Ra-226	1.427E-03	2.818E-03	-7.34629	1.26043
Rb-87	1.007E-05	3.490E-05	-12.78805	1.60154
Sn-126	1.579E-04	4.576E-04	-9.87396	1.49686
Sr-90	7.392E+01	8.702E+01	3.86829	0.93245
Tc-99	6.629E-02	5.363E-02	-2.96535	0.70951
Th-229	9.145E-03	1.891E-02	-5.52608	1.28960
Th-230	4.020E-03	6.970E-03	-6.21061	1.17816
Th-231	4.491E-03	6.992E-03	-6.02121	1.10948
U-232	4.279E-02	7.097E-02	-3.81241	1.14978
U-233	3.622E+00	5.700E+00	0.66392	1.11631
U-234	8.315E-01	8.866E-01	-0.56421	0.87140
U-236	1.628E-02	1.666E-02	-4.47617	0.84660
U-233D	1.643E-03	3.565E-03	-7.28240	1.31991

Notes:

Refer to Table H-8 for legend that defines the highlighting colors for shaded radionuclides.

[a] Values shaded in green represent radionuclides with zero projected inventory at closure. However, "Closed and Open ETs Only" average inventories from Table 9-2 are used instead in the uncertainty quantification analysis to allow for potential future burial of these radionuclides.

I.1.1.2. Distribution Parameters for Low-Activity Waste and Intermediate-Level Vaults

As noted in Section 9.1.2.2, the LAWV and ILV have waste compositions that differ so much from those of the other DUs that comparison will not provide a meaningful basis for estimating uncertainty. Consequently, as can be seen in Table I-10, all standard deviations have been assigned values of zero for the stochastic analysis. Both the LAWV and ILV contain the SWF radionuclide U-235D (depleted uranium: U-235 isotope affects limits in LAWV and ILV; U-233 affects limits in STs and ETs), while the ILV also holds nine other SWF radionuclides: I-129C, C-14K, I-129K, Tc-99K, and five tritium-related SWFs. The H-3R SWF radionuclide represents IP2 Tritium Box waste, while Ar-39T, C-14T, Cs-137T, and H-3T are associated with spent TPBAR waste. Highlighting of SWF radionuclides in Table I-10 identifies whether future additions will occur (yes: green or blue; no: yellow or orange) and which disposal limits apply (generic waste form: green or orange; SWF-specific: blue or yellow). Refer to Table H-8 for a legend that defines the highlighting colors for shaded SWF radionuclides. Because no future additions of SWF radionuclides shaded in yellow or orange will occur, their inventories have been set to 1.0E-50 Ci for the stochastic analysis. Generic waste form radionuclides and U-235D are scaled proportionally from current inventories, while the TPBAR radionuclide inventories are calculated based on planned tritium production.

Table I-10. Distribution Parameters for Estimated Closure Inventories for LAWV and ILV

Radionuclide	LAWV				ILV			
	Normal		Log-Normal		Normal		Log-Normal	
	Average (Ci)	Std Dev (Ci)	Average (-)	Std Dev (-)	Average (Ci)	Std Dev (Ci)	Average (-)	Std Dev (-)
Ag-108m	8.958E-05	0	-9.32036	0	4.019E-05	0	-10.12189	0
Am-241	4.196E-01	0	-0.86845	0	6.778E-01	0	-0.38889	0
Ar-39	--	--	--	--	1.000E-50	0	-115.12925	0
C-14	1.954E-01	0	-1.63296	0	4.862E-01	0	-0.72116	0
Ca-41	2.069E-05	0	-10.78567	0	--	--	--	--
Cf-249	--	--	--	--	1.578E-03	0	-6.45166	0
Cl-36	1.970E-03	0	-6.22982	0	7.465E-05	0	-9.50270	0
Cm-245	2.318E-03	0	-6.06692	0	2.478E-03	0	-6.00046	0
Cs-137	8.428E+01	0	4.43418	0	3.714E+02	0	5.91728	0
H-3	4.272E+05	0	12.96503	0	1.375E+06	0	14.13418	0
I-129	1.775E-04	0	-8.63648	0	5.731E-04	0	-7.46443	0
K-40	5.650E-07	0	-14.38646	0	5.568E-03	0	-5.19067	0
Kr-85	--	--	--	--	2.034E+01	0	3.01254	0
Nb-94	1.522E-01	0	-1.88230	0	--	--	--	--
Ni-59	1.555E+00	0	0.44148	0	9.499E-01	0	-0.05138	0
Ni-63	2.659E+02	0	5.58320	0	1.160E+02	0	4.75376	0
Np-237	4.289E-02	0	-3.14914	0	1.539E-02	0	-4.17391	0
Pu-239	1.622E+00	0	0.48354	0	7.955E-01	0	-0.22885	0
Pu-241	1.095E+01	0	2.39370	0	4.306E+00	0	1.45989	0
Ra-226	3.950E-02	0	-3.23145	0	7.673E-01	0	-0.26486	0
Sr-90	2.429E+02	0	5.49257	0	1.113E+02	0	4.71259	0
Tc-99	1.244E-01	0	-2.08425	0	1.175E-01	0	-2.14123	0
U-235	5.080E-03	0	-5.28246	0	2.502E-03	0	-5.99062	0
U-235D	1.035E-02	0	-4.57067	0	7.705E-03	0	-4.86583	0
I-129C	--	--	--	--	1.000E-50	0	-115.12925	0
C-14K	--	--	--	--	1.000E-50	0	-115.12925	0
I-129K	--	--	--	--	1.000E-50	0	-115.12925	0
Tc-99K	--	--	--	--	1.000E-50	0	-115.12925	0
H-3R	--	--	--	--	1.000E-50	0	-115.12925	0
Ar-39T	--	--	--	--	2.787E+01	0	3.32755	0
C-14T	--	--	--	--	6.601E+00	0	1.88722	0
Cs-137T	--	--	--	--	8.830E+02	0	6.78333	0
H-3T	--	--	--	--	7.711E+05	0	13.55557	0

Notes:
Refer to Table H-8 for legend that defines the highlighting colors for shaded radionuclides.

I.1.1.3. Distribution Parameters for Naval Reactor Component Disposal Areas

Finally, the operating NRCDA, NR26E, has unique wastes that originate off-site, which makes comparison with the compositional vectors of other DUs irrelevant for assessing uncertainty. Like the LAWV and ILV, the standard deviations of all NRCDA radionuclide inventories have been set equal to zero as indicated in Table I-11. The vector of radionuclide inventories at closure is scaled up proportionately from the current inventories. The first 12 rows correspond to bolted, gasketed containers whose contents are treated as generic waste. The remaining radionuclides correspond to welded steel casks and are treated as SWFs. In keeping with the highlighting convention in

Table H-8, SWF radionuclides in NR26E are shaded blue to indicate that future additions are planned.

Table I-11. Distribution Parameters for Estimated Closure Inventories for NR26E

Radionuclide	NR26E			
	Normal		Log-Normal	
	Average (Ci)	Std Dev (Ci)	Average (-)	Std Dev (-)
Am-241	3.290E-05	0	-10.32204	0
C-14	9.408E-02	0	-2.36361	0
Cl-36	1.000E-50	0	-115.12925	0
H-3	1.000E-50	0	-115.12925	0
I-129	3.774E-07	0	-14.78996	0
Ni-59	2.821E-02	0	-3.56801	0
Ni-63	2.806E+00	0	1.03176	0
Np-237	2.821E-10	0	-21.98869	0
Pu-241	9.200E-04	0	-6.99114	0
Sr-90	3.730E-03	0	-5.59135	0
Tc-99	9.408E-05	0	-9.27137	0
U-235	1.000E-50	0	-115.12925	0
Am-241S	1.333E-01	0	-2.01538	0
Am-243S	2.776E-03	0	-5.88671	0
Be-10S	2.160E-05	0	-10.74282	0
C-14S	8.773E+01	0	4.47429	0
Cl-36S	1.270E-02	0	-4.36600	0
Co-60S	6.569E+04	0	11.09266	0
Cs-137S	7.132E+00	0	1.96461	0
H-3S	4.499E+01	0	3.80633	0
I-129S	1.118E-05	0	-11.40103	0
Mo-93S	6.200E-01	0	-0.47797	0
Nb-93mS	7.925E+01	0	4.37254	0
Nb-94S	5.414E+00	0	1.68893	0
Ni-59S	1.493E+03	0	7.30827	0
Ni-63S	1.737E+05	0	12.06503	0
Np-237S	3.202E-06	0	-12.65167	0
Pu-241S	1.609E+01	0	2.77820	0
Sn-121mS	1.711E+01	0	2.83966	0
Sn-126S	8.250E-05	0	-9.40276	0
Sr-90S	3.337E+00	0	1.20495	0
Tc-99S	1.672E-01	0	-1.78844	0
U-235S	7.330E-06	0	-11.82356	0
Zr-93S	1.194E+01	0	2.47989	0

Notes:

Refer to Table H-8 for legend that defines the highlighting colors for shaded radionuclides.

I.2 BIAS AND UNCERTAINTY IN CWTS INVENTORIES

As described in Section 9.1.2.3, the three parameters needed to calculate the bias factor and uncertainty distribution of the DU are I_W, U_{DU}, and δ_B, where I_W is the sum of the CWTS reported inventory, U_{DU} is the relative uncertainty in the DU, and δ_B is the total inventory bias in the DU, equal to $\left(I_T / I_W\right)$.

Because the uncertainty in the DU is assumed to be normally distributed, the PDF is given by:

$$f\left(x\right) = \frac{1}{\sigma\sqrt{2\pi}} exp\left\{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2\right\} \qquad \text{Eq. (I-1)}$$

And the CDF is given by:

$$f\left(x\right) = \frac{1}{2}\left[1 + erf\left\{\frac{x-\mu}{\sigma\sqrt{2}}\right\}\right] \qquad \text{Eq. (I-2)}$$

where:

μ Normalized CWTS-reported inventory $\left(I_W / I_W = 1.0\right)$

σ Relative uncertainty $\left(U_{DU}\right)$.

For the closure analysis, and as shown in Table I-12 through Table I-44, the mean (*mean*) is $\left(I_W / I_W = 1.0\right)$ and the standard deviation (*sdev*) is the relative uncertainty $\left(U_{DU}\right)$. The ratio $\left(I_T / I_W\right) = \delta_B$ is the bias factor of the DU (*bias*).

Because these functions describe the uncertainty in the normalized activity, x cannot be less than zero; therefore, when utilizing the CDF equations and $x \le 0$, the function is set to equal zero. To speed up the MC calculation, cdf_{min} is calculated at $x = 0$. Then, any CDF value (*y*-axis) that is less than or equal to cdf_{min} returns zero.

Table I-12. Bias and Uncertainty Parameters for ST01

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	1.0000000E-01	0
Am-241	0.66648	1	1.2821305E-01	3.1086245E-15
Am-242m	0.98774	1	4.8753995E-02	0
Am-243	0.84375	1	3.5085753E-02	0
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.66720	1	5.6767663E-02	0
Cf-249	0.53811	1	2.6096151E-02	0
Cf-251	0.50193	1	7.2348799E-02	0
Cl-36	1.00000	1	1.0000000E-01	0
Cm-245	0.50287	1	7.5940286E-02	0
Cm-247	0.50000	1	8.4001284E-02	0
Cm-248	0.50000	1	8.2330386E-02	0
Cs-135	0.50000	1	8.1701403E-02	0
Cs-137	0.52980	1	1.9055421E-01	7.6942104E-08
H-3	0.73174	1	8.0518808E-02	0
I-129	0.63865	1	6.5402716E-02	0
K-40	0.99187	1	6.1092686E-03	0
Nb-94	1.00000	1	1.8731132E-02	0
Ni-59	0.86126	1	1.5748552E-02	0
Ni-63	0.99774	1	1.7125913E-02	0
Np-237	0.54818	1	5.0572252E-02	0
Pa-231	1.00000	1	1.0000000E-01	0
Pd-107	0.50000	1	8.5448246E-02	0
Pu-239	0.54507	1	1.5084730E-01	1.6873225E-11
Pu-240	0.63616	1	1.6566651E-01	7.8881573E-10
Pu-241	0.53958	1	1.2509502E-01	6.6613381E-16
Ra-226	0.99290	1	7.1830996E-03	0
Rb-87	0.50000	1	8.3380941E-02	0
Sn-126	0.50153	1	6.8351888E-02	0
Sr-90	0.75288	1	1.9676497E-01	1.8653875E-07
Tc-99	0.64756	1	1.8022590E-01	1.4398955E-08
Th-229	1.00000	1	1.0000000E-01	0
Th-230	1.00000	1	7.7934365E-03	0
Th-231	0.87580	1	6.0138610E-02	0
U-232	0.99977	1	5.2021304E-02	0
U-233	0.51132	1	1.0086082E-01	0
U-234	0.76805	1	2.6177185E-02	0
U-236	0.53723	1	5.2366768E-02	0
U-233D	0.97725	1	4.9833040E-02	0
C-14N	1.00000	1	1.8277970E-02	0
H-3F	1.00000	1	1.1273390E-02	0
I-129F	0.50000	1	1.3907323E-01	3.2285286E-13
I-129J	0.99000	1	4.6572325E-02	0

Table I-13. Bias and Uncertainty Parameters for ST02

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	1.0000000E-01	0
Am-241	0.61282	1	4.0639569E-02	0
Am-242m	0.98803	1	2.4887278E-02	0
Am-243	0.54869	1	6.5033449E-01	6.2064629E-02
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.93938	1	2.7014004E-02	0
Cf-249	0.50339	1	5.5893832E-02	0
Cf-251	0.51425	1	4.4985189E-02	0
Cl-36	1.00000	1	1.3290195E-01	2.6478819E-14
Cm-245	0.50054	1	9.1553461E-01	1.3735986E-01
Cm-247	0.50000	1	1.4289923E-01	1.2987944E-12
Cm-248	0.50129	1	5.8834480E-02	0
Cs-135	0.50026	1	1.3750777E-01	1.7669199E-13
Cs-137	0.50507	1	4.9538570E-02	0
H-3	0.78727	1	1.5460780E-02	0
I-129	0.62672	1	1.0607180E-01	0
K-40	0.50000	1	1.4905318E-01	9.7971631E-12
Nb-94	1.00000	1	1.6430580E-02	0
Ni-59	0.96955	1	1.4730981E-02	0
Ni-63	0.99953	1	1.0811728E-02	0
Np-237	0.71286	1	5.2678116E-02	0
Pa-231	1.00000	1	1.0000000E-01	0
Pd-107	0.50029	1	1.3778619E-01	1.9695356E-13
Pu-239	0.57104	1	2.3326140E-02	0
Pu-240	0.68984	1	3.7067400E-02	0
Pu-241	0.65013	1	3.6382150E-02	0
Ra-226	0.50000	1	1.5071751E-01	1.6232904E-11
Rb-87	0.50000	1	1.4927711E-01	1.0496104E-11
Sn-126	0.62093	1	4.2563974E-02	0
Sr-90	0.61559	1	3.2919829E-01	1.1920236E-03
Tc-99	0.60560	1	7.5440442E-02	0
Th-229	1.00000	1	1.0000000E-01	0
Th-230	1.00000	1	1.0000000E-01	0
Th-231	0.91471	1	3.3950619E-02	0
U-232	1.00000	1	1.5898544E-02	0
U-233	0.55054	1	2.3660748E-02	0
U-234	0.91885	1	1.4231979E-02	0
U-236	0.77623	1	3.1476905E-02	0
U-233D	0.96428	1	2.4626807E-02	0
C-14N	1.00000	1	2.0670579E-02	0
I-129D	0.50000	1	2.4404405E-02	0
I-129G	0.53094	1	2.1481059E-02	0
I-129H	0.52769	1	3.8016527E-02	0
I-129I	0.98495	1	3.6344764E-02	0
I-129J	0.99000	1	2.3641172E-02	0
U-234G	0.53723	1	4.3834583E-03	0
U-236G	0.53475	1	4.3719563E-03	0

Table I-14. Bias and Uncertainty Parameters for ST03

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	1.0000000E-01	0
Am-241	0.52046	1	1.7447268E-02	0
Am-242m	0.94941	1	7.5026284E-02	0
Am-243	0.51128	1	3.0182882E-01	4.6128014E-04
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.79562	1	5.5866111E-02	0
Cf-249	0.76890	1	3.5012706E-02	0
Cf-251	0.66934	1	2.7662769E-02	0
Cl-36	1.00000	1	4.5422105E-02	0
Cm-245	0.52302	1	9.0746415E-02	0
Cm-247	0.50000	1	1.3288517E-01	2.6312286E-14
Cm-248	0.55232	1	1.2095015E-01	5.5511151E-17
Cs-135	1.00000	1	1.0000000E-01	0
Cs-137	0.58876	1	6.1060378E-02	0
H-3	0.56048	1	2.5345247E-02	0
I-129	0.53829	1	3.9098562E-02	0
K-40	0.50000	1	8.5606368E-02	0
Nb-94	1.00000	1	1.3913954E-02	0
Ni-59	0.72389	1	2.2947483E-02	0
Ni-63	0.99994	1	1.1941819E-02	0
Np-237	0.58625	1	6.5926547E-02	0
Pa-231	1.00000	1	1.0000000E-01	0
Pd-107	1.00000	1	1.0000000E-01	0
Pu-239	0.53839	1	1.5221500E-02	0
Pu-240	0.59529	1	1.7516974E-02	0
Pu-241	0.62153	1	1.9431646E-02	0
Ra-226	0.50000	1	1.4036065E-01	5.2230442E-13
Rb-87	1.00000	1	1.0000000E-01	0
Sn-126	0.61535	1	2.4098639E-02	0
Sr-90	0.54532	1	3.7871269E-02	0
Tc-99	0.53008	1	4.8364725E-02	0
Th-229	1.00000	1	3.5147569E-02	0
Th-230	0.72407	1	7.8184062E-02	0
Th-231	0.55073	1	1.8573484E-02	0
U-232	0.99653	1	1.2918801E-01	4.9404925E-15
U-233	0.91554	1	2.3887970E-02	0
U-234	0.61775	1	1.5925854E-02	0
U-236	0.67351	1	3.4031532E-02	0
U-233D	0.90544	1	6.5096925E-02	0
C-14N	1.00000	1	1.8712634E-02	0
I-129I	1.00000	1	3.3384967E-02	0
I-129J	0.99000	1	7.2695084E-02	0
H-3C	1.00000	1	3.3634255E-02	0
I-129C	1.00000	1	2.3778260E-02	0

Table I-15. Bias and Uncertainty Parameters for ST04

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	1.0000000E-01	0
Am-241	0.52419	1	4.0623203E-02	0
Am-242m	0.81308	1	1.2278199E-01	1.6653345E-16
Am-243	0.52473	1	2.8094429E-01	1.8583417E-04
Be-10	1.00000	1	4.0258582E-02	0
C-14	0.80935	1	2.3960582E-02	0
Cf-249	0.55074	1	1.8986816E-01	6.9406402E-08
Cf-251	0.59948	1	1.6267054E-01	3.9382986E-10
Cl-36	1.00000	1	1.0000000E-01	0
Cm-245	0.75072	1	9.8420595E-02	0
Cm-247	0.50231	1	2.4782429E-01	2.7287559E-05
Cm-248	0.50546	1	8.3396331E-02	0
Cs-135	1.00000	1	1.0000000E-01	0
Cs-137	0.52098	1	1.2448760E-01	4.9960036E-16
H-3	0.96301	1	8.9298750E-02	0
I-129	0.52849	1	1.6502234E-01	6.8151584E-10
K-40	0.50100	1	8.7161217E-02	0
Nb-94	1.00000	1	1.2384351E-02	0
Ni-59	0.82628	1	6.8025876E-02	0
Ni-63	0.99917	1	1.2142051E-02	0
Np-237	0.59648	1	1.6778251E-01	1.2604415E-09
Pa-231	1.00000	1	1.0000000E-01	0
Pd-107	1.00000	1	1.0000000E-01	0
Pu-239	0.51990	1	3.9646226E-02	0
Pu-240	0.53730	1	5.4349497E-02	0
Pu-241	0.52302	1	1.2706489E-01	1.7763568E-15
Ra-226	0.93128	1	3.7094643E-02	0
Rb-87	1.00000	1	1.0000000E-01	0
Sn-126	0.51691	1	3.5751414E-02	0
Sr-90	0.52173	1	5.4996904E-02	0
Tc-99	0.52812	1	4.6851856E-02	0
Th-229	1.00000	1	1.8113588E-02	0
Th-230	1.00000	1	1.6461291E-02	0
Th-231	0.53870	1	1.2730751E-02	0
U-232	0.90427	1	1.4947055E-02	0
U-233	0.99692	1	1.9631376E-02	0
U-234	0.55137	1	1.8441617E-02	0
U-236	0.57488	1	5.6739422E-02	0
U-233D	0.82049	1	1.1433442E-01	0
C-14N	1.00000	1	2.0396185E-02	0
I-129H	0.50000	1	8.6449094E-02	0
I-129I	1.00000	1	3.7930312E-02	0
I-129J	0.99000	1	1.5748919E-01	1.0790824E-10

Table **I-16. Bias and Uncertainty Parameters for ST05**

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	4.4382872E-02	0
Am-241	0.69864	1	3.2294987E-02	0
Am-242m	0.50278	1	9.9312570E-02	0
Am-243	0.43008	1	7.1539260E-02	0
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.93446	1	2.7567741E-02	0
Cf-249	0.49930	1	9.0430006E-02	0
Cf-251	0.53298	1	8.3661467E-02	0
Cl-36	0.50000	1	1.3468775E-01	5.6565863E-14
Cm-245	0.72722	1	3.6322624E-02	0
Cm-247	0.40205	1	8.0922139E-02	0
Cm-248	0.35090	1	1.0834423E-01	0
Cs-135	1.00000	1	3.6115323E-02	0
Cs-137	0.74236	1	4.1496481E-02	0
H-3	0.76422	1	2.6916994E-02	0
I-129	0.83216	1	4.2016679E-01	8.6561488E-03
K-40	0.50000	1	9.6444761E-02	0
Nb-94	1.00000	1	2.1284768E-02	0
Ni-59	0.98917	1	2.3470710E-02	0
Ni-63	0.72453	1	1.6188839E-02	0
Np-237	0.50019	1	2.7631637E-02	0
Pa-231	1.00000	1	1.0000000E-01	0
Pd-107	1.00000	1	1.0000000E-01	0
Pu-239	0.67573	1	3.1025082E-02	0
Pu-240	0.65803	1	3.8591554E-02	0
Pu-241	0.63785	1	3.7289452E-02	0
Ra-226	0.50180	1	5.8012912E-02	0
Rb-87	1.00000	1	1.0000000E-01	0
Sn-126	0.57019	1	4.9872887E-02	0
Sr-90	0.91463	1	5.4674406E-02	0
Tc-99	0.39518	1	7.2281901E-02	0
Th-229	1.00000	1	4.5360794E-02	0
Th-230	0.54646	1	5.3528236E-02	0
Th-231	0.55937	1	3.0737135E-02	0
U-232	1.00000	1	5.5955875E-02	0
U-233	0.51943	1	1.4381897E-01	1.7856272E-12
U-234	0.56796	1	3.1163248E-02	0
U-236	0.76426	1	2.8382950E-02	0
U-233D	0.65034	1	1.6004996E-01	2.0780550E-10
C-14N	1.00000	1	2.2528362E-02	0
I-129J	0.99000	1	4.7161765E-01	1.6987778E-02
I-129R	0.50000	1	1.3351820E-01	3.4527936E-14
Sr-90R	0.50000	1	1.3443252E-01	5.0848215E-14
Tc-99R	0.50000	1	1.4603544E-01	3.7535530E-12

Table I-17. Bias and Uncertainty Parameters for ST06

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	0.50000	1	1.0293034E-01	0
Am-241	0.61236	1	3.1794894E-02	0
Am-242m	0.50123	1	7.3937874E-02	0
Am-243	0.88010	1	4.5376333E-02	0
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.58582	1	1.9231020E-01	9.9680693E-08
Cf-249	0.68445	1	7.0342570E-02	0
Cf-251	0.50152	1	7.5624466E-02	0
Cl-36	0.50000	1	1.0089506E-01	0
Cm-245	0.55501	1	6.3819387E-02	0
Cm-247	0.52940	1	1.4929316E-01	1.0547896E-11
Cm-248	0.75265	1	1.0652309E-01	0
Cs-135	0.75000	1	1.0200438E-01	0
Cs-137	0.57137	1	2.1556380E-01	1.7505134E-06
H-3	0.51908	1	1.5626812E-01	7.8066997E-11
I-129	0.79832	1	4.2429877E-01	9.2158455E-03
K-40	0.63209	1	7.3130850E-02	0
Nb-94	0.50759	1	9.5874712E-02	0
Ni-59	0.68834	1	4.4495416E-02	0
Ni-63	0.51715	1	9.6102232E-02	0
Np-237	0.67106	1	2.5030169E-01	3.2322729E-05
Pa-231	0.50000	1	9.9953577E-02	0
Pd-107	0.50000	1	9.5213366E-02	0
Pu-239	0.57861	1	3.1028529E-02	0
Pu-240	0.58437	1	5.4685857E-02	0
Pu-241	0.54917	1	3.5726772E-02	0
Ra-226	0.99396	1	7.8359360E-02	0
Rb-87	0.50000	1	9.8415620E-02	0
Sn-126	0.52063	1	2.9161127E-02	0
Sr-90	0.97128	1	8.8109512E-02	0
Tc-99	0.80826	1	9.3493300E-02	0
Th-229	1.00000	1	2.0525585E-02	0
Th-230	0.99999	1	2.4840935E-02	0
Th-231	0.57438	1	2.1462289E-02	0
U-232	1.00000	1	2.4531345E-02	0
U-233	0.99582	1	2.3671622E-02	0
U-234	0.61608	1	2.5090841E-02	0
U-236	0.68100	1	1.0893792E-01	0
U-233D	1.00000	1	1.0000000E-01	0
C-14N	1.00000	1	1.0000000E-01	0
Ra-226T	0.52222	1	1.2155165E-02	0
Th-230T	0.53333	1	1.2173580E-02	0

Table I-18. Bias and Uncertainty Parameters for ST07

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	1.0000000E-01	0
Am-241	0.57091	1	4.5415074E-02	0
Am-242m	0.80949	1	7.6355641E-01	9.5155282E-02
Am-243	0.61536	1	9.1012169E-02	0
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.57486	1	2.4529427E-02	0
Cf-249	0.52280	1	5.8701447E-02	0
Cf-251	0.54438	1	6.8730849E-02	0
Cl-36	1.00000	1	1.0000000E-01	0
Cm-245	0.54211	1	1.2379314E-01	3.3306691E-16
Cm-247	0.54735	1	2.6132186E-01	6.4936682E-05
Cm-248	0.88620	1	2.6251633E-01	6.9684100E-05
Cs-135	1.00000	1	1.0000000E-01	0
Cs-137	0.52145	1	1.9480613E-01	1.4234612E-07
H-3	0.60116	1	1.3581390E-01	8.9872554E-14
I-129	0.64588	1	8.5312656E-02	0
K-40	1.00000	1	1.0000000E-01	0
Nb-94	1.00000	1	1.4900711E-02	0
Ni-59	0.57815	1	2.8395772E-01	2.1443412E-04
Ni-63	0.99707	1	1.3836796E-02	0
Np-237	0.76423	1	2.1621374E-01	1.8725138E-06
Pa-231	1.00000	1	1.0000000E-01	0
Pd-107	1.00000	1	1.0000000E-01	0
Pu-239	0.54991	1	4.1272708E-02	0
Pu-240	0.54401	1	4.0236914E-02	0
Pu-241	0.58085	1	4.2727213E-02	0
Ra-226	0.50150	1	6.2602073E-02	0
Rb-87	1.00000	1	1.0000000E-01	0
Sn-126	0.61712	1	3.0763972E-02	0
Sr-90	0.62055	1	7.8887793E-02	0
Tc-99	0.57091	1	7.7914399E-02	0
Th-229	1.00000	1	4.5569887E-02	0
Th-230	0.96856	1	4.1696937E-02	0
Th-231	0.99267	1	2.4560087E-02	0
U-232	0.99944	1	3.6798713E-02	0
U-233	0.90489	1	8.1101059E-02	0
U-234	0.68434	1	4.8597479E-02	0
U-236	0.80650	1	2.8374868E-01	2.1234528E-04
U-233D	0.76798	1	2.8385159E-01	2.1337164E-04
C-14N	1.00000	1	1.7423903E-02	0
H-3C	1.00000	1	5.5575966E-02	0
I-129C	1.00000	1	4.4159480E-02	0
I-129J	0.99000	1	4.7161765E-01	1.6987778E-02

Table I-19. Bias and Uncertainty Parameters for ST08

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	1.0000000E-01	0
Am-241	0.76838	1	8.4268496E-02	0
Am-242m	0.62503	1	7.2737534E-02	0
Am-243	0.62668	1	7.0018021E-02	0
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.72265	1	2.6956253E-02	0
Cf-249	0.50046	1	7.0315385E-02	0
Cf-251	0.50115	1	6.8281188E-02	0
Cl-36	1.00000	1	1.0000000E-01	0
Cm-245	0.51375	1	6.0514060E-02	0
Cm-247	0.56538	1	1.1550827E-01	0
Cm-248	0.88445	1	5.4683129E-01	3.3720963E-02
Cs-135	1.00000	1	1.0000000E-01	0
Cs-137	0.54418	1	5.7208168E-01	4.0231828E-02
H-3	0.45690	1	9.5270844E-02	0
I-129	0.53985	1	1.5219371E-01	2.5060842E-11
K-40	1.00000	1	1.0000000E-01	0
Nb-94	1.00000	1	4.5608853E-02	0
Ni-59	0.50616	1	7.6249069E-01	9.4845894E-02
Ni-63	1.00000	1	4.0097312E-02	0
Np-237	0.56581	1	9.4413343E-01	1.4476065E-01
Pa-231	1.00000	1	1.0000000E-01	0
Pd-107	1.00000	1	1.0000000E-01	0
Pu-239	0.77298	1	3.4576542E-02	0
Pu-240	0.72121	1	5.4237869E-02	0
Pu-241	0.77686	1	3.2394516E-02	0
Ra-226	1.00000	1	1.0000000E-01	0
Rb-87	1.00000	1	1.0000000E-01	0
Sn-126	0.50153	1	1.4401123E-01	1.9070856E-12
Sr-90	0.66359	1	4.5867740E-01	1.4622003E-02
Tc-99	0.44249	1	2.0202136E-01	3.7112145E-07
Th-229	1.00000	1	1.0000000E-01	0
Th-230	1.00000	1	2.4243287E-02	0
Th-231	0.55214	1	4.0191918E-02	0
U-232	0.86155	1	1.0805480E-01	0
U-233	0.49993	1	1.0186425E-01	0
U-234	0.50348	1	6.1454866E-02	0
U-236	0.50081	1	7.0904743E-02	0
U-233D	1.00000	1	1.0000000E-01	0
C-14N	1.00000	1	4.6060097E-02	0
Am-241B	0.49500	1	8.3780527E-01	1.1631826E-01
C-14B	0.45000	1	4.2276097E+00	4.0650673E-01
Cs-137B	0.50000	1	1.3801580E-01	2.1532776E-13
H-3B	0.82237	1	4.1983429E+00	4.0586717E-01
I-129B	0.45000	1	4.2278674E+00	4.0651232E-01
Ni-59B	0.49500	1	8.1597031E-01	1.1018690E-01
Sr-90B	0.50000	1	1.3297846E-01	2.7366998E-14
Tc-99B	0.45000	1	4.2272149E+00	4.0649816E-01
U-233B	0.90461	1	8.4480272E-01	1.1826427E-01

Table I-20. Bias and Uncertainty Parameters for ST09

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	1.0000000E-01	0
Am-241	0.63721	1	4.1785394E-02	0
Am-242m	0.50018	1	7.0583946E-01	7.8277613E-02
Am-243	0.64383	1	2.7059130E-01	1.0967962E-04
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.83200	1	6.0814384E-02	0
Cf-249	0.99858	1	4.0062446E-02	0
Cf-251	0.99660	1	4.9442698E-02	0
Cl-36	1.00000	1	5.0402248E-02	0
Cm-245	0.69031	1	4.2264405E-02	0
Cm-247	0.93423	1	5.4755780E-02	0
Cm-248	1.00000	1	5.5119703E-02	0
Cs-135	1.00000	1	1.0000000E-01	0
Cs-137	0.51742	1	3.5658473E-02	0
H-3	0.69624	1	6.6023695E-02	0
I-129	0.57551	1	2.5150428E-02	0
K-40	1.00000	1	1.1134039E-02	0
Nb-94	1.00000	1	2.0136113E-02	0
Ni-59	0.62225	1	9.4316526E-02	0
Ni-63	0.99648	1	2.2558377E-02	0
Np-237	0.72510	1	1.6350568E-01	4.7977966E-10
Pa-231	1.00000	1	3.1388580E-02	0
Pd-107	1.00000	1	1.0000000E-01	0
Pu-239	0.61844	1	3.5208268E-02	0
Pu-240	0.57012	1	4.4568714E-02	0
Pu-241	0.78846	1	6.3539477E-02	0
Ra-226	0.52984	1	3.4881972E-01	2.0731569E-03
Rb-87	1.00000	1	1.0000000E-01	0
Sn-126	1.00000	1	1.9000016E-02	0
Sr-90	0.53521	1	2.1727142E-02	0
Tc-99	0.62162	1	2.2887407E-02	0
Th-229	1.00000	1	3.4040583E-02	0
Th-230	1.00000	1	2.9244557E-02	0
Th-231	0.82212	1	2.2742570E-02	0
U-232	0.97964	1	3.0153019E-02	0
U-233	0.65484	1	5.7211454E-01	4.0240521E-02
U-234	0.71942	1	3.8498580E-01	4.6952777E-03
U-236	0.76478	1	3.5321727E-01	2.3192758E-03
U-233D	0.50000	1	1.4195997E-01	9.3236530E-13
C-14N	1.00000	1	1.0000000E-01	0
Am-241B	0.50000	1	7.2275171E-02	0
C-14B	0.50000	1	1.0846567E-01	0
Cs-137B	0.50000	1	1.0279297E-01	0
H-3B	0.50000	1	1.0072661E-01	0
I-129B	0.50000	1	9.8384268E-02	0
Ni-59B	1.00000	1	1.0000000E-01	0
Np-237B	0.50000	1	1.0644980E-01	0
Pu-239B	0.50000	1	9.7692272E-02	0
Pu-240B	0.50000	1	1.0040539E-01	0
Pu-241B	0.50000	1	7.4362356E-02	0
Sr-90B	0.50000	1	9.2767056E-02	0
Tc-99B	0.50000	1	9.6266190E-02	0
U-233B	0.50000	1	9.9520936E-02	0
U-233E	1.00000	1	1.0000000E-01	0
U-234B	0.50000	1	7.9391745E-02	0
C-14X	1.00000	1	1.3570806E-01	8.6097796E-14
H-3X	1.00000	1	2.2253461E-01	3.5000894E-06

Table I-21. Bias and Uncertainty Parameters for ST10

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	1.0000000E-01	0
Am-241	0.63721	1	4.1785394E-02	0
Am-242m	0.50018	1	7.0583946E-01	7.8277613E-02
Am-243	0.64383	1	2.7059130E-01	1.0967962E-04
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.83200	1	6.0814384E-02	0
Cf-249	0.99858	1	4.0062446E-02	0
Cf-251	0.99660	1	4.9442698E-02	0
Cl-36	1.00000	1	5.0402248E-02	0
Cm-245	0.69031	1	4.2264405E-02	0
Cm-247	0.93423	1	5.4755780E-02	0
Cm-248	1.00000	1	5.5119703E-02	0
Cs-135	1.00000	1	1.0000000E-01	0
Cs-137	0.51742	1	3.5658473E-02	0
H-3	0.69624	1	6.6023695E-02	0
I-129	0.57551	1	2.5150428E-02	0
K-40	1.00000	1	1.1134039E-02	0
Nb-94	1.00000	1	2.0136113E-02	0
Ni-59	0.62225	1	9.4316526E-02	0
Ni-63	0.99648	1	2.2558377E-02	0
Np-237	0.72510	1	1.6350568E-01	4.7977966E-10
Pa-231	1.00000	1	3.1388580E-02	0
Pd-107	1.00000	1	1.0000000E-01	0
Pu-239	0.61844	1	3.5208268E-02	0
Pu-240	0.57012	1	4.4568714E-02	0
Pu-241	0.78846	1	6.3539477E-02	0
Ra-226	0.52984	1	3.4881972E-01	2.0731569E-03
Rb-87	1.00000	1	1.0000000E-01	0
Sn-126	1.00000	1	1.9000016E-02	0
Sr-90	0.53521	1	2.1727142E-02	0
Tc-99	0.62162	1	2.2887407E-02	0
Th-229	1.00000	1	3.4040583E-02	0
Th-230	1.00000	1	2.9244557E-02	0
Th-231	0.82212	1	2.2742570E-02	0
U-232	0.97964	1	3.0153019E-02	0
U-233	0.65484	1	5.7211454E-01	4.0240521E-02
U-234	0.71942	1	3.8498580E-01	4.6952777E-03
U-236	0.76478	1	3.5321727E-01	2.3192758E-03
U-233D	0.50000	1	1.4195997E-01	9.3236530E-13
C-14N	1.00000	1	1.0000000E-01	0
Am-241B	0.50000	1	7.2275171E-02	0
C-14B	0.50000	1	1.0846567E-01	0
Cs-137B	0.50000	1	1.0279297E-01	0
H-3B	0.50000	1	1.0072661E-01	0
I-129B	0.50000	1	9.8384268E-02	0
Ni-59B	1.00000	1	1.0000000E-01	0
Np-237B	0.50000	1	1.0644980E-01	0
Pu-239B	0.50000	1	9.7692272E-02	0
Pu-240B	0.50000	1	1.0040539E-01	0
Pu-241B	0.50000	1	7.4362356E-02	0
Sr-90B	0.50000	1	9.2767056E-02	0
Tc-99B	0.50000	1	9.6266190E-02	0
U-233B	0.50000	1	9.9520936E-02	0
U-233E	1.00000	1	1.0000000E-01	0
U-234B	0.50000	1	7.9391745E-02	0

Table I-22. Bias and Uncertainty Parameters for ST11

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	1.0293034E-01	0
Am-241	0.76838	1	1.2821305E-01	3.1086245E-15
Am-242m	0.98803	1	1.4715457E+00	2.4839232E-01
Am-243	0.88010	1	6.5033449E-01	6.2064629E-02
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.96033	1	1.9231020E-01	9.9680693E-08
Cf-249	0.99858	1	1.8986816E-01	6.9406402E-08
Cf-251	0.99809	1	1.6267054E-01	3.9382986E-10
Cl-36	1.00000	1	1.3468775E-01	5.6565863E-14
Cm-245	0.86008	1	9.1553461E-01	1.3735986E-01
Cm-247	0.93423	1	2.6132186E-01	6.4936682E-05
Cm-248	1.00000	1	5.4683129E-01	3.3720963E-02
Cs-135	1.00000	1	1.4715752E-01	5.3991256E-12
Cs-137	0.74236	1	5.7208168E-01	4.0231828E-02
H-3	0.96301	1	1.5626812E-01	7.8066997E-11
I-129	0.83216	1	4.2429877E-01	9.2158455E-03
K-40	1.00000	1	1.4905318E-01	9.7971631E-12
Nb-94	1.00000	1	9.5874712E-02	0
Ni-59	0.98917	1	7.6249069E-01	9.4845894E-02
Ni-63	1.00000	1	9.6102232E-02	0
Np-237	0.76423	1	9.4413343E-01	1.4476065E-01
Pa-231	1.00000	1	1.4640824E-01	4.2393311E-12
Pd-107	1.00000	1	1.4588357E-01	3.5710879E-12
Pu-239	0.77298	1	1.5084730E-01	1.6873225E-11
Pu-240	0.72121	1	1.6566651E-01	7.8881573E-10
Pu-241	0.78846	1	1.2706489E-01	1.7763568E-15
Ra-226	1.00000	1	9.6443140E-01	1.4989580E-01
Rb-87	1.00000	1	1.4927711E-01	1.0496104E-11
Sn-126	1.00000	1	6.4915358E-01	6.1723218E-02
Sr-90	0.97128	1	4.5867740E-01	1.4622003E-02
Tc-99	0.80826	1	2.0202136E-01	3.7112145E-07
Th-229	1.00000	1	1.0000000E-01	0
Th-230	1.00000	1	1.0000000E-01	0
Th-231	0.99862	1	6.0138610E-02	0
U-232	1.00000	1	1.2918801E-01	4.9404925E-15
U-233	0.99692	1	5.7211454E-01	4.0240521E-02
U-234	0.95039	1	3.8498580E-01	4.6952777E-03
U-236	0.99980	1	4.4607403E-01	1.2487786E-02
U-233D	1.00000	1	2.8385159E-01	2.1337164E-04
C-14N	1.00000	1	1.0000000E-01	0

Table I-23. Bias and Uncertainty Parameters for ST14

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	5.9485455E-02	0
Am-241	0.59559	1	1.1035042E-01	0
Am-242m	0.50002	1	1.4715457E+00	2.4839232E-01
Am-243	0.50906	1	6.2981947E-02	0
Be-10	1.00000	1	4.7192227E-02	0
C-14	0.96033	1	1.2680658E-02	0
Cf-249	0.99116	1	1.9071898E-02	0
Cf-251	0.99809	1	1.9202165E-02	0
Cl-36	0.85276	1	5.6446427E-02	0
Cm-245	0.86008	1	3.1076371E-02	0
Cm-247	0.50000	1	1.3964068E-01	3.9973580E-13
Cm-248	1.00000	1	1.6639201E-02	0
Cs-135	0.45000	1	1.4715752E-01	5.3991256E-12
Cs-137	0.53474	1	7.9518468E-02	0
H-3	0.91617	1	2.0864176E-02	0
I-129	0.56125	1	5.8463388E-02	0
K-40	1.00000	1	3.4807175E-02	0
Nb-94	1.00000	1	1.0630795E-02	0
Ni-59	0.92781	1	1.5934885E-02	0
Ni-63	0.99997	1	1.0646376E-02	0
Np-237	0.55462	1	7.1619084E-02	0
Pa-231	0.45812	1	1.4640824E-01	4.2393311E-12
Pd-107	0.45000	1	1.4588357E-01	3.5710879E-12
Pu-239	0.61892	1	6.0224283E-02	0
Pu-240	0.62294	1	6.6206111E-02	0
Pu-241	0.75689	1	7.0858243E-02	0
Ra-226	0.50625	1	9.6443140E-01	1.4989580E-01
Rb-87	0.45000	1	1.4638860E-01	4.2123527E-12
Sn-126	0.71418	1	6.4915358E-01	6.1723218E-02
Sr-90	0.61211	1	1.5141136E-01	1.9939828E-11
Tc-99	0.63502	1	1.5203100E-01	2.3904156E-11
Th-229	1.00000	1	5.4764422E-02	0
Th-230	0.99931	1	4.3925893E-02	0
Th-231	0.99862	1	1.6004588E-02	0
U-232	0.99052	1	5.6379092E-02	0
U-233	0.95349	1	7.3594964E-02	0
U-234	0.95039	1	1.0959910E-01	0
U-236	0.99980	1	4.4607403E-01	1.2487786E-02
U-233D	0.50000	1	9.2928851E-02	0
C-14N	1.00000	1	2.3800305E-02	0
Ag-108mH	0.45000	1	1.6372422E-01	5.0496812E-10
C-14H	0.45000	1	1.6367819E-01	4.9956339E-10
Nb-94H	0.45000	1	1.6314764E-01	4.4100668E-10
Ni-59H	0.45000	1	1.6320219E-01	4.4672166E-10
Ni-63H	0.45000	1	1.0037569E-01	0
Tc-99H	0.45000	1	1.6207371E-01	3.4138026E-10

Table I-24. Bias and Uncertainty Parameters for ST17

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	1.0293034E-01	0
Am-241	0.76838	1	1.2821305E-01	3.1086245E-15
Am-242m	0.98803	1	1.4715457E+00	2.4839232E-01
Am-243	0.88010	1	6.5033449E-01	6.2064629E-02
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.96033	1	1.9231020E-01	9.9680693E-08
Cf-249	0.99858	1	1.8986816E-01	6.9406402E-08
Cf-251	0.99809	1	1.6267054E-01	3.9382986E-10
Cl-36	1.00000	1	1.3468775E-01	5.6565863E-14
Cm-245	0.86008	1	9.1553461E-01	1.3735986E-01
Cm-247	0.93423	1	2.6132186E-01	6.4936682E-05
Cm-248	1.00000	1	5.4683129E-01	3.3720963E-02
Cs-135	1.00000	1	1.4715752E-01	5.3991256E-12
Cs-137	0.74236	1	5.7208168E-01	4.0231828E-02
H-3	0.96301	1	1.5626812E-01	7.8066997E-11
I-129	0.83216	1	4.2429877E-01	9.2158455E-03
K-40	1.00000	1	1.4905318E-01	9.7971631E-12
Nb-94	1.00000	1	9.5874712E-02	0
Ni-59	0.98917	1	7.6249069E-01	9.4845894E-02
Ni-63	1.00000	1	9.6102232E-02	0
Np-237	0.76423	1	9.4413343E-01	1.4476065E-01
Pa-231	1.00000	1	1.4640824E-01	4.2393311E-12
Pd-107	1.00000	1	1.4588357E-01	3.5710879E-12
Pu-239	0.77298	1	1.5084730E-01	1.6873225E-11
Pu-240	0.72121	1	1.6566651E-01	7.8881573E-10
Pu-241	0.78846	1	1.2706489E-01	1.7763568E-15
Ra-226	1.00000	1	9.6443140E-01	1.4989580E-01
Rb-87	1.00000	1	1.4927711E-01	1.0496104E-11
Sn-126	1.00000	1	6.4915358E-01	6.1723218E-02
Sr-90	0.97128	1	4.5867740E-01	1.4622003E-02
Tc-99	0.80826	1	2.0202136E-01	3.7112145E-07
Th-229	1.00000	1	1.0000000E-01	0
Th-230	1.00000	1	1.0000000E-01	0
Th-231	0.99862	1	6.0138610E-02	0
U-232	1.00000	1	1.2918801E-01	4.9404925E-15
U-233	0.99692	1	5.7211454E-01	4.0240521E-02
U-234	0.95039	1	3.8498580E-01	4.6952777E-03
U-236	0.99980	1	4.4607403E-01	1.2487786E-02
U-233D	1.00000	1	2.8385159E-01	2.1337164E-04
C-14N	1.00000	1	1.0000000E-01	0

Table I-25. Bias and Uncertainty Parameters for ST18

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	1.0293034E-01	0
Am-241	0.76838	1	1.2821305E-01	3.1086245E-15
Am-242m	0.98803	1	1.4715457E+00	2.4839232E-01
Am-243	0.88010	1	6.5033449E-01	6.2064629E-02
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.96033	1	1.9231020E-01	9.9680693E-08
Cf-249	0.99858	1	1.8986816E-01	6.9406402E-08
Cf-251	0.99809	1	1.6267054E-01	3.9382986E-10
Cl-36	1.00000	1	1.3468775E-01	5.6565863E-14
Cm-245	0.86008	1	9.1553461E-01	1.3735986E-01
Cm-247	0.93423	1	2.6132186E-01	6.4936682E-05
Cm-248	1.00000	1	5.4683129E-01	3.3720963E-02
Cs-135	1.00000	1	1.4715752E-01	5.3991256E-12
Cs-137	0.74236	1	5.7208168E-01	4.0231828E-02
H-3	0.96301	1	1.5626812E-01	7.8066997E-11
I-129	0.83216	1	4.2429877E-01	9.2158455E-03
K-40	1.00000	1	1.4905318E-01	9.7971631E-12
Nb-94	1.00000	1	9.5874712E-02	0
Ni-59	0.98917	1	7.6249069E-01	9.4845894E-02
Ni-63	1.00000	1	9.6102232E-02	0
Np-237	0.76423	1	9.4413343E-01	1.4476065E-01
Pa-231	1.00000	1	1.4640824E-01	4.2393311E-12
Pd-107	1.00000	1	1.4588357E-01	3.5710879E-12
Pu-239	0.77298	1	1.5084730E-01	1.6873225E-11
Pu-240	0.72121	1	1.6566651E-01	7.8881573E-10
Pu-241	0.78846	1	1.2706489E-01	1.7763568E-15
Ra-226	1.00000	1	9.6443140E-01	1.4989580E-01
Rb-87	1.00000	1	1.4927711E-01	1.0496104E-11
Sn-126	1.00000	1	6.4915358E-01	6.1723218E-02
Sr-90	0.97128	1	4.5867740E-01	1.4622003E-02
Tc-99	0.80826	1	2.0202136E-01	3.7112145E-07
Th-229	1.00000	1	1.0000000E-01	0
Th-230	1.00000	1	1.0000000E-01	0
Th-231	0.99862	1	6.0138610E-02	0
U-232	1.00000	1	1.2918801E-01	4.9404925E-15
U-233	0.99692	1	5.7211454E-01	4.0240521E-02
U-234	0.95039	1	3.8498580E-01	4.6952777E-03
U-236	0.99980	1	4.4607403E-01	1.2487786E-02
U-233D	1.00000	1	2.8385159E-01	2.1337164E-04
C-14N	1.00000	1	1.0000000E-01	0

Table I-26. Bias and Uncertainty Parameters for ST19

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	1.0293034E-01	0
Am-241	0.76838	1	1.2821305E-01	3.1086245E-15
Am-242m	0.98803	1	1.4715457E+00	2.4839232E-01
Am-243	0.88010	1	6.5033449E-01	6.2064629E-02
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.96033	1	1.9231020E-01	9.9680693E-08
Cf-249	0.99858	1	1.8986816E-01	6.9406402E-08
Cf-251	0.99809	1	1.6267054E-01	3.9382986E-10
Cl-36	1.00000	1	1.3468775E-01	5.6565863E-14
Cm-245	0.86008	1	9.1553461E-01	1.3735986E-01
Cm-247	0.93423	1	2.6132186E-01	6.4936682E-05
Cm-248	1.00000	1	5.4683129E-01	3.3720963E-02
Cs-135	1.00000	1	1.4715752E-01	5.3991256E-12
Cs-137	0.74236	1	5.7208168E-01	4.0231828E-02
H-3	0.96301	1	1.5626812E-01	7.8066997E-11
I-129	0.83216	1	4.2429877E-01	9.2158455E-03
K-40	1.00000	1	1.4905318E-01	9.7971631E-12
Nb-94	1.00000	1	9.5874712E-02	0
Ni-59	0.98917	1	7.6249069E-01	9.4845894E-02
Ni-63	1.00000	1	9.6102232E-02	0
Np-237	0.76423	1	9.4413343E-01	1.4476065E-01
Pa-231	1.00000	1	1.4640824E-01	4.2393311E-12
Pd-107	1.00000	1	1.4588357E-01	3.5710879E-12
Pu-239	0.77298	1	1.5084730E-01	1.6873225E-11
Pu-240	0.72121	1	1.6566651E-01	7.8881573E-10
Pu-241	0.78846	1	1.2706489E-01	1.7763568E-15
Ra-226	1.00000	1	9.6443140E-01	1.4989580E-01
Rb-87	1.00000	1	1.4927711E-01	1.0496104E-11
Sn-126	1.00000	1	6.4915358E-01	6.1723218E-02
Sr-90	0.97128	1	4.5867740E-01	1.4622003E-02
Tc-99	0.80826	1	2.0202136E-01	3.7112145E-07
Th-229	1.00000	1	1.0000000E-01	0
Th-230	1.00000	1	1.0000000E-01	0
Th-231	0.99862	1	6.0138610E-02	0
U-232	1.00000	1	1.2918801E-01	4.9404925E-15
U-233	0.99692	1	5.7211454E-01	4.0240521E-02
U-234	0.95039	1	3.8498580E-01	4.6952777E-03
U-236	0.99980	1	4.4607403E-01	1.2487786E-02
U-233D	1.00000	1	2.8385159E-01	2.1337164E-04
C-14N	1.00000	1	1.0000000E-01	0

Table I-27. Bias and Uncertainty Parameters for ST20

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	1.0293034E-01	0
Am-241	0.76838	1	1.2821305E-01	3.1086245E-15
Am-242m	0.98803	1	1.4715457E+00	2.4839232E-01
Am-243	0.88010	1	6.5033449E-01	6.2064629E-02
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.96033	1	1.9231020E-01	9.9680693E-08
Cf-249	0.99858	1	1.8986816E-01	6.9406402E-08
Cf-251	0.99809	1	1.6267054E-01	3.9382986E-10
Cl-36	1.00000	1	1.3468775E-01	5.6565863E-14
Cm-245	0.86008	1	9.1553461E-01	1.3735986E-01
Cm-247	0.93423	1	2.6132186E-01	6.4936682E-05
Cm-248	1.00000	1	5.4683129E-01	3.3720963E-02
Cs-135	1.00000	1	1.4715752E-01	5.3991256E-12
Cs-137	0.74236	1	5.7208168E-01	4.0231828E-02
H-3	0.96301	1	1.5626812E-01	7.8066997E-11
I-129	0.83216	1	4.2429877E-01	9.2158455E-03
K-40	1.00000	1	1.4905318E-01	9.7971631E-12
Nb-94	1.00000	1	9.5874712E-02	0
Ni-59	0.98917	1	7.6249069E-01	9.4845894E-02
Ni-63	1.00000	1	9.6102232E-02	0
Np-237	0.76423	1	9.4413343E-01	1.4476065E-01
Pa-231	1.00000	1	1.4640824E-01	4.2393311E-12
Pd-107	1.00000	1	1.4588357E-01	3.5710879E-12
Pu-239	0.77298	1	1.5084730E-01	1.6873225E-11
Pu-240	0.72121	1	1.6566651E-01	7.8881573E-10
Pu-241	0.78846	1	1.2706489E-01	1.7763568E-15
Ra-226	1.00000	1	9.6443140E-01	1.4989580E-01
Rb-87	1.00000	1	1.4927711E-01	1.0496104E-11
Sn-126	1.00000	1	6.4915358E-01	6.1723218E-02
Sr-90	0.97128	1	4.5867740E-01	1.4622003E-02
Tc-99	0.80826	1	2.0202136E-01	3.7112145E-07
Th-229	1.00000	1	1.0000000E-01	0
Th-230	1.00000	1	1.0000000E-01	0
Th-231	0.99862	1	6.0138610E-02	0
U-232	1.00000	1	1.2918801E-01	4.9404925E-15
U-233	0.99692	1	5.7211454E-01	4.0240521E-02
U-234	0.95039	1	3.8498580E-01	4.6952777E-03
U-236	0.99980	1	4.4607403E-01	1.2487786E-02
U-233D	1.00000	1	2.8385159E-01	2.1337164E-04
C-14N	1.00000	1	1.0000000E-01	0

Table I-28. Bias and Uncertainty Parameters for ST21

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	1.0293034E-01	0
Am-241	0.76838	1	1.2821305E-01	3.1086245E-15
Am-242m	0.98803	1	1.4715457E+00	2.4839232E-01
Am-243	0.88010	1	6.5033449E-01	6.2064629E-02
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.96033	1	1.9231020E-01	9.9680693E-08
Cf-249	0.99858	1	1.8986816E-01	6.9406402E-08
Cf-251	0.99809	1	1.6267054E-01	3.9382986E-10
Cl-36	1.00000	1	1.3468775E-01	5.6565863E-14
Cm-245	0.86008	1	9.1553461E-01	1.3735986E-01
Cm-247	0.93423	1	2.6132186E-01	6.4936682E-05
Cm-248	1.00000	1	5.4683129E-01	3.3720963E-02
Cs-135	1.00000	1	1.4715752E-01	5.3991256E-12
Cs-137	0.74236	1	5.7208168E-01	4.0231828E-02
H-3	0.96301	1	1.5626812E-01	7.8066997E-11
I-129	0.83216	1	4.2429877E-01	9.2158455E-03
K-40	1.00000	1	1.4905318E-01	9.7971631E-12
Nb-94	1.00000	1	9.5874712E-02	0
Ni-59	0.98917	1	7.6249069E-01	9.4845894E-02
Ni-63	1.00000	1	9.6102232E-02	0
Np-237	0.76423	1	9.4413343E-01	1.4476065E-01
Pa-231	1.00000	1	1.4640824E-01	4.2393311E-12
Pd-107	1.00000	1	1.4588357E-01	3.5710879E-12
Pu-239	0.77298	1	1.5084730E-01	1.6873225E-11
Pu-240	0.72121	1	1.6566651E-01	7.8881573E-10
Pu-241	0.78846	1	1.2706489E-01	1.7763568E-15
Ra-226	1.00000	1	9.6443140E-01	1.4989580E-01
Rb-87	1.00000	1	1.4927711E-01	1.0496104E-11
Sn-126	1.00000	1	6.4915358E-01	6.1723218E-02
Sr-90	0.97128	1	4.5867740E-01	1.4622003E-02
Tc-99	0.80826	1	2.0202136E-01	3.7112145E-07
Th-229	1.00000	1	1.0000000E-01	0
Th-230	1.00000	1	1.0000000E-01	0
Th-231	0.99862	1	6.0138610E-02	0
U-232	1.00000	1	1.2918801E-01	4.9404925E-15
U-233	0.99692	1	5.7211454E-01	4.0240521E-02
U-234	0.95039	1	3.8498580E-01	4.6952777E-03
U-236	0.99980	1	4.4607403E-01	1.2487786E-02
U-233D	1.00000	1	2.8385159E-01	2.1337164E-04
C-14N	1.00000	1	1.0000000E-01	0

Table I-29. Bias and Uncertainty Parameters for ST22

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	1.0293034E-01	0
Am-241	0.76838	1	1.2821305E-01	3.1086245E-15
Am-242m	0.98803	1	1.4715457E+00	2.4839232E-01
Am-243	0.88010	1	6.5033449E-01	6.2064629E-02
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.96033	1	1.9231020E-01	9.9680693E-08
Cf-249	0.99858	1	1.8986816E-01	6.9406402E-08
Cf-251	0.99809	1	1.6267054E-01	3.9382986E-10
Cl-36	1.00000	1	1.3468775E-01	5.6565863E-14
Cm-245	0.86008	1	9.1553461E-01	1.3735986E-01
Cm-247	0.93423	1	2.6132186E-01	6.4936682E-05
Cm-248	1.00000	1	5.4683129E-01	3.3720963E-02
Cs-135	1.00000	1	1.4715752E-01	5.3991256E-12
Cs-137	0.74236	1	5.7208168E-01	4.0231828E-02
H-3	0.96301	1	1.5626812E-01	7.8066997E-11
I-129	0.83216	1	4.2429877E-01	9.2158455E-03
K-40	1.00000	1	1.4905318E-01	9.7971631E-12
Nb-94	1.00000	1	9.5874712E-02	0
Ni-59	0.98917	1	7.6249069E-01	9.4845894E-02
Ni-63	1.00000	1	9.6102232E-02	0
Np-237	0.76423	1	9.4413343E-01	1.4476065E-01
Pa-231	1.00000	1	1.4640824E-01	4.2393311E-12
Pd-107	1.00000	1	1.4588357E-01	3.5710879E-12
Pu-239	0.77298	1	1.5084730E-01	1.6873225E-11
Pu-240	0.72121	1	1.6566651E-01	7.8881573E-10
Pu-241	0.78846	1	1.2706489E-01	1.7763568E-15
Ra-226	1.00000	1	9.6443140E-01	1.4989580E-01
Rb-87	1.00000	1	1.4927711E-01	1.0496104E-11
Sn-126	1.00000	1	6.4915358E-01	6.1723218E-02
Sr-90	0.97128	1	4.5867740E-01	1.4622003E-02
Tc-99	0.80826	1	2.0202136E-01	3.7112145E-07
Th-229	1.00000	1	1.0000000E-01	0
Th-230	1.00000	1	1.0000000E-01	0
Th-231	0.99862	1	6.0138610E-02	0
U-232	1.00000	1	1.2918801E-01	4.9404925E-15
U-233	0.99692	1	5.7211454E-01	4.0240521E-02
U-234	0.95039	1	3.8498580E-01	4.6952777E-03
U-236	0.99980	1	4.4607403E-01	1.2487786E-02
U-233D	1.00000	1	2.8385159E-01	2.1337164E-04
C-14N	1.00000	1	1.0000000E-01	0

Table I-30. Bias and Uncertainty Parameters for ST23

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	1.0293034E-01	0
Am-241	0.76838	1	1.2821305E-01	3.1086245E-15
Am-242m	0.98803	1	1.4715457E+00	2.4839232E-01
Am-243	0.88010	1	6.5033449E-01	6.2064629E-02
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.96033	1	1.9231020E-01	9.9680693E-08
Cf-249	0.99858	1	1.8986816E-01	6.9406402E-08
Cf-251	0.99809	1	1.6267054E-01	3.9382986E-10
Cl-36	1.00000	1	1.3468775E-01	5.6565863E-14
Cm-245	0.86008	1	9.1553461E-01	1.3735986E-01
Cm-247	0.93423	1	2.6132186E-01	6.4936682E-05
Cm-248	1.00000	1	5.4683129E-01	3.3720963E-02
Cs-135	1.00000	1	1.4715752E-01	5.3991256E-12
Cs-137	0.74236	1	5.7208168E-01	4.0231828E-02
H-3	0.96301	1	1.5626812E-01	7.8066997E-11
I-129	0.83216	1	4.2429877E-01	9.2158455E-03
K-40	1.00000	1	1.4905318E-01	9.7971631E-12
Nb-94	1.00000	1	9.5874712E-02	0
Ni-59	0.98917	1	7.6249069E-01	9.4845894E-02
Ni-63	1.00000	1	9.6102232E-02	0
Np-237	0.76423	1	9.4413343E-01	1.4476065E-01
Pa-231	1.00000	1	1.4640824E-01	4.2393311E-12
Pd-107	1.00000	1	1.4588357E-01	3.5710879E-12
Pu-239	0.77298	1	1.5084730E-01	1.6873225E-11
Pu-240	0.72121	1	1.6566651E-01	7.8881573E-10
Pu-241	0.78846	1	1.2706489E-01	1.7763568E-15
Ra-226	1.00000	1	9.6443140E-01	1.4989580E-01
Rb-87	1.00000	1	1.4927711E-01	1.0496104E-11
Sn-126	1.00000	1	6.4915358E-01	6.1723218E-02
Sr-90	0.97128	1	4.5867740E-01	1.4622003E-02
Tc-99	0.80826	1	2.0202136E-01	3.7112145E-07
Th-229	1.00000	1	1.0000000E-01	0
Th-230	1.00000	1	1.0000000E-01	0
Th-231	0.99862	1	6.0138610E-02	0
U-232	1.00000	1	1.2918801E-01	4.9404925E-15
U-233	0.99692	1	5.7211454E-01	4.0240521E-02
U-234	0.95039	1	3.8498580E-01	4.6952777E-03
U-236	0.99980	1	4.4607403E-01	1.2487786E-02
U-233D	1.00000	1	2.8385159E-01	2.1337164E-04
C-14K	0.51751	1	5.5617599E-02	0
I-129K	0.50074	1	1.1874731E-01	0
Tc-99K	0.51158	1	1.0220220E-01	0
Am-241A	0.66718	1	1.0685087E-01	0
Am-242mA	0.50000	1	1.5546991E+00	2.6004350E-01
Am-243A	0.50108	1	1.3345798E-01	3.3639758E-14
C-14A	0.60131	1	4.1971758E-02	0
Cf-249A	0.50000	1	1.3338624E-01	3.2640557E-14
Cf-251A	0.50000	1	1.3861892E-01	2.7161606E-13
Cm-245A	0.50000	1	1.4799463E-01	7.0438100E-12
Cm-247A	0.50000	1	1.4707637E-01	5.2605142E-12
Cm-248A	0.50000	1	1.4826816E-01	7.6758044E-12
Cs-135A	0.50000	1	1.3355778E-01	3.5138559E-14

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Cs-137A	0.50658	1	1.4378735E-01	1.7663648E-12
H-3A	0.95786	1	3.0995598E-01	6.2708673E-04
I-129A	0.71369	1	1.5936850E+00	2.6517344E-01
K-40A	1.00000	1	4.3396775E-02	0
Nb-94A	1.00000	1	4.7989617E-02	0
Ni-59A	0.87084	1	2.7818094E-02	0
Ni-63A	0.99999	1	2.8797685E-02	0
Np-237A	0.58228	1	3.9230981E-02	0
Pd-107A	0.50000	1	1.3772294E-01	1.9217961E-13
Pu-239A	0.60343	1	5.5952429E-02	0
Pu-240A	0.61110	1	4.4449872E-02	0
Pu-241A	0.60668	1	4.8224057E-02	0
Ra-226A	1.00000	1	5.2172315E-02	0
Rb-87A	0.50000	1	1.3834937E-01	2.4491520E-13
Sn-126A	0.77373	1	8.3502834E-02	0
Sr-90A	0.71656	1	3.3328152E-02	0
Tc-99A	0.57416	1	2.8501998E-01	2.2529867E-04
Th-231A	0.67259	1	3.7492034E-02	0
U-232A	0.50000	1	1.4730762E-01	5.6646909E-12
U-233A	0.67103	1	8.9509843E-02	0
U-233E	1.00000	1	1.0000000E-01	0
U-234A	0.67475	1	9.3668042E-02	0
U-236A	0.64807	1	3.4700279E-02	0

Table I-31. Bias and Uncertainty Parameters for ST24

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	1.0293034E-01	0
Am-241	0.76838	1	1.2821305E-01	3.1086245E-15
Am-242m	0.98803	1	1.4715457E+00	2.4839232E-01
Am-243	0.88010	1	6.5033449E-01	6.2064629E-02
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.96033	1	1.9231020E-01	9.9680693E-08
Cf-249	0.99858	1	1.8986816E-01	6.9406402E-08
Cf-251	0.99809	1	1.6267054E-01	3.9382986E-10
Cl-36	1.00000	1	1.3468775E-01	5.6565863E-14
Cm-245	0.86008	1	9.1553461E-01	1.3735986E-01
Cm-247	0.93423	1	2.6132186E-01	6.4936682E-05
Cm-248	1.00000	1	5.4683129E-01	3.3720963E-02
Cs-135	1.00000	1	1.4715752E-01	5.3991256E-12
Cs-137	0.74236	1	5.7208168E-01	4.0231828E-02
H-3	0.96301	1	1.5626812E-01	7.8066997E-11
I-129	0.83216	1	4.2429877E-01	9.2158455E-03
K-40	1.00000	1	1.4905318E-01	9.7971631E-12
Nb-94	1.00000	1	9.5874712E-02	0
Ni-59	0.98917	1	7.6249069E-01	9.4845894E-02
Ni-63	1.00000	1	9.6102232E-02	0
Np-237	0.76423	1	9.4413343E-01	1.4476065E-01
Pa-231	1.00000	1	1.4640824E-01	4.2393311E-12
Pd-107	1.00000	1	1.4588357E-01	3.5710879E-12
Pu-239	0.77298	1	1.5084730E-01	1.6873225E-11
Pu-240	0.72121	1	1.6566651E-01	7.8881573E-10
Pu-241	0.78846	1	1.2706489E-01	1.7763568E-15
Ra-226	1.00000	1	9.6443140E-01	1.4989580E-01
Rb-87	1.00000	1	1.4927711E-01	1.0496104E-11
Sn-126	1.00000	1	6.4915358E-01	6.1723218E-02
Sr-90	0.97128	1	4.5867740E-01	1.4622003E-02
Tc-99	0.80826	1	2.0202136E-01	3.7112145E-07
Th-229	1.00000	1	1.0000000E-01	0
Th-230	1.00000	1	1.0000000E-01	0
Th-231	0.99862	1	6.0138610E-02	0
U-232	1.00000	1	1.2918801E-01	4.9404925E-15
U-233	0.99692	1	5.7211454E-01	4.0240521E-02
U-234	0.95039	1	3.8498580E-01	4.6952777E-03
U-236	0.99980	1	4.4607403E-01	1.2487786E-02
U-233D	1.00000	1	2.8385159E-01	2.1337164E-04

Table I-32. Bias and Uncertainty Parameters for ET01

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	5.9606913E-02	0
Am-241	0.49774	1	1.5902806E-02	0
Am-242m	0.80425	1	5.6324128E-02	0
Am-243	0.61305	1	3.6485101E-01	3.0640724E-03
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.95630	1	7.8164074E-03	0
Cf-249	0.50951	1	1.9038539E-02	0
Cf-251	0.54389	1	1.6368308E-02	0
Cl-36	1.00000	1	5.4798550E-02	0
Cm-245	0.54123	1	4.2750150E-02	0
Cm-247	0.51492	1	7.2354469E-01	8.3472857E-02
Cm-248	1.00000	1	9.7497712E-03	0
Cs-135	0.50041	1	1.4404106E-01	1.9265700E-12
Cs-137	0.64990	1	3.0703781E-02	0
H-3	0.59583	1	1.1433100E-02	0
I-129	0.54086	1	2.0995272E-02	0
K-40	0.89110	1	1.4595966E-02	0
Nb-94	1.00000	1	1.2843125E-02	0
Ni-59	0.80057	1	3.7190376E-02	0
Ni-63	0.99996	1	1.7815709E-02	0
Np-237	0.56833	1	9.0973321E-02	0
Pa-231	1.00000	1	1.0000000E-01	0
Pd-107	1.00000	1	1.0000000E-01	0
Pu-239	0.50067	1	1.4480507E-02	0
Pu-240	0.54078	1	3.6454731E-02	0
Pu-241	0.52354	1	1.1993899E-02	0
Ra-226	0.66215	1	8.0693915E-02	0
Rb-87	1.00000	1	1.0000000E-01	0
Sn-126	0.50978	1	1.5741623E-02	0
Sr-90	0.59043	1	6.1978828E-02	0
Tc-99	0.65479	1	2.9636453E-02	0
Th-229	1.00000	1	8.6716825E-03	0
Th-230	0.80119	1	3.9801422E-02	0
Th-231	0.69079	1	1.1200227E-02	0
U-232	0.99994	1	8.3102027E-03	0
U-233	0.99683	1	8.2513769E-03	0
U-234	0.68221	1	1.6689046E-02	0
U-236	0.56185	1	1.7791479E-02	0
U-233D	0.77040	1	4.0513405E-02	0
I-129D	0.50000	1	3.7674993E-02	0
I-129E	1.00000	1	4.6253576E-02	0
I-129G	0.50000	1	1.0371365E-01	0
I-129H	0.50000	1	1.0209141E-01	0
I-129I	0.50000	1	1.0015202E-01	0
I-129J	0.99000	1	7.0555891E-02	0

Table I-33. Bias and Uncertainty Parameters for ET02

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	3.1822917E-02	0
Am-241	0.51600	1	4.5447322E-02	0
Am-242m	0.60919	1	8.7361866E-02	0
Am-243	0.50871	1	6.0428854E-02	0
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.81649	1	3.7855598E-02	0
Cf-249	0.50010	1	7.6043524E-02	0
Cf-251	0.50008	1	7.4889217E-02	0
Cl-36	1.00000	1	5.3636056E-02	0
Cm-245	0.58003	1	4.1769072E-02	0
Cm-247	0.63024	1	1.3367926E-01	3.6970427E-14
Cm-248	1.00000	1	4.1176103E-02	0
Cs-135	1.00000	1	2.8598883E-02	0
Cs-137	0.54377	1	3.3070619E-02	0
H-3	0.58458	1	3.3127357E-02	0
I-129	0.64865	1	4.9758299E-02	0
K-40	0.77104	1	3.5379821E-02	0
Nb-94	1.00000	1	1.7650473E-02	0
Ni-59	0.61979	1	8.9779320E-02	0
Ni-63	0.99858	1	1.7689381E-02	0
Np-237	0.61301	1	1.2520333E-01	6.6613381E-16
Pa-231	1.00000	1	2.7216564E-02	0
Pd-107	1.00000	1	1.0000000E-01	0
Pu-239	0.53108	1	1.5830064E-02	0
Pu-240	0.52238	1	3.2698239E-02	0
Pu-241	0.48186	1	2.3724227E-02	0
Ra-226	0.67967	1	6.6479521E-01	6.6262027E-02
Rb-87	1.00000	1	1.0000000E-01	0
Sn-126	0.50222	1	9.8748390E-01	1.5560777E-01
Sr-90	0.52229	1	8.9977057E-02	0
Tc-99	0.67887	1	7.3607877E-02	0
Th-229	1.00000	1	5.5461825E-03	0
Th-230	1.00000	1	7.2335570E-03	0
Th-231	0.85676	1	2.3816381E-02	0
U-232	0.99958	1	5.4540132E-03	0
U-233	0.98752	1	1.9580715E-02	0
U-234	0.69485	1	1.7569012E-01	6.2838880E-09
U-236	0.68826	1	1.7582885E-01	6.4513328E-09
U-233D	0.50723	1	1.0469021E-01	0

Table I-34. Bias and Uncertainty Parameters for ET03

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	5.1327527E-02	0
Am-241	0.61081	1	6.7452642E-02	0
Am-242m	0.54939	1	2.8037476E-01	1.8078355E-04
Am-243	0.61734	1	6.5155194E-02	0
Be-10	1.00000	1	4.2282486E-02	0
C-14	0.81425	1	8.5692616E-02	0
Cf-249	0.54486	1	4.6885309E-02	0
Cf-251	0.58305	1	5.0723668E-02	0
Cl-36	1.00000	1	4.8128271E-02	0
Cm-245	0.50512	1	5.3081840E-02	0
Cm-247	0.67019	1	8.2893027E-02	0
Cm-248	1.00000	1	4.7171910E-02	0
Cs-135	1.00000	1	4.4378255E-02	0
Cs-137	0.57558	1	2.5785908E-02	0
H-3	0.64597	1	5.8219868E-02	0
I-129	0.50960	1	3.4789058E-02	0
K-40	1.00000	1	3.4657802E-02	0
Nb-94	1.00000	1	1.3862159E-02	0
Ni-59	0.99769	1	1.0346786E-02	0
Ni-63	0.99958	1	1.0496588E-02	0
Np-237	0.59720	1	1.6914700E-01	1.6897158E-09
Pa-231	1.00000	1	1.6705634E-02	0
Pd-107	1.00000	1	5.9556351E-02	0
Pu-239	0.66922	1	4.7387804E-02	0
Pu-240	0.62716	1	7.4265911E-02	0
Pu-241	0.60861	1	9.1019126E-02	0
Ra-226	0.78766	1	1.3153898E-01	1.4543922E-14
Rb-87	1.00000	1	5.3232490E-02	0
Sn-126	0.67963	1	6.3396226E-02	0
Sr-90	0.68344	1	1.8352506E-02	0
Tc-99	0.57661	1	1.4929540E-02	0
Th-229	1.00000	1	2.5042319E-02	0
Th-230	0.94191	1	1.3380173E-02	0
Th-231	0.92468	1	1.0905476E-02	0
U-232	0.59616	1	1.9333879E-02	0
U-233	0.56159	1	5.1960433E-01	2.7143384E-02
U-234	0.58359	1	3.4251241E-01	1.7523919E-03
U-236	0.99999	1	1.6493881E-02	0
U-233D	0.50000	1	1.0421940E-01	0

Table I-35. Bias and Uncertainty Parameters for ET04

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	5.9606913E-02	0
Am-241	0.61081	1	6.7452642E-02	0
Am-242m	0.80425	1	2.8037476E-01	1.8078355E-04
Am-243	0.61734	1	3.6485101E-01	3.0640724E-03
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.95630	1	8.5692616E-02	0
Cf-249	0.54486	1	7.6043524E-02	0
Cf-251	0.58305	1	7.4889217E-02	0
Cl-36	1.00000	1	5.4798550E-02	0
Cm-245	0.58003	1	5.3081840E-02	0
Cm-247	0.67019	1	7.2354469E-01	8.3472857E-02
Cm-248	1.00000	1	4.7171910E-02	0
Cs-135	1.00000	1	1.4404106E-01	1.9265700E-12
Cs-137	0.64990	1	3.3070619E-02	0
H-3	0.64597	1	5.8219868E-02	0
I-129	0.64865	1	4.9758299E-02	0
K-40	1.00000	1	3.5379821E-02	0
Nb-94	1.00000	1	1.7650473E-02	0
Ni-59	0.99769	1	8.9779320E-02	0
Ni-63	0.99996	1	1.7815709E-02	0
Np-237	0.61301	1	1.6914700E-01	1.6897158E-09
Pa-231	1.00000	1	1.0000000E-01	0
Pd-107	1.00000	1	1.0000000E-01	0
Pu-239	0.66922	1	4.7387804E-02	0
Pu-240	0.62716	1	7.4265911E-02	0
Pu-241	0.60861	1	9.1019126E-02	0
Ra-226	0.78766	1	6.6479521E-01	6.6262027E-02
Rb-87	1.00000	1	1.0000000E-01	0
Sn-126	0.67963	1	9.8748390E-01	1.5560777E-01
Sr-90	0.68344	1	8.9977057E-02	0
Tc-99	0.67887	1	7.3607877E-02	0
Th-229	1.00000	1	2.5042319E-02	0
Th-230	1.00000	1	3.9801422E-02	0
Th-231	0.92468	1	2.3816381E-02	0
U-232	0.99994	1	1.9333879E-02	0
U-233	0.99683	1	5.1960433E-01	2.7143384E-02
U-234	0.69485	1	3.4251241E-01	1.7523919E-03
U-236	0.99999	1	1.7582885E-01	6.4513328E-09
U-233D	0.77040	1	1.0469021E-01	0

Table I-36. Bias and Uncertainty Parameters for ET05

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	5.9606913E-02	0
Am-241	0.61081	1	6.7452642E-02	0
Am-242m	0.80425	1	2.8037476E-01	1.8078355E-04
Am-243	0.61734	1	3.6485101E-01	3.0640724E-03
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.95630	1	8.5692616E-02	0
Cf-249	0.54486	1	7.6043524E-02	0
Cf-251	0.58305	1	7.4889217E-02	0
Cl-36	1.00000	1	5.4798550E-02	0
Cm-245	0.58003	1	5.3081840E-02	0
Cm-247	0.67019	1	7.2354469E-01	8.3472857E-02
Cm-248	1.00000	1	4.7171910E-02	0
Cs-135	1.00000	1	1.4404106E-01	1.9265700E-12
Cs-137	0.64990	1	3.3070619E-02	0
H-3	0.64597	1	5.8219868E-02	0
I-129	0.64865	1	4.9758299E-02	0
K-40	1.00000	1	3.5379821E-02	0
Nb-94	1.00000	1	1.7650473E-02	0
Ni-59	0.99769	1	8.9779320E-02	0
Ni-63	0.99996	1	1.7815709E-02	0
Np-237	0.61301	1	1.6914700E-01	1.6897158E-09
Pa-231	1.00000	1	1.0000000E-01	0
Pd-107	1.00000	1	1.0000000E-01	0
Pu-239	0.66922	1	4.7387804E-02	0
Pu-240	0.62716	1	7.4265911E-02	0
Pu-241	0.60861	1	9.1019126E-02	0
Ra-226	0.78766	1	6.6479521E-01	6.6262027E-02
Rb-87	1.00000	1	1.0000000E-01	0
Sn-126	0.67963	1	9.8748390E-01	1.5560777E-01
Sr-90	0.68344	1	8.9977057E-02	0
Tc-99	0.67887	1	7.3607877E-02	0
Th-229	1.00000	1	2.5042319E-02	0
Th-230	1.00000	1	3.9801422E-02	0
Th-231	0.92468	1	2.3816381E-02	0
U-232	0.99994	1	1.9333879E-02	0
U-233	0.99683	1	5.1960433E-01	2.7143384E-02
U-234	0.69485	1	3.4251241E-01	1.7523919E-03
U-236	0.99999	1	1.7582885E-01	6.4513328E-09
U-233D	0.77040	1	1.0469021E-01	0

Table I-37. Bias and Uncertainty Parameters for ET06

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	5.9606913E-02	0
Am-241	0.61081	1	6.7452642E-02	0
Am-242m	0.80425	1	2.8037476E-01	1.8078355E-04
Am-243	0.61734	1	3.6485101E-01	3.0640724E-03
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.95630	1	8.5692616E-02	0
Cf-249	0.54486	1	7.6043524E-02	0
Cf-251	0.58305	1	7.4889217E-02	0
Cl-36	1.00000	1	5.4798550E-02	0
Cm-245	0.58003	1	5.3081840E-02	0
Cm-247	0.67019	1	7.2354469E-01	8.3472857E-02
Cm-248	1.00000	1	4.7171910E-02	0
Cs-135	1.00000	1	1.4404106E-01	1.9265700E-12
Cs-137	0.64990	1	3.3070619E-02	0
H-3	0.64597	1	5.8219868E-02	0
I-129	0.64865	1	4.9758299E-02	0
K-40	1.00000	1	3.5379821E-02	0
Nb-94	1.00000	1	1.7650473E-02	0
Ni-59	0.99769	1	8.9779320E-02	0
Ni-63	0.99996	1	1.7815709E-02	0
Np-237	0.61301	1	1.6914700E-01	1.6897158E-09
Pa-231	1.00000	1	1.0000000E-01	0
Pd-107	1.00000	1	1.0000000E-01	0
Pu-239	0.66922	1	4.7387804E-02	0
Pu-240	0.62716	1	7.4265911E-02	0
Pu-241	0.60861	1	9.1019126E-02	0
Ra-226	0.78766	1	6.6479521E-01	6.6262027E-02
Rb-87	1.00000	1	1.0000000E-01	0
Sn-126	0.67963	1	9.8748390E-01	1.5560777E-01
Sr-90	0.68344	1	8.9977057E-02	0
Tc-99	0.67887	1	7.3607877E-02	0
Th-229	1.00000	1	2.5042319E-02	0
Th-230	1.00000	1	3.9801422E-02	0
Th-231	0.92468	1	2.3816381E-02	0
U-232	0.99994	1	1.9333879E-02	0
U-233	0.99683	1	5.1960433E-01	2.7143384E-02
U-234	0.69485	1	3.4251241E-01	1.7523919E-03
U-236	0.99999	1	1.7582885E-01	6.4513328E-09
U-233D	0.77040	1	1.0469021E-01	0

Table I-38. Bias and Uncertainty Parameters for ET07

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	5.9606913E-02	0
Am-241	0.61081	1	6.7452642E-02	0
Am-242m	0.80425	1	2.8037476E-01	1.8078355E-04
Am-243	0.61734	1	3.6485101E-01	3.0640724E-03
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.95630	1	8.5692616E-02	0
Cf-249	0.54486	1	7.6043524E-02	0
Cf-251	0.58305	1	7.4889217E-02	0
Cl-36	1.00000	1	5.4798550E-02	0
Cm-245	0.58003	1	5.3081840E-02	0
Cm-247	0.67019	1	7.2354469E-01	8.3472857E-02
Cm-248	1.00000	1	4.7171910E-02	0
Cs-135	1.00000	1	1.4404106E-01	1.9265700E-12
Cs-137	0.64990	1	3.3070619E-02	0
H-3	0.64597	1	5.8219868E-02	0
I-129	0.64865	1	4.9758299E-02	0
K-40	1.00000	1	3.5379821E-02	0
Nb-94	1.00000	1	1.7650473E-02	0
Ni-59	0.99769	1	8.9779320E-02	0
Ni-63	0.99996	1	1.7815709E-02	0
Np-237	0.61301	1	1.6914700E-01	1.6897158E-09
Pa-231	1.00000	1	1.0000000E-01	0
Pd-107	1.00000	1	1.0000000E-01	0
Pu-239	0.66922	1	4.7387804E-02	0
Pu-240	0.62716	1	7.4265911E-02	0
Pu-241	0.60861	1	9.1019126E-02	0
Ra-226	0.78766	1	6.6479521E-01	6.6262027E-02
Rb-87	1.00000	1	1.0000000E-01	0
Sn-126	0.67963	1	9.8748390E-01	1.5560777E-01
Sr-90	0.68344	1	8.9977057E-02	0
Tc-99	0.67887	1	7.3607877E-02	0
Th-229	1.00000	1	2.5042319E-02	0
Th-230	1.00000	1	3.9801422E-02	0
Th-231	0.92468	1	2.3816381E-02	0
U-232	0.99994	1	1.9333879E-02	0
U-233	0.99683	1	5.1960433E-01	2.7143384E-02
U-234	0.69485	1	3.4251241E-01	1.7523919E-03
U-236	0.99999	1	1.7582885E-01	6.4513328E-09
U-233D	0.77040	1	1.0469021E-01	0

Table I-39. Bias and Uncertainty Parameters for ET08

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	5.9606913E-02	0
Am-241	0.61081	1	6.7452642E-02	0
Am-242m	0.80425	1	2.8037476E-01	1.8078355E-04
Am-243	0.61734	1	3.6485101E-01	3.0640724E-03
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.95630	1	8.5692616E-02	0
Cf-249	0.54486	1	7.6043524E-02	0
Cf-251	0.58305	1	7.4889217E-02	0
Cl-36	1.00000	1	5.4798550E-02	0
Cm-245	0.58003	1	5.3081840E-02	0
Cm-247	0.67019	1	7.2354469E-01	8.3472857E-02
Cm-248	1.00000	1	4.7171910E-02	0
Cs-135	1.00000	1	1.4404106E-01	1.9265700E-12
Cs-137	0.64990	1	3.3070619E-02	0
H-3	0.64597	1	5.8219868E-02	0
I-129	0.64865	1	4.9758299E-02	0
K-40	1.00000	1	3.5379821E-02	0
Nb-94	1.00000	1	1.7650473E-02	0
Ni-59	0.99769	1	8.9779320E-02	0
Ni-63	0.99996	1	1.7815709E-02	0
Np-237	0.61301	1	1.6914700E-01	1.6897158E-09
Pa-231	1.00000	1	1.0000000E-01	0
Pd-107	1.00000	1	1.0000000E-01	0
Pu-239	0.66922	1	4.7387804E-02	0
Pu-240	0.62716	1	7.4265911E-02	0
Pu-241	0.60861	1	9.1019126E-02	0
Ra-226	0.78766	1	6.6479521E-01	6.6262027E-02
Rb-87	1.00000	1	1.0000000E-01	0
Sn-126	0.67963	1	9.8748390E-01	1.5560777E-01
Sr-90	0.68344	1	8.9977057E-02	0
Tc-99	0.67887	1	7.3607877E-02	0
Th-229	1.00000	1	2.5042319E-02	0
Th-230	1.00000	1	3.9801422E-02	0
Th-231	0.92468	1	2.3816381E-02	0
U-232	0.99994	1	1.9333879E-02	0
U-233	0.99683	1	5.1960433E-01	2.7143384E-02
U-234	0.69485	1	3.4251241E-01	1.7523919E-03
U-236	0.99999	1	1.7582885E-01	6.4513328E-09
U-233D	0.77040	1	1.0469021E-01	0

Table I-40. Bias and Uncertainty Parameters for ET09

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	5.9606913E-02	0
Am-241	0.61081	1	6.7452642E-02	0
Am-242m	0.80425	1	2.8037476E-01	1.8078355E-04
Am-243	0.61734	1	3.6485101E-01	3.0640724E-03
Be-10	1.00000	1	1.0000000E-01	0
C-14	0.95630	1	8.5692616E-02	0
Cf-249	0.54486	1	7.6043524E-02	0
Cf-251	0.58305	1	7.4889217E-02	0
Cl-36	1.00000	1	5.4798550E-02	0
Cm-245	0.58003	1	5.3081840E-02	0
Cm-247	0.67019	1	7.2354469E-01	8.3472857E-02
Cm-248	1.00000	1	4.7171910E-02	0
Cs-135	1.00000	1	1.4404106E-01	1.9265700E-12
Cs-137	0.64990	1	3.3070619E-02	0
H-3	0.64597	1	5.8219868E-02	0
I-129	0.64865	1	4.9758299E-02	0
K-40	1.00000	1	3.5379821E-02	0
Nb-94	1.00000	1	1.7650473E-02	0
Ni-59	0.99769	1	8.9779320E-02	0
Ni-63	0.99996	1	1.7815709E-02	0
Np-237	0.61301	1	1.6914700E-01	1.6897158E-09
Pa-231	1.00000	1	1.0000000E-01	0
Pd-107	1.00000	1	1.0000000E-01	0
Pu-239	0.66922	1	4.7387804E-02	0
Pu-240	0.62716	1	7.4265911E-02	0
Pu-241	0.60861	1	9.1019126E-02	0
Ra-226	0.78766	1	6.6479521E-01	6.6262027E-02
Rb-87	1.00000	1	1.0000000E-01	0
Sn-126	0.67963	1	9.8748390E-01	1.5560777E-01
Sr-90	0.68344	1	8.9977057E-02	0
Tc-99	0.67887	1	7.3607877E-02	0
Th-229	1.00000	1	2.5042319E-02	0
Th-230	1.00000	1	3.9801422E-02	0
Th-231	0.92468	1	2.3816381E-02	0
U-232	0.99994	1	1.9333879E-02	0
U-233	0.99683	1	5.1960433E-01	2.7143384E-02
U-234	0.69485	1	3.4251241E-01	1.7523919E-03
U-236	0.99999	1	1.7582885E-01	6.4513328E-09
U-233D	0.77040	1	1.0469021E-01	0

Table I-41. Bias and Uncertainty Parameters for LAWV

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	2.0653989E-02	0
Am-241	0.60581	1	1.0872015E-02	0
C-14	0.71807	1	1.6701316E-02	0
Ca-41	1.00000	1	3.2866135E-02	0
Cl-36	1.00000	1	2.2702118E-02	0
Cm-245	0.50344	1	5.9707627E-02	0
Cs-137	0.84428	1	1.4435797E-02	0
H-3	0.56064	1	1.4617735E-02	0
I-129	0.82247	1	1.7185148E-02	0
K-40	0.50023	1	1.1100175E-01	0
Nb-94	1.00000	1	1.8800050E-02	0
Ni-59	0.99036	1	1.5808464E-02	0
Ni-63	0.83574	1	3.4392603E-02	0
Np-237	0.68332	1	4.4251746E-02	0
Pu-239	0.67518	1	1.8087680E-02	0
Pu-241	0.56399	1	2.0179125E-02	0
Ra-226	1.00000	1	4.3051755E-02	0
Sr-90	0.63717	1	4.6507356E-02	0
Tc-99	0.62241	1	7.4817549E-02	0
U-235	0.69287	1	4.5204542E-02	0
U-235D	0.50272	1	7.8667072E-02	0

Table I-42. Bias and Uncertainty Parameters for ILV

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Ag-108m	1.00000	1	3.2754591E-02	0
Am-241	0.61681	1	4.1345606E-02	0
Ar-39	1.00000	1	1.0000000E-01	0
C-14	0.72079	1	2.3516143E-02	0
Cf-249	0.85695	1	1.0453799E+00	1.6938712E-01
Cl-36	1.00000	1	2.5011446E-02	0
Cm-245	0.85556	1	1.0402149E+00	1.6819066E-01
Cs-137	0.67270	1	2.0708095E-02	0
H-3	0.53786	1	1.5590238E-02	0
I-129	0.75779	1	1.2635375E-01	1.2212453E-15
K-40	0.50000	1	5.1531099E-02	0
Kr-85	0.50342	1	9.7148801E-02	0
Ni-59	0.99356	1	2.2140832E-02	0
Ni-63	0.99999	1	1.9675634E-02	0
Np-237	0.56975	1	6.0302604E-02	0
Pu-239	0.45989	1	5.8727126E-02	0
Pu-241	0.46062	1	4.0464324E-02	0
Ra-226	0.50000	1	1.4567912E-01	3.3385517E-12
Sr-90	0.66969	1	4.0177873E-02	0
Tc-99	0.74291	1	5.7949485E-02	0
U-235	0.94585	1	6.8324951E-03	0
U-235D	0.53542	1	5.4116673E-02	0
I-129C	1.00000	1	3.8999266E-02	0
C-14K	0.52115	1	5.8209906E-02	0
I-129K	0.51938	1	3.4760182E-02	0
Tc-99K	0.50050	1	5.5526111E-02	0
H-3R	0.50000	1	1.3539737E-01	7.5828233E-14
C-14T	1.00000	1	2.2549738E-02	0
Cs-137T	1.00000	1	5.9100084E-02	0
H-3T	1.00000	1	2.3609681E-02	0

Table I-43. Bias and Uncertainty Parameters for NR07E

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Am-241S	1.00000	1	1.4802374E-02	0
Am-243S	1.00000	1	1.4364440E-02	0
Be-10S	1.00000	1	1.0000000E-01	0
C-14S	1.00000	1	1.4581110E-02	0
Cl-36S	1.00000	1	5.7253458E-02	0
Co-60S	1.00000	1	1.4999613E-02	0
Cs-137S	1.00000	1	1.4804216E-02	0
I-129S	1.00000	1	9.0251888E-03	0
Mo-93S	1.00000	1	1.5063506E-02	0
Nb-93mS	1.00000	1	1.4575663E-02	0
Nb-94S	1.00000	1	1.5118943E-02	0
Ni-59S	1.00000	1	1.5612425E-02	0
Ni-63S	1.00000	1	1.4643618E-02	0
Np-237S	1.00000	1	1.5569305E-02	0
Pu-241S	1.00000	1	1.5210355E-02	0
Sn-121mS	1.00000	1	1.0000000E-01	0
Sn-126S	1.00000	1	1.3028542E-02	0
Sr-90S	1.00000	1	1.5142718E-02	0
Tc-99S	1.00000	1	1.4394843E-02	0
U-235S	1.00000	1	1.5022463E-02	0
Zr-93S	1.00000	1	1.4862082E-02	0

Table I-44. Bias and Uncertainty Parameters for NR26E

Radionuclide	*bias*	*mean*	*sdev*	cdf_{min}
Am-241	1.00000	1	9.1847456E-03	0
C-14	1.00000	1	9.1446360E-03	0
Cl-36	1.00000	1	1.0000000E-01	0
H-3	1.00000	1	1.0000000E-01	0
I-129	1.00000	1	9.0802870E-03	0
Ni-59	1.00000	1	9.2520240E-03	0
Ni-63	1.00000	1	9.3132081E-03	0
Np-237	1.00000	1	9.1861999E-03	0
Pu-241	1.00000	1	9.0386487E-03	0
Ra-226	1.00000	1	1.0000000E-01	0
Sr-90	1.00000	1	9.0973583E-03	0
Tc-99	1.00000	1	9.0283763E-03	0
U-235	1.00000	1	1.0000000E-01	0
Am-241S	1.00000	1	2.3234242E-02	0
Am-243S	1.00000	1	2.3161145E-02	0
Be-10S	1.00000	1	4.3973600E-02	0
C-14S	1.00000	1	1.5947823E-02	0
Cl-36S	1.00000	1	5.8941688E-02	0
Co-60S	1.00000	1	1.5957404E-02	0
Cs-137S	1.00000	1	2.1696157E-02	0
I-129S	1.00000	1	1.2104996E-02	0
Mo-93S	1.00000	1	2.2552706E-02	0
Nb-93mS	1.00000	1	2.3735358E-02	0
Nb-94S	1.00000	1	1.7388426E-02	0
Ni-59S	1.00000	1	1.5298714E-02	0
Ni-63S	1.00000	1	1.6409967E-02	0
Np-237S	1.00000	1	2.0023571E-02	0
Pu-241S	1.00000	1	1.9148607E-02	0
Ra-226S	1.00000	1	1.0000000E-01	0
Sn-121mS	1.00000	1	3.3352801E-02	0
Sn-126S	1.00000	1	2.2238375E-02	0
Sr-90S	1.00000	1	2.1919194E-02	0
Tc-99S	1.00000	1	1.8170706E-02	0
U-235S	1.00000	1	4.4312868E-02	0
Zr-93S	1.00000	1	1.8510700E-02	0

I.3 CLOSURE ANALYSIS TOOLKIT

The Closure Analysis Toolkit was developed to quantify the dose impact of the GWP, all-pathways, IHI, air, and radon exposure pathways to human receptors within and at the 100-meter POA surrounding the ELLWF. This algorithm is not a general-purpose tool but is a one-time purposeful calculation in support of the PA2022 closure analysis.

The Closure Analysis Toolkit is designed to compute deterministic (single realization) and stochastic POA dose impacts from parent radionuclides within ELLWF DUs including STs, ETs, LAWV, ILV, and NRCDAs. DU status is either closed, operating, or future. A closed DU contains existing waste only and will not receive future waste. An operating DU contains existing waste and is open to receiving future waste. A future DU will receive future waste. The stochastic dose

impact arises by randomly selecting the future waste inventory based on historical DU operation and operational constraints (maximum SOF within a DU is limited to 1.0).

The POA boundary for GWP pathways and all-pathways comprises a curtain of PORFLOW aquifer model computational cells where concentrations of parent radionuclides and short-chain radioactive progeny (half-life > 1 year) are calculated and recorded at one-year time intervals. The total time history of the calculation encompasses the period of performance for the GWP pathways and all-pathways.

A curtain of 33,360 elements (834 West to East x 40 vertical elements) constitutes the 100-meter POA North boundary (North curtain) that intercepts the GW flow trajectories of the 27 DUs (STs, ETs, LAWV, ILV, NR07E, and NR26E). The purpose of the curtain is to superimpose the concentration and dose contributions from each of the ELLWF radionuclides in the 27 DUs. This superposition of concentrations and doses is possible because of the linearity of the advection-dispersion transport equation. The curtain is a way to rigorously account for plume interaction from each DU for the GW pathways. Both spatial and temporal aspects are accounted for explicitly.

The following method illuminates the spatial and timing dose contributions from each DU:[3]

$$EPOA\%GWPW(ii,j) = \sum_{u=1}^{nEDU} DU(u)\%GWPW(i,j) \qquad \text{Eq. (I-3)}$$

where:

EPOA	GW transient total dose or concentration along North curtain of 100-meter POA
GWPW(ii,j)	GW pathway (GWPB, GWPA, GWPR, GWPU, or PAAP)[4] history concentrations and doses
DU(u)	ST01-ST11, ST14, ST18, ST23, ST24, ET01-ET05, ET07-ET09, LAWV, ILV, NR07E, and NR26E
ii	Global element index (1 to 33,600)
i	Local element index (aquifer cutout dependent)
j	Time index (Years 0 to 1,171)
u	Disposal unit index (1 to 27)
nEDU	Number of ELLWF DU

The GW transient total DU dose/concentration on the local aquifer cutouts is expressed as follows:

$$DU(u)\%GWPW(i,j) = \sum_{n=1}^{nGW} DU(u)\%gNUC(n)\%GWPW_{DF}(i,j) \times (DU(u)\%gNUC(n)\%Inv_{old} + DU(u)\%gNUC(n)\%Inv_{new}) \qquad \text{Eq. (I-4)}$$

[3] The % in Eq. (I-3) implies that variables belong to a Fortran-derived data type or structure.
[4] GWPB (GWP beta-gamma); GWPA (GWP gross-alpha); GWPR (GWP radium); GWPU (GWP uranium); PAAP (PA all-pathways).

where:

gNUC(n)	List of GW parent radionuclides in *DU*
$GWPW_{DF}(i,j)$	GW pathway history dose/concentration factors
Inv_{old}	Existing inventory of parent radionuclide in *DU* (Ci)
Inv_{new}	Future inventory of parent radionuclide in *DU* (Ci)
n	Radionuclide index (1 to *nGW*)
nGW	Number of GW parent radionuclides in *DU*

POAs for the IHI acute and chronic pathways, which include doses from ingestion, inhalation, and external exposure to human receptors, are located within each individual DU. IHI transient doses are computed for each DU similarly to the GW pathways but without any spatial variation by:

$$DU(u)\%PAII(j) = \sum_{n=1}^{nIHI} DU(u)\%iNUC(n)\%PAII_{DF}(j) \times (DU(u)\%iNUC(n)\%Inv_{old} + DU(u)\%iNUC(n)\%Inv_{new}) \quad \text{Eq. (I-5)}$$

where:

iNUC(n)	List of IHI parent radionuclides in *DU*
PAII(j)	Acute or chronic IHI transient doses (mrem or mrem yr^{-1}, respectively)
$PAII_{DF}(j)$	Acute or chronic IHI transient dose factors (mrem Ci^{-1} or mrem yr^{-1} Ci^{-1})
nIHI	Number of IHI parent radionuclides in *DU*

The air pathway comprises emanations of volatile radionuclides into the atmosphere from each DU; doses are computed at the 100-meter POA assuming plume interaction for each DU. Air pathway transient doses are computed for each DU as follows:

$$DU(u)\%AIRP(j) = \sum_{n=1}^{nAIR} DU(u)\%aNUC(n)\%AIRP_{DF}(j) \times (DU(u)\%aNUC(n)\%Inv_{old} + DU(u)\%aNUC(n)\%Inv_{new}) \quad \text{Eq. (I-6)}$$

where:

aNUC(n)	List of air pathway parent radionuclides in *DU*
AIRP(j)	Air pathway transient doses (mrem yr^{-1})
$AIRP_{DF}(j)$	Air pathway transient dose factors (mrem yr^{-1} Ci^{-1})
nAIR	Number of air pathway parent radionuclides in *DU*

For the air pathway, the North curtain is a single node where complete overlap of all 27 DU plumes is assumed. The contribution of air pathway transient doses from each DU is computed for the ELLWF as follows:

$$ELLWF\%AIRP(j) = \sum_{u=1}^{nEDU} DU(u)\%AIRP(j) \quad \text{Eq. (I-7)}$$

where:

ELLWF Air pathway transient total doses at 100-meter POA

The POA for the radon pathway, which targets release of Rn-222 from sources within the waste zone, is located at the surface of each individual DU. Radon pathway transient fluxes are computed for each DU as follows:

$$DU(u)\%RFLX(j) = \sum_{n=1}^{nRFX} DU(u)\%rNUC(n)\%RFLX_{DF}(j) \times (DU(u)\%rNUC(n)\%Inv_{old} + DU(u)\%rNUC(n)\%Inv_{new}) \quad \text{Eq. (I-8)}$$

where:

rNUC(n) List of radon pathway parent radionuclides in *DU*
RFLX(j) Radon pathway transient fluxes (pCi m^{-2} s^{-1})
$RFLX_{DF}(j)$ Radon pathway transient flux factors (pCi m^{-2} s^{-1} Ci^{-1})
nRFX Number of radon pathway parent radionuclides in *DU*

During stochastic simulations, concentrations and doses calculated from Eq. (I-3) through Eq. (I-8) are used to compute the proximity of these values to their respective PO by computing maximum SOFs for each exposure pathway and MC realization.

The maximum SOF for each GW pathway is computed at the DU and ELLWF levels as follows:

$$DU(u)\%\text{maxSOF}(r,s) = \text{maxval}\{DU(u)\%\text{GWPW}(i,j)/PO(s)\}$$
$$ELLWF\%\text{maxSOF}(r,s) = \text{maxval}\{ELLWF\%\text{GWPW}(ii,j)/PO(s)\} \quad \text{Eq. (I-9)}$$

where:

r MC realization index (1 to 10,000)
s Scenario index (GWPB=1, GWPA=2, GWPR=3, GWPU=4, PAAP=5)[5]
PO(s) PO (4 mrem yr^{-1}, 15 pCi L^{-1}, 5 pCi L^{-1}, 30 µg L^{-1}, 25 mrem yr^{-1})

The maxval function in Eq. (I-9) computes the maximum value of the SOF over all elements and time on the 100-meter POA.

The maximum SOF for each IHI pathway is computed at the DU level as follows:

$$DU(u)\%\text{maxSOF}(r,s) = \text{maxval}\{DU(u)\%\text{PAII}(j)/PO(s)\} \quad \text{Eq. (I-10)}$$

[5] GWPB (GWP beta-gamma); GWPA (GWP gross-alpha); GWPR (GWP radium); GWPU (GWP uranium); PAAP (PA all-pathways).

where:

s Scenario index (PAAI=6, PACI=7)[6]

PO(s) PO (500 mrem, 100 mrem yr^{-1})

The maximum SOF for each IHI pathway over all DUs is computed as follows:

$$ELLWF\%\text{maxSOF}(r,6{:}7) = \max\{DU(u)\%\text{maxSOF}(r,6{:}7)\} \quad \text{Eq. (I-11)}$$

The maximum SOF for the air pathway is computed at the DU and ELLWF levels as follows:

$$\begin{aligned} DU(u)\%\text{maxSOF}(r,s) &= \text{maxval}\{DU(u)\%\text{AIRP}(j)/PO(s)\} \\ ELLWF\%\text{maxSOF}(r,s) &= \text{maxval}\{ELLWF\%\text{AIRP}(j)/PO(s)\} \end{aligned} \quad \text{Eq. (I-12)}$$

where:

s Scenario index (AIRP=8)[7]

PO(s) Performance objective (10 mrem yr^{-1})

The maximum SOF for the radon pathway is computed at the DU level as follows:

$$DU(u)\%\text{maxSOF}(r,s) = \text{maxval}\{DU(u)\%\text{RFLX}(j)/PO(s)\} \quad \text{Eq. (I-13)}$$

where:

s Scenario index (RFLX=9)[8]

PO(s) Performance objective (20 pCi m^{-2} s^{-1})

The maximum SOF for the radon pathway over all DUs is computed as follows:

$$ELLWF\%\text{maxSOF}(r,9) = \max\{DU(u)\%\text{maxSOF}(r,9)\} \quad \text{Eq. (I-14)}$$

The overall maximum SOF in the ELLWF, during a MC realization, is computed as follows:

$$ELLWF\%\text{maxSOF}(r,0) = \max\{ELLWF\%\text{maxSOF}(r,1{:}9)\} \quad \text{Eq. (I-15)}$$

The closure analysis employed in PA2022 updates and extends the FORTRAN algorithm used by Hamm et al. (2018) and explicitly addresses all four exposure pathways (GW, IHI, air, and radon) as defined in Table 8-1 for the 27 ELLWF DUs included in PA2022.

[6] PAAI (PA IHI-Acute); PACI (PA IHI-Chronic)
[7] AIRP (air pathway)
[8] RFLX (radon flux)

Given the inherent uncertainties associated with inventories and their projection to calendar year 2065, the supplemental stochastic approach to closure analysis is deemed warranted. The basic closure analysis strategy follows the steps outlined below:

Initial Setup

1. Existing CWTS radionuclide inventories for operating and closed DUs are input.
2. DU-specific radionuclide inventory limits for every pathway are input for each CWTS time window (taken from Chapters 7 and 8).
3. Dose-factor history time profiles are input for the GW pathways and are computed from transient aquifer concentrations that vary spatially over the entire 100-meter POA. The output of these concentrations is recorded in PORFLOW HIST files.
4. Transient dose factors are input for the IHI pathways and are computed from soil concentrations within the waste zone of a DU.
5. Transient dose factors are input for the air pathway and are computed for plume concentrations at the 100-meter POA from volatile radionuclides emanating from a DU.
6. Transient dose factors are input for the radon pathway and are computed from the flux of Rn-226 at the surface of each DU. All parent radionuclides that produce Rn-226 are included.
7. Biases and uncertainties associated with waste-generator inventories are input for every parent radionuclide on a DU basis.
8. Log-normal distributions or composition vectors associated with the 2065 projected closure compositions within each DU are input.

Deterministic Simulation

1. DU-specific, best-estimate composition vectors (CWTS closure inventories) are imposed. The composition vector is comprised of an existing inventory vector (operating or closed DU) and a projected inventory vector (operating or future DU). The existing inventory vector is based on CWTS inventories supplied by the waste generators.
2. DU-projected inventory vectors are adjusted such that a total maximum SOF of 1.0 is achieved for a limiting pathway within a CWTS time window. For the GW and air pathways, inventory limits include PIFs.
3. The resulting, projected CWTS closure inventories are adjusted using bias multipliers ($\leq$ 1).
4. The maximum dose and peak time for each GW, IHI, air, and radon pathway are computed using the CWTS-adjusted closure inventories.
5. Plots of ELLWF GW pathway doses along the North curtain are generated at the peak time. Plots of transient GW pathway doses for the top-ten DUs sorted by peak doses are generated at the element on the curtain where the DU peak dose occurs.
6. Plots of transient acute and chronic IHI pathway doses are generated for the top-ten DUs with peak doses.

7. Plot of transient air pathway doses is generated for the top-ten DUs with peak doses and the total for the ELLWF.
8. Plot of transient radon pathway doses is generated for the top-ten DUs with peak doses.
9. Plots of transient DU pathway doses are generated for the top-ten contributing radionuclides. The transient DU total doses are also plotted. Transient doses at the element of peak dose on the North curtain are plotted for GW pathways.

Stochastic Simulations (Monte Carlo Method)

1. DU-specific closure composition vectors are generated for each MC realization. The composition vector is comprised of an existing inventory vector (open or closed DU) and a projected, stochastic inventory vector (open or future DU). The existing inventory vector is based on CWTS inventories supplied by the waste generators. The projected stochastic inventory vector is randomly sampled from a log-normal distribution (ST and ET) or determined from a composition vector computed from an existing inventory (LAWV, ILV, and NR26E). The projected stochastic inventory vector is normalized to a unit composition (Ci per Ci).
2. CWTS inventory uncertainties are randomly sampled from a gaussian distribution for each radionuclide within the DU.
3. For a closed DU, CWTS inventory biases and uncertainties are applied to existing inventories to produce the stochastic closure inventories.
4. For an open or future DU, a future SOF vector (w) is computed for each pathway within a CWTS time window using the unit composition vector (n) and the reciprocal of each member of the inventory limits matrix (w by n), where n is the number of radionuclides in the DU and w is the number of CWTS time windows. The future SOF vector is scaled and added to an existing SOF vector until a total SOF of 1.0 is achieved for the limiting pathway within a CWTS time window. The CWTS projected total inventory is the sum of the scaled unit composition and the existing inventory. The stochastic closure inventory is the product of the CWTS inventory bias and uncertainty applied to the CWTS projected total inventory.
5. The maximum total SOFs for each GW, IHI, air, and radon pathway are computed using stochastic closure inventories at each MC realization. A maximum total SOF of all pathways is further computed. The maximum total SOFs for each realization and pathway are stored at the ELLWF and DU level in csv files. The csv files are postprocessed to create histograms of maximum SOF for significant pathways. The files are further processed to create mean, standard deviation, and the coefficient of variation for each pathway within a DU and the ELLWF. The maximum total SOF over all MC realizations is located at realization number (r_{max}), which is used to retrieve stochastic closure inventories for dose output processing.
6. Plots of maximum SOF as a function of MC realization are generated for each pathway at the ELLWF and DU level.
7. Plots of total SOF as a function of MC realization are generated for each pathway within a CWTS time window at the DU level.

8. Plots of ELLWF GW pathway doses along the North curtain are generated at the peak time for realization r_{max}. Plots of transient GW pathway doses for the top-ten DUs sorted by peak doses are generated at the element on the curtain where the DU peak dose occurs.
9. Plots of transient acute and chronic IHI pathway doses are generated for the top-ten DUs with peak doses for realization r_{max}.
10. Plot of transient air pathway doses is generated for the top-ten DUs with peak doses and the total for the ELLWF for realization r_{max}.
11. Plot of transient radon pathway doses is generated for the top-ten DUs with peak doses for realization r_{max}.
12. Plots of transient DU pathway doses are generated for the top-ten contributing radionuclides for realization r_{max}. The transient DU total doses are also plotted. Transient doses at the element of peak dose on the North curtain are plotted for GW pathways.

I.4 CLOSURE ANALYSIS RESULTS

Section I.4.1 presents deterministic results for all exposure pathways based on the upper-bound projected CWTS closure inventories with CWTS inventory biases applied. Results are presented in the following three subsections:

- Section I.4.1.1 presents ELLWF concentrations and doses along the North curtain of the 100-POA for all exposure pathways at the time of peak dose during the compliance period. The top-ten, ranked DUs contributing to dose are also shown for each exposure pathway as a function of time. No POs are exceeded at the ELLWF (GW) and DU level during the compliance period.
- Section I.4.1.2 documents for each exposure pathway during the compliance period the maximum and total, transient concentrations and doses for each individual DU and its top-ten contributing parent radionuclides. No DUs or radionuclides exceed the POs during the compliance period.
- Section I.4.1.3 provides total, transient concentrations and doses by DU for the GW pathways during the post-compliance period. The top-ten contributing parent radionuclides in each DU are included. During the post-compliance period, ST14, LAWV, ILV, NR07E, and NR26E exceed the beta-gamma PO, LAWV and ILV exceed the gross-alpha PO, and ILV and NR26E exceed the all-pathways PO.

Section I.4.2 presents stochastic results for (1) a closed DU with CWTS inventory biases and uncertainties applied to existing inventories to generate stochastic closure inventories; (2) an open or future DU with CWTS inventory biases and uncertainties applied to CWTS projected total inventories. Results are based on a MC simulation with 10,000 realizations and are presented for all exposure pathways in the following subsections:

- Section I.4.2.1: Curtain doses and concentrations for the ELLWF and top-ten contributing DUs during the compliance period at the MC realization of overall maximum SOF (1.959 at r_{max} = 7511).

- Section I.4.2.2: Curtain doses and concentrations by individual DU and top contributing parent radionuclides at the realization of overall maximum SOF (1.959 at r_{max} = 7511).
- Section I.4.2.3: Maximum total SOF for the ELLWF and all 27 DUs and total SOF (DU CWTS Time Window) plots as a function of sequential realizations.
- Section I.4.2.4: ELLWF and DU maximum SOF histograms derived from the MC simulation of 10,000 realizations.
- Section I.4.2.5: ELLWF and DU maximum SOF statistics derived from the MC simulation of 10,000 realizations.

I.4.1 Deterministic Results

The Closure Analysis Toolkit computes deterministic concentrations and doses at POAs using existing, future, or total CWTS inventories with or without CWTS inventory biases. The deterministic results presented in this section are based on the upper-bound projected CWTS closure inventories, with CWTS inventory biases applied, that are provided in Appendix H, Section H.7.2.

I.4.1.1. Doses and Concentrations for ELLWF and Top-Ten Disposal Units Along North Curtain During Compliance Period

Concentrations and doses along the North curtain of the 100-meter POA for the GW pathways at the time of peak dose are shown in the left image of Figure I-1 through Figure I-5 for beta-gamma, gross-alpha, radium, uranium, and the all-pathways exposure pathways, respectively. The right image of Figure I-1 through Figure I-5 presents transient concentrations and doses for the top-ten ranked DUs at the element along the North curtain where the peak for each DU occurs during the compliance period. The Limit curve (solid red) in each GW plot is the PO of 4 mrem yr^{-1}, 15 pCi L^{-1}, 5 pCi L^{-1}, 30 μg L^{-1} and 25 mrem yr^{-1}, respectively, for each GW pathway. The max curve (solid black) in each figure is the maximum curtain dose at each point in time for the GW pathway. The peak of the max curve and timing corresponds to the peak concentration/dose on the curtain plot to the left for each GW pathway. The top contributing DUs for beta-gamma, gross-alpha, radium, uranium, and all-pathways exposure scenarios are ST24, ET08, ET08, ET08 and ET07, respectively.

Transient doses of the top-ten ranked DUs for the acute and chronic IHI pathway are shown in Figure I-6. The Limit curve (solid red) in each plot is the PO of 500 mrem and 100 mrem yr^{-1}, respectively, for each pathway. The top contributing DUs for acute and chronic IHI exposure scenarios are ST23 and NR26E, respectively.

Transient doses/fluxes of the top-ten ranked DUs for the air and radon pathways are shown in Figure I-7. The solid-red Limit curve in each plot marks the PO of 10 mrem yr^{-1} and 20 pCi m^{-2} s^{-1}, respectively, for each pathway. The solid-black ELLWF curve in the air pathway plot represents the sum of doses from all 27 DUs at each point in time. This curve is compared to the PO to confirm compliance within the PA compliance period. The top-contributing DUs for the air and radon exposure pathways are NR26E and ST06, respectively.

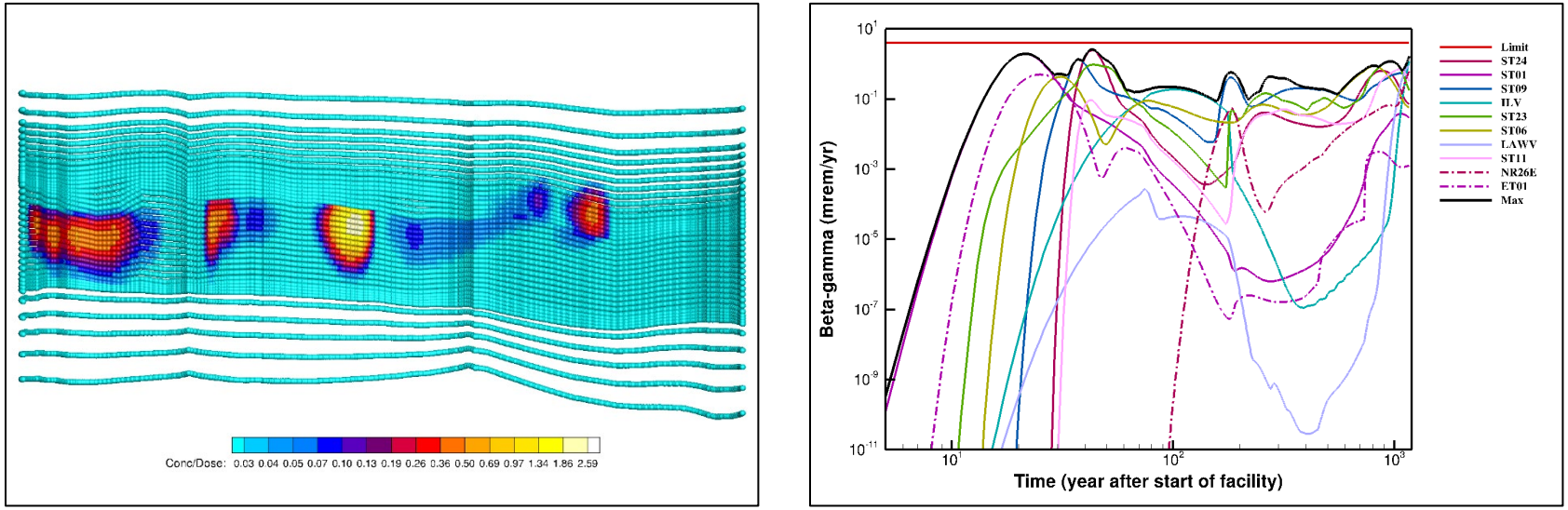


Figure I-1. Beta-Gamma Doses (Year 43) for ELLWF and Top-Ten Contributing Disposal Units During Compliance Period

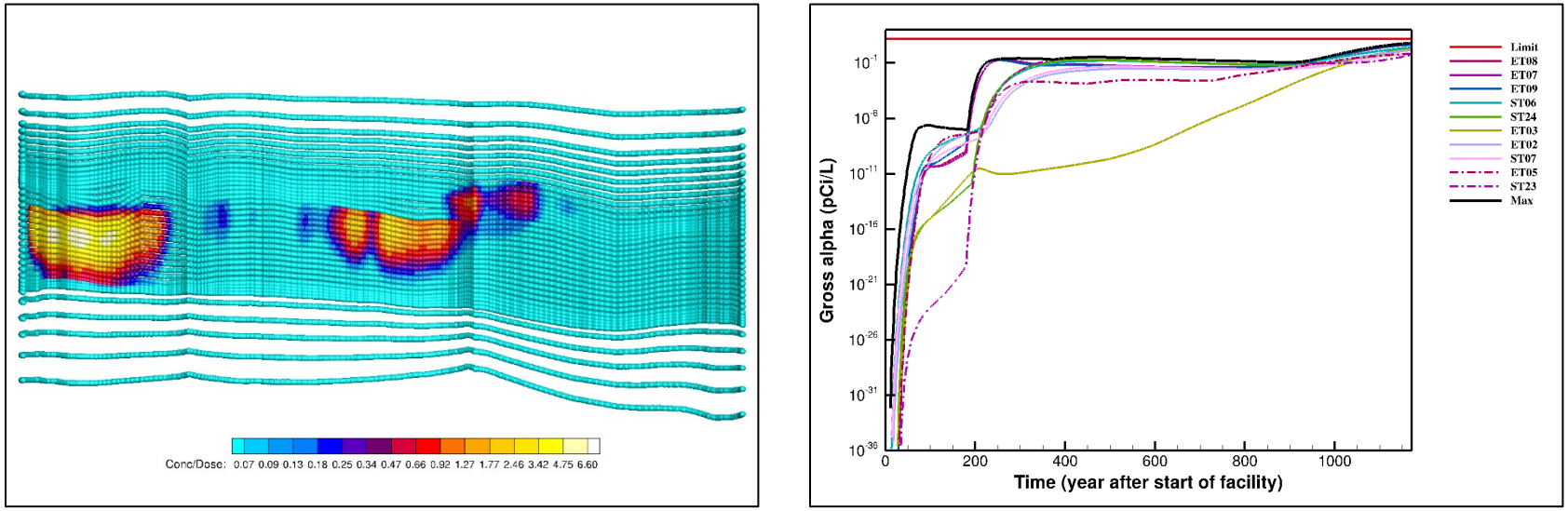


Figure I-2. Gross-Alpha Doses (Year 1,171) for ELLWF and Top-Ten Contributing Disposal Units During Compliance Period

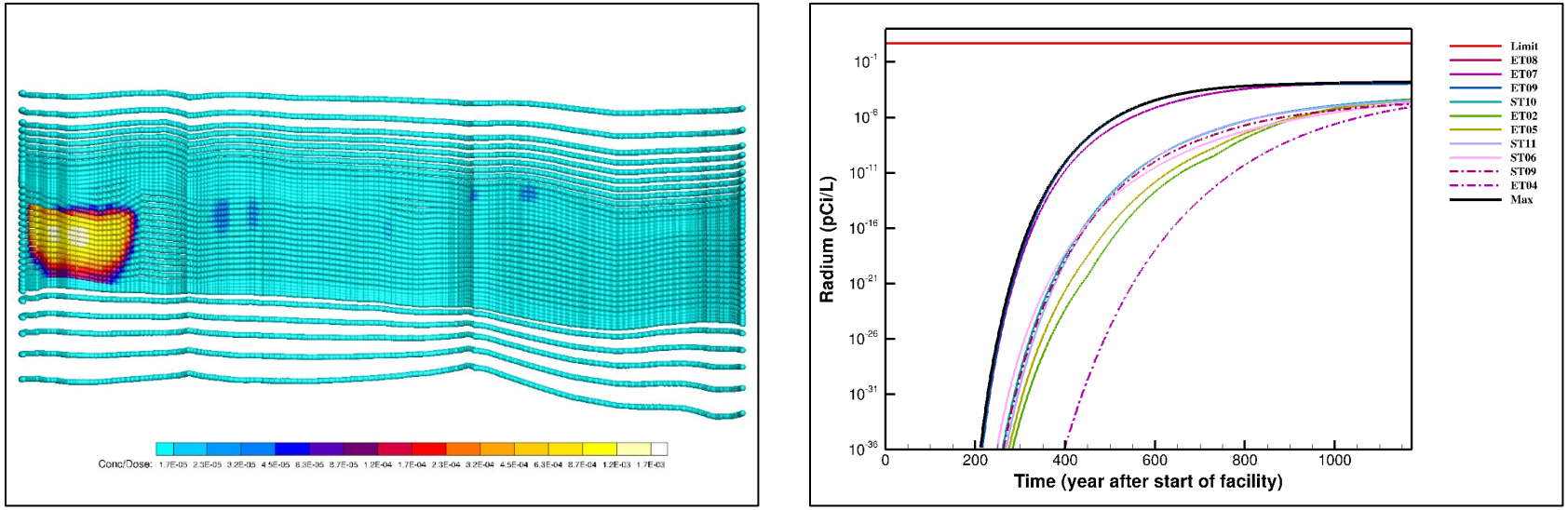


Figure I-3. Radium Concentrations (Year 1,171) for ELLWF and Top-Ten Contributing Disposal Units During Compliance Period

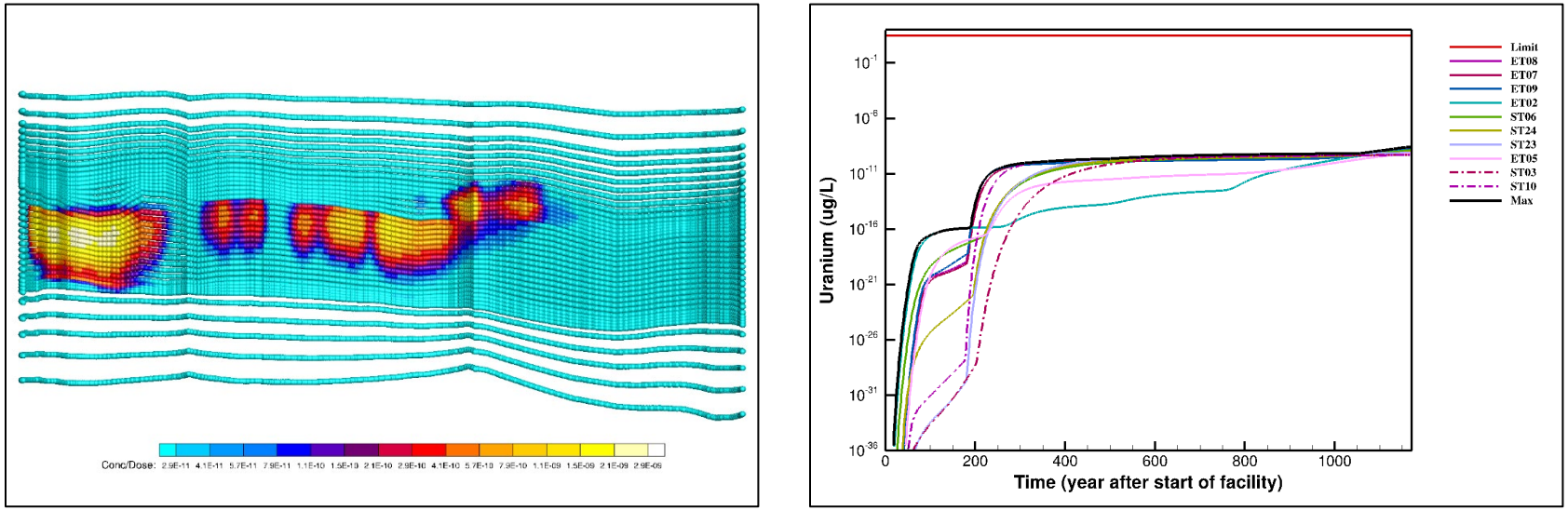


Figure I-4. Uranium Concentrations (Year 1,171) for ELLWF and Top-Ten Contributing Disposal Units During Compliance Period

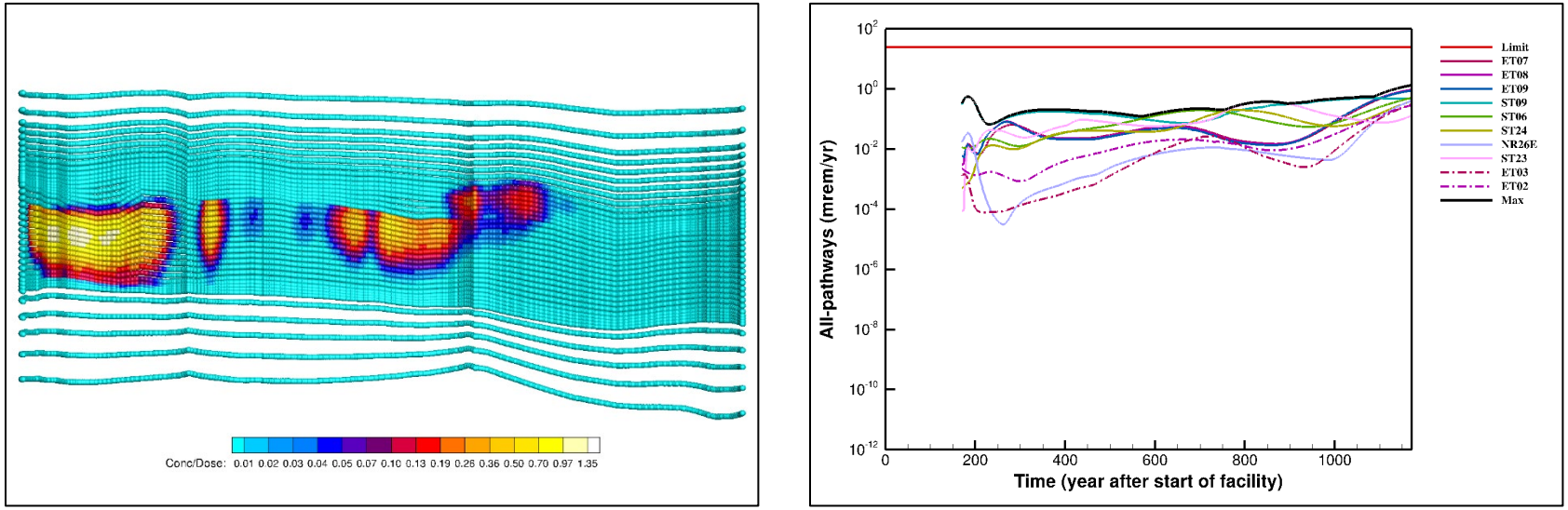


Figure I-5. All-Pathways Doses (Year 1,171) for ELLWF and Top-Ten Contributing Disposal Units During Compliance Period

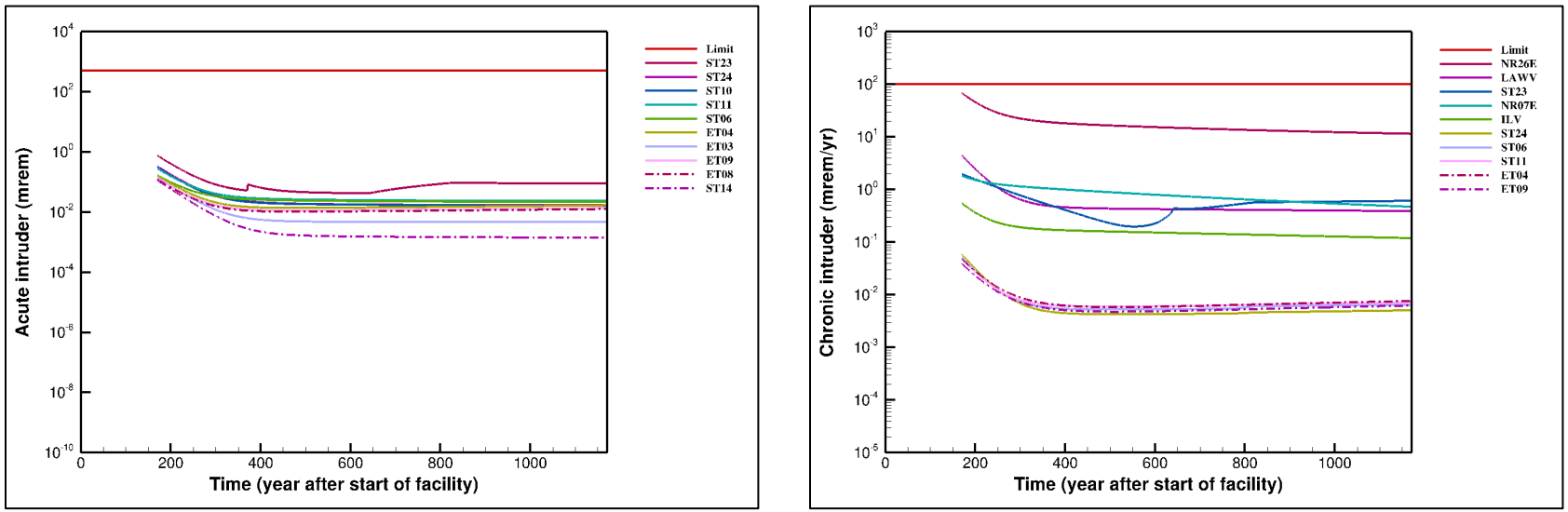


Figure I-6. Inadvertent Human Intruder Acute and Chronic Doses for Top-Ten Contributing Disposal Units During Compliance Period

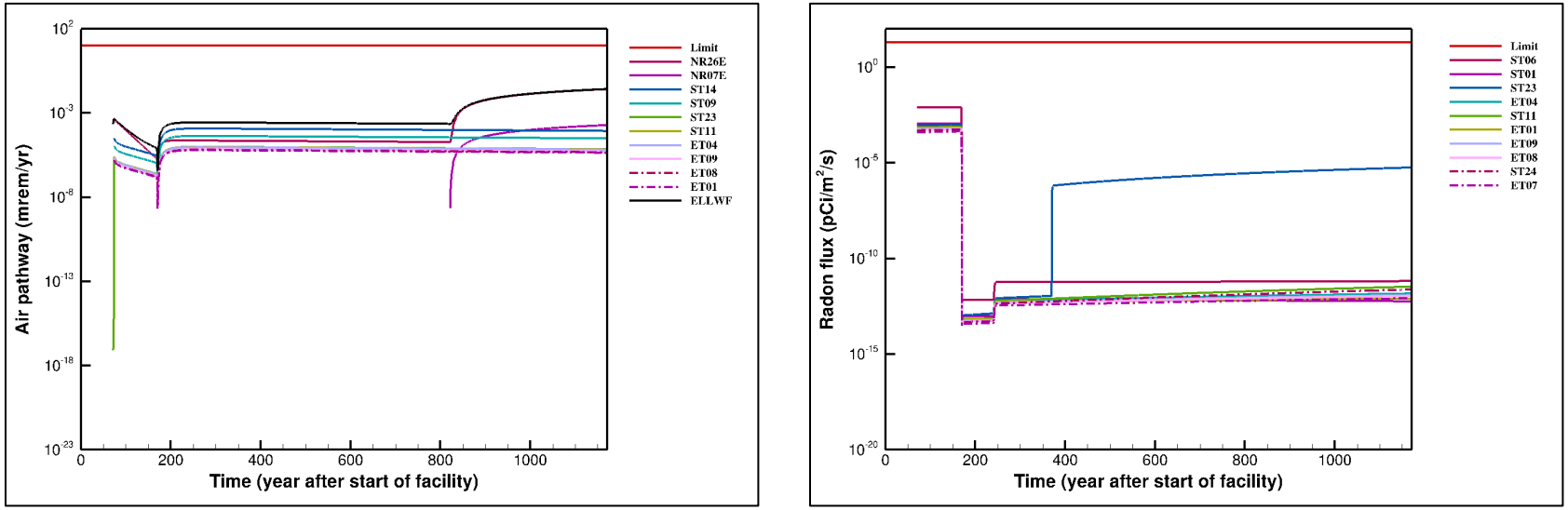


Figure I-7. Dose/Flux for ELLWF and Top-Ten Contributing Disposal Units During Compliance Period for Air and Radon Pathways

Table I-45 summarizes the deterministic peak concentrations and doses for each exposure pathway as derived from Figure I-1 through Figure I-7. The IHI-Chronic, beta-gamma, gross-alpha, and all-pathways exposure scenarios have the top-four highest SOFs, ranging from 68.33% to 5.39%.

Table I-45. Summary of Deterministic Peak Concentration and Dose for Exposure Scenarios

Exposure Scenario	Performance Objective	Peak Time (Year)	Peak Concentration/Dose	SOF
Air Pathway	10 mrem yr^{-1}	1,171	2.66E-02	0.27%
Radon Pathway	20 pCi m^{-2} s^{-1}	170	7.93E-03	0.04%
All-Pathways	25 mrem yr^{-1}	1,171	1.35E+00	5.39%
Water Resources				
Beta-Gamma	4 mrem yr^{-1}	43	2.59E+00	64.75%
Gross-Alpha	15 pCi L^{-1}	1,171	6.61E+00	44.04%
Ra-226+Ra-228	5 pCi L^{-1}		1.68E-03	0.03%
Uranium (total)	30 µg L^{-1}		2.95E-09	0.00%
Inadvertent Human Intruder				
Chronic Exposure	100 mrem yr^{-1}	171	6.83E+01	68.33%
Acute Exposure	500 mrem		7.51E-01	0.15%

Table I-46 through Table I-49 summarize the top-ten ranked DUs with the greatest SOF impacts (> 1%) for each exposure pathway. The peak dose in each table is highlighted in orange. Deterministic IHI-Chronic transient doses for the top-ten contributing DUs are shown in Figure I-6; peak doses are displayed in Table I-46. NR26E has a peak dose 15 times greater than the LAWV's. The peak doses for all ten DUs occur at the end of IC in Year 171.

Table I-46. Deterministic Peak Doses for IHI-Chronic Exposure Pathway

DU	IHI-Chronic Dose (mrem yr^{-1})	SOF (-)	Time of Peak Dose (Year)
NR26E	68.33	0.6833	171
LAWV	4.44	0.0444	
ST23	1.95	0.0195	
NR07E	1.83	0.0183	
ILV	0.54	0.0054	
ST24	0.06	0.0006	
ST06	0.05	0.0005	
ST11			
ET04			
ET09	0.04	0.0004	

Notes:
The peak dose is highlighted in orange.

Figure I-1 displays deterministic beta-gamma transient doses for the ELLWF and top-ten DU contributors, while Table I-47 lists peak doses and times of peak dose. A peak dose of 2.484 mrem yr^{-1} at Year 43 for ST24 represents 96% of the total dose for the ELLWF. The location of the peak dose along the North curtain for ST24 and ELLWF appear to be in the same proximity in the center sector of Figure I-1.

Table I-47. Deterministic Peak Doses for Beta-Gamma Groundwater Pathway

DU	Beta-Gamma Dose (mrem yr^{-1})	SOF (-)	Time of Peak Dose (Year)
ELLWF	2.590	0.647	43
ST24	2.484	0.621	
ST01	1.981	0.495	21
ST09	1.352	0.338	37
ILV	1.213	0.303	1,171
ST23	1.161	0.290	968
ST06	0.870	0.217	815
LAWV	0.829	0.207	1,166
ST11	0.697	0.174	1,059
NR26E	0.620	0.155	1,171
ET01	0.505	0.126	25

Notes:
The peak dose is highlighted in orange.

Figure I-2 displays deterministic gross-alpha transient concentrations for the ELLWF and top-ten DU contributors, while Table I-48 lists peak concentrations and times of peak concentration. A peak concentration of 6.606 pCi L^{-1} for the ELLWF is primarily because of plume interactions among ET07, ET08, and ET09 in the western sector of the North curtain as shown in Figure I-2.The peak concentrations of 4.599, 4.599, and 4.278 pCi L^{-1} for ET07, ET08, and ET09, respectively, represent 70%, 70%, and 65% of the ELLWF peak concentration, respectively.

Table I-48. Deterministic Peak Concentrations for Gross-Alpha Groundwater Pathway

DU	Gross-Alpha Concentration (pCi L^{-1})	SOF (-)	Time of Peak Concentration (Year)
ELLWF	6.606	0.440	1,171
ET08	4.599	0.307	
ET07			
ET09	4.278	0.285	
ST06	2.520	0.168	
ST24	1.949	0.130	
ET03	1.493	0.100	
ET02	1.436	0.096	
ST07	0.775	0.052	
ET05	0.657	0.044	
ST23	0.548	0.037	

Notes:
The peak concentration is highlighted in orange.

Figure I-5 displays deterministic all-pathways transient doses for the ELLWF and top-ten DU contributors, while Table I-49 lists peak doses and times of peak dose. A peak dose of 1.347 mrem yr^{-1} for the ELLWF is again primarily because of plume interactions among ET07, ET08, and ET09 in the western sector of the North curtain as shown in Figure I-5. The peak doses of 0.938, 0.937, and 0.872 mrem yr^{-1} represent 70%, 70%, and 65% of the ELLWF peak dose for ET07, ET08, and ET09, respectively. *The top-three DU contributors to all-pathways dose also dominate gross-alpha concentration in the same order.*

Table I-49. Deterministic Peak Doses for All-Pathways Groundwater Exposure Scenario

DU	All-Pathways Dose (mrem yr^{-1})	SOF (-)	Time of Peak Dose (Year)
ELLWF	1.347	0.054	1,171
ET07	0.938	0.038	
ET08	0.937	0.037	
ET09	0.872	0.035	
ST09	0.570	0.023	184
ST06	0.508	0.020	1,171
ST24	0.397	0.016	
NR26E	0.395		
ST23	0.372	0.015	849
ET03	0.305	0.012	1,171
ET02	0.288		

Notes:
The peak dose is highlighted in orange.

I.4.1.2. Doses and Concentrations for Disposal Units and Top-Ten Radionuclides Along North Curtain During Compliance Period

Figure I-8 through Figure I-34 display for all exposure pathways the transient concentrations and doses for the top-ten ranked radionuclides within each ELLWF DU during the compliance period. Each figure comprises up to 9 graphs representing the exposure scenarios within a given DU. The solid-red Limit curve in each graph is the PO for each exposure pathway. The solid-black Max curve in each GW pathway figure represents the maximum curtain dose at each point in time. The peak of the Max curve and its timing corresponds to the peak concentration or dose on the curtain plot for each GW pathway. The DU curve in each GW pathway plot represents the transient concentrations or doses at the element on the North curtain where the peak value for the DU occurs during the compliance period. The DU curve in each non-GW pathway graph represents the summation of radionuclide concentrations or doses within the DU.

Table I-50 through Table I-53 list the top-ten ranked radionuclides with the greatest SOF impacts for each DU and exposure pathway.

Figure I-34 displays the deterministic, transient IHI-Chronic doses for NR26E and its top-ten radionuclide contributors; Table I-50 lists peak doses and times of peak dose for NR26E. Sr-90S, Sn-121mS, Am-241S, and Am-243S account for 95% of the IHI-Chronic dose from NR26E. Peak doses of the top-ten contributing radionuclides occur at the end of IC in Year 171.

Figure I-22 shows the deterministic, transient beta-gamma doses for ST24 and its top-ten radionuclide contributors; Table I-51 lists peak doses and times of peak dose for ST24. H-3 accounts for 100% of the beta-gamma dose in ST24 in Year 43. Peak doses of the top-ten contributing radionuclides occur at different times during the compliance period primarily because of differences in half-lives and radionuclide transport properties (i.e., K_d values in sand and clay regions of the aquifer).

Table I-50. Deterministic Peak Doses for NR26E and Top-Ten Contributing Radionuclides for IHI-Chronic Exposure Pathway

DU/Radionuclide	IHI-Chronic Dose (mrem yr^{-1})	SOF (-)	% of NR26E	Time of Peak Dose (Year)
NR26E	68.3326	0.6833	100.00%	171
Sr-90S	32.8865	0.3289	48.13%	
Sn-121mS	13.9009	0.1390	20.34%	
Am-241S	11.5192	0.1152	16.86%	
Am-243S	6.3951	0.0640	9.36%	
Sn-126S	2.4813	0.0248	3.63%	
Mo-93S	0.7852	0.0079	1.15%	
Nb-93mS	0.2146	0.0021	0.31%	
Nb-94S	0.1067	0.0011	0.16%	
Co-60S	0.0403	0.0004	0.06%	
Cs-137S	0.0029	0.0000	0.00%	

Table I-51. Deterministic Peak Doses for ST24 and Top-Ten Contributing Radionuclides for Beta-Gamma Groundwater Pathway

DU/Radionuclide	Beta-Gamma Dose (mrem yr^{-1})	SOF (-)	% of ST24	Time of Peak Dose (Year)
ST24	2.4843	0.6211	100.00%	43
H-3				
I-129	0.5234	0.1308	21.07%	922
Tc-99	0.2618	0.0655	10.54%	776
Np-237	0.0256	0.0064	1.03%	1,171
Ni-59	0.0095	0.0024	0.38%	973
Ni-63	0.0082	0.0020	0.33%	659
Sr-90	0.0044	0.0011	0.18%	410
C-14	0.0032	0.0008	0.13%	1,171
Am-241	0.0003	0.0001	0.01%	1,171
K-40	0.0001	0.0000		834

Figure I-29 displays the deterministic, transient gross-alpha concentrations for ET08 and its top-ten radionuclide contributors, while Table I-52 lists peak concentrations and times of peak concentration for ET08. Np-237 accounts for 99.55% of the gross-alpha dose concentration from ET08 at the end of the compliance period. All the radionuclides peak at the end of the compliance period except for Ra-226 which peaks in Year 934.

Table I-52. Deterministic Peak Concentrations for ET08 and Top-Ten Contributing Radionuclides for Gross-Alpha Groundwater Pathway

DU/Radionuclide	Gross-Alpha Concentration (pCi L^{-1})	SOF (-)	% of ET08	Time of Peak Concentration (Year)
ET08	4.5987	0.3066	100.00%	1,171
Np-237	4.5779	0.3052	99.55%	
Am-241	0.0113	0.0008	0.25%	
Pu-241	0.0047	0.0003	0.10%	
Ra-226	0.0019	0.0001	0.04%	934
Th-230	0.0014		0.03%	1,171
Pa-231	0.0012			
U-234	0.0006	0.0000	0.01%	
Cm-245	0.0000		0.00%	
Pu-239				
Cf-249				

Figure I-28 displays the deterministic, transient all-pathways doses for ET07 and its top-ten radionuclide contributors; Table I-53 lists peak doses and times of peak dose for ET07. Np-237 (97.94%), C-14 (1.54%), Am-241 (0.22%), Pa-231 (0.11%), and Pu-241 (0.09%) account for 99.90% of the all-pathways dose in ET07 at the end of the compliance period.

Table I-53. Deterministic Peak Doses for ET07 and Top-Ten Contributing Radionuclides for All-Pathways Groundwater Exposure Scenario

DU/Radionuclide	All-Pathways Dose (mrem yr^{-1})	SOF (-)	% of ET07	Time of Peak Dose (Year)
ET07	0.9376	0.0375	100.00%	1,171
Np-237	0.9182	0.0367	97.94%	
Tc-99	0.0480	0.0019	5.12%	636
Sr-90	0.0290	0.0012	3.09%	292
C-14	0.0145	0.0006	1.54%	1,171
I-129	0.0067	0.0003	0.72%	780
Am-241	0.0020	0.0001	0.22%	1,171
Pa-231	0.0011	0.0000	0.11%	
Pu-241	0.0008		0.09%	
Ni-63	0.0006		0.06%	367
Ra-226	0.0005		0.05%	1,020

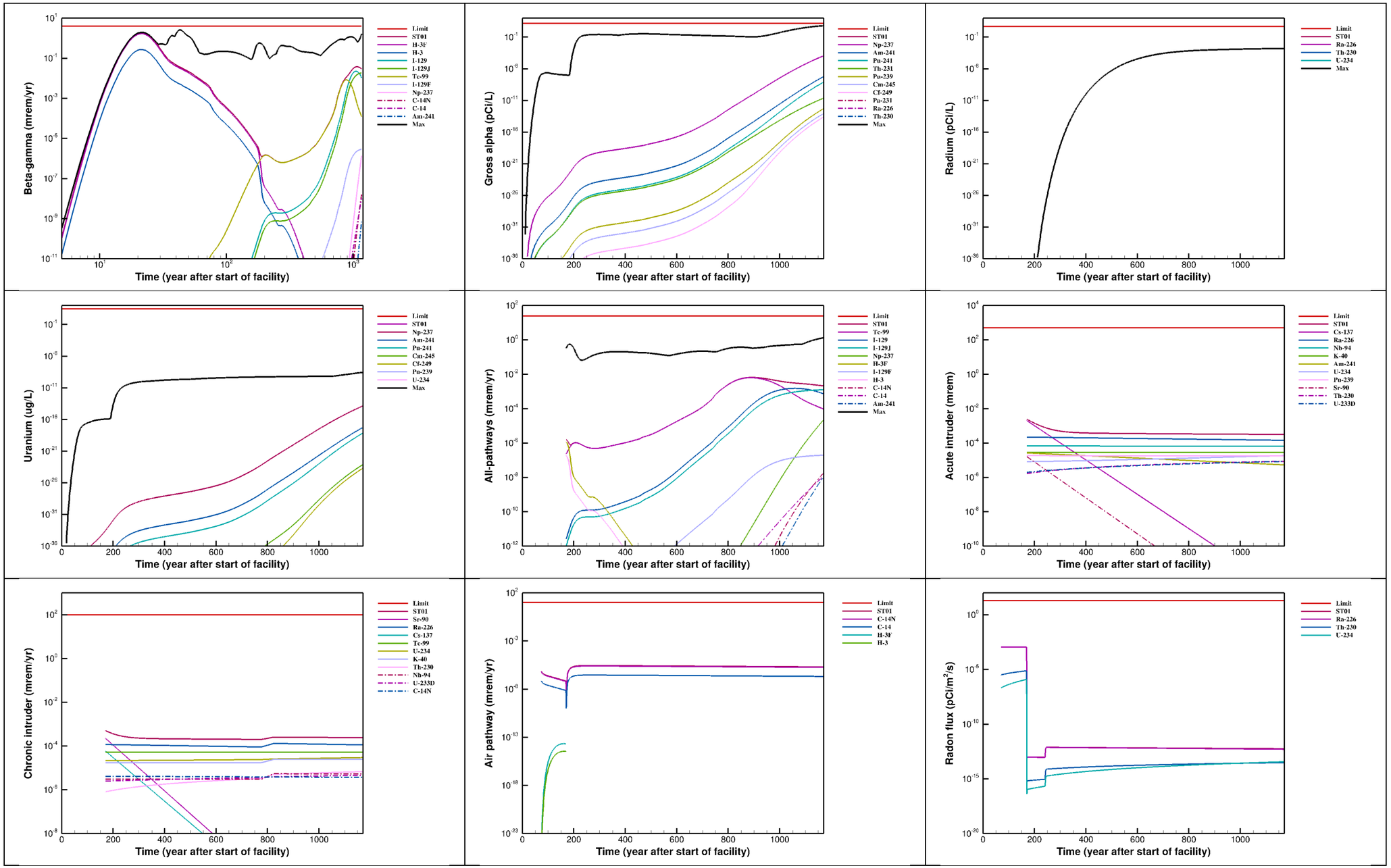


Figure I-8. Doses and Concentrations for ST01 and Top Contributing Radionuclides

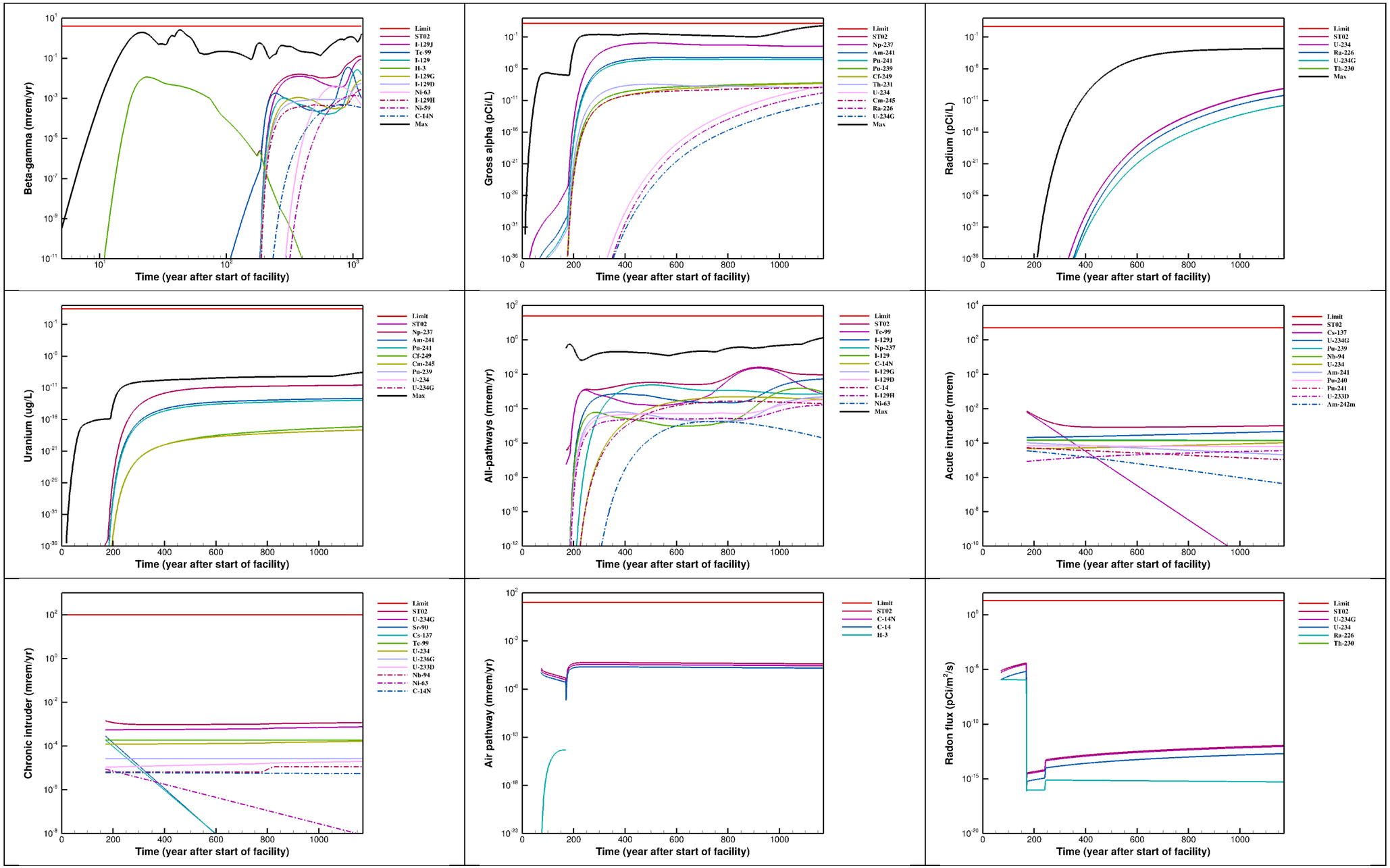


Figure I-9. Doses and Concentrations for ST02 and Top Contributing Radionuclides

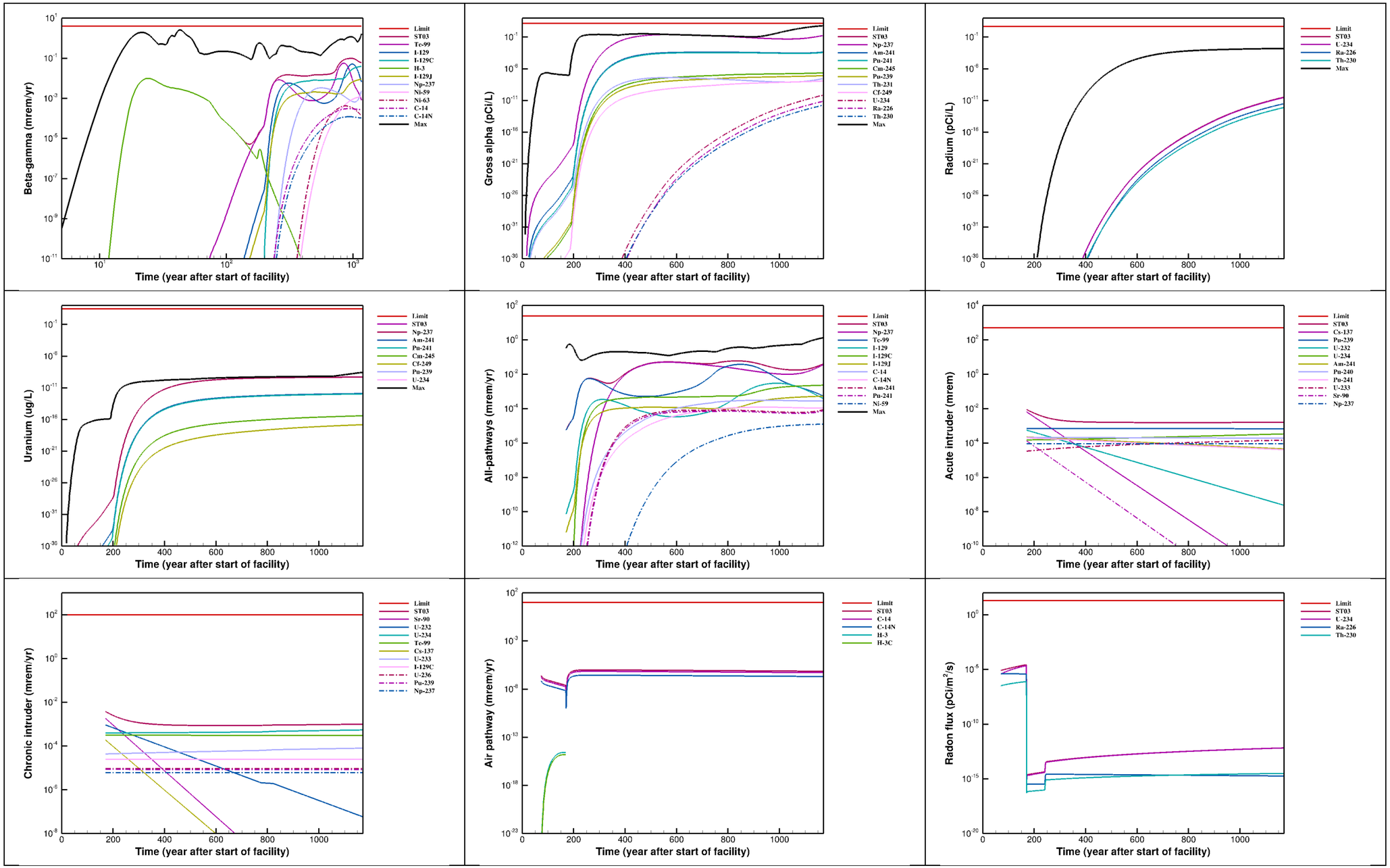


Figure I-10. Doses and Concentrations for ST03 and Top Contributing Radionuclides

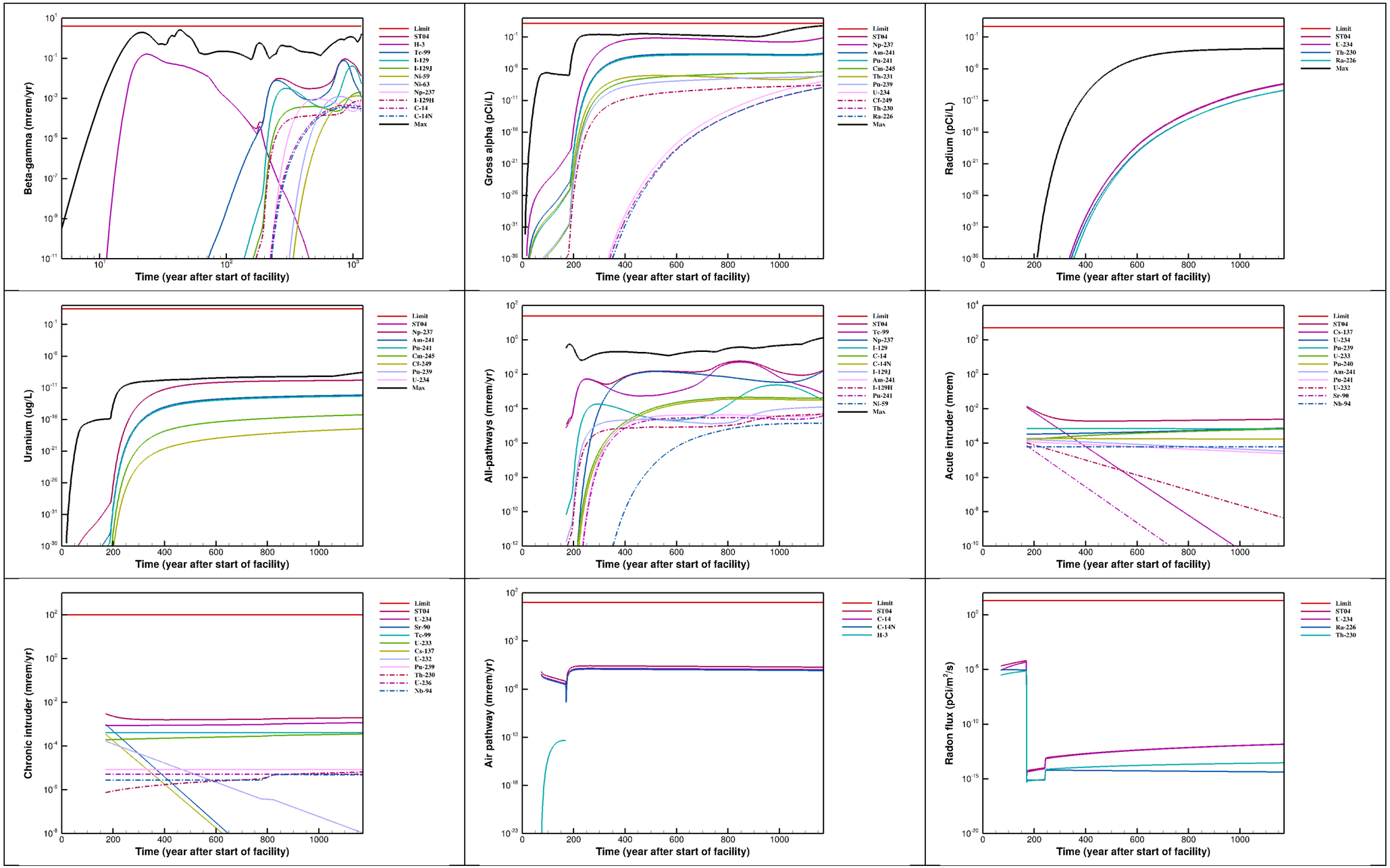


Figure I-11. Doses and Concentrations for ST04 and Top Contributing Radionuclides

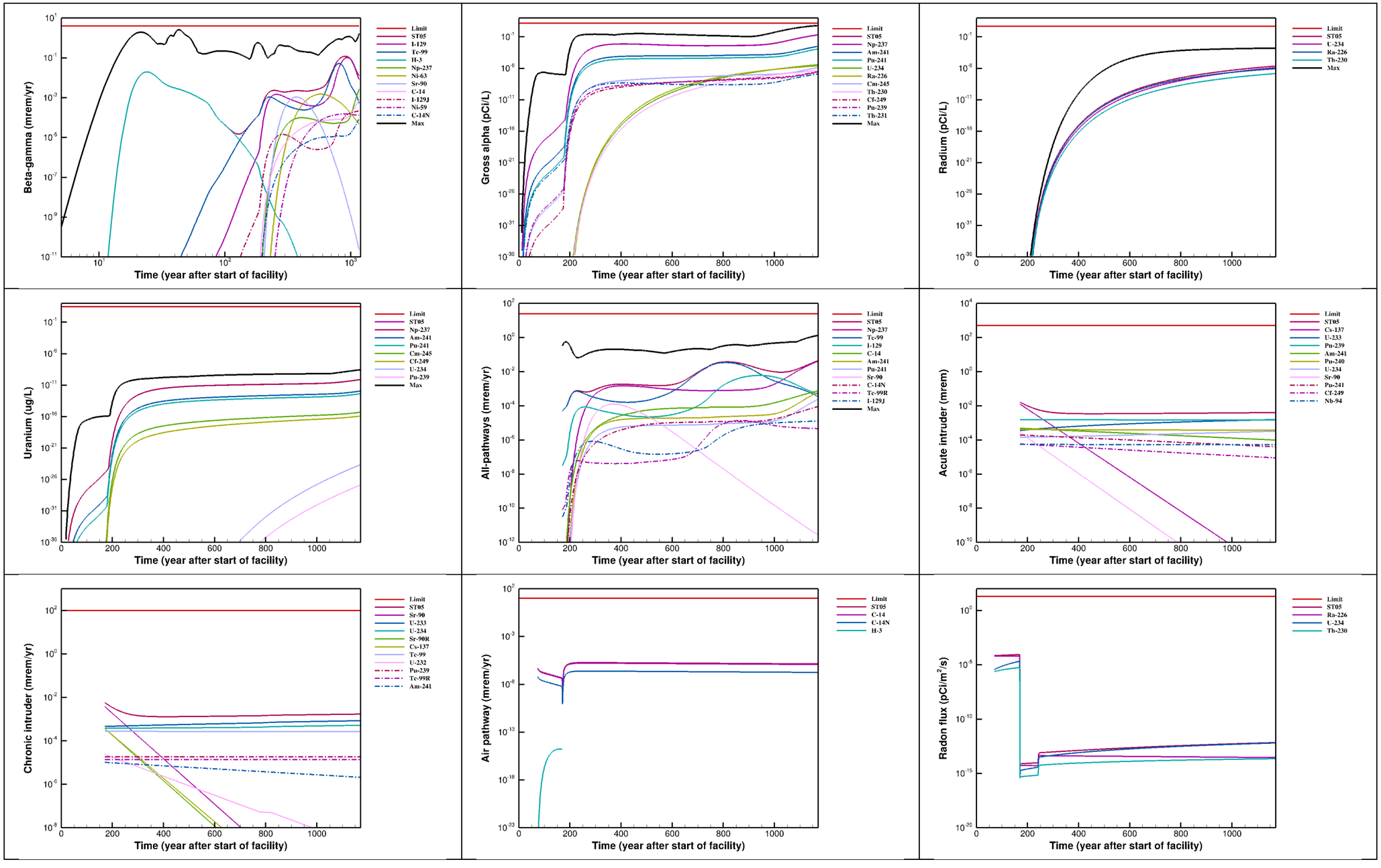


Figure I-12. Doses and Concentrations for ST05 and Top Contributing Radionuclides

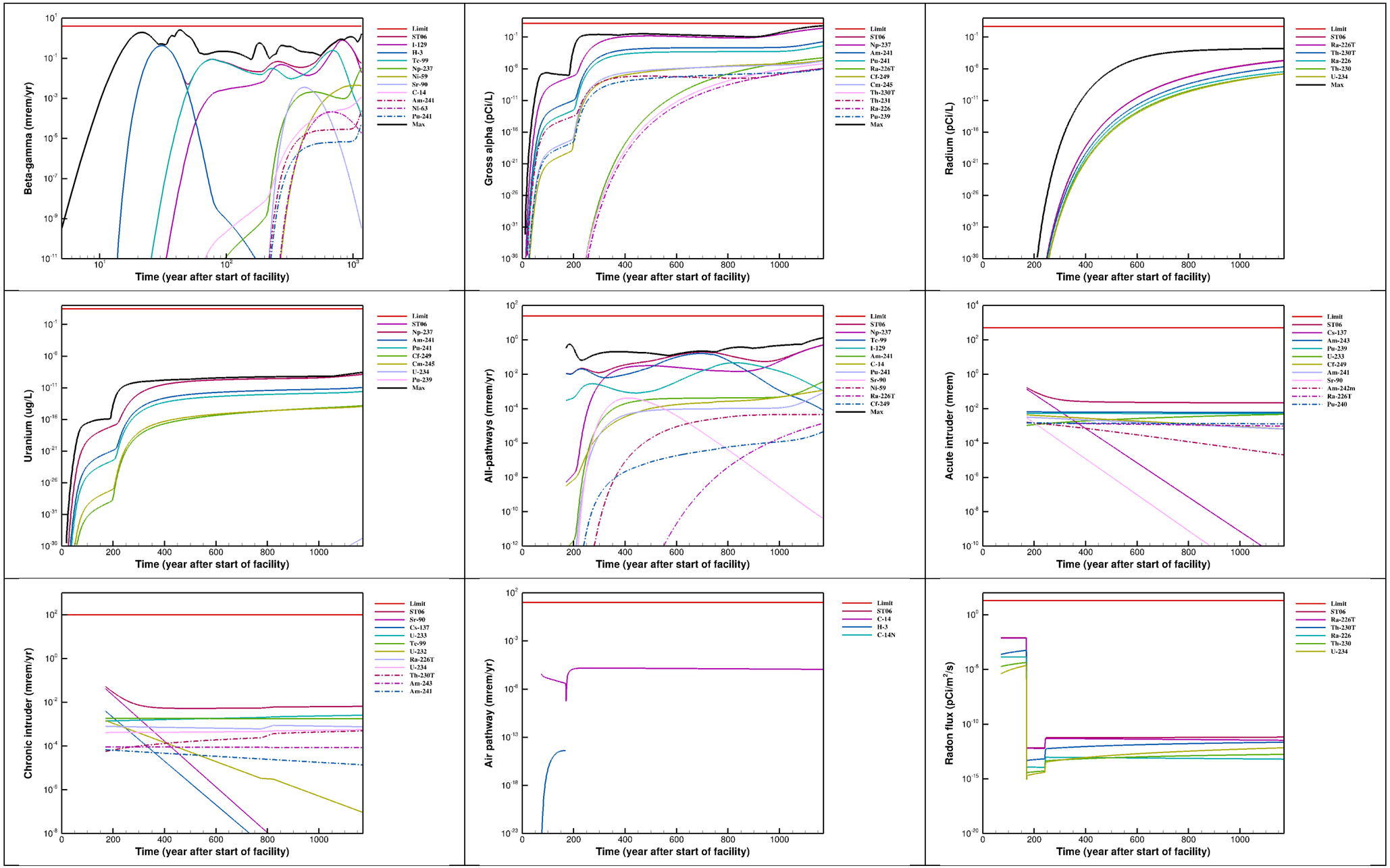


Figure I-13. Doses and Concentrations for ST06 and Top Contributing Radionuclides

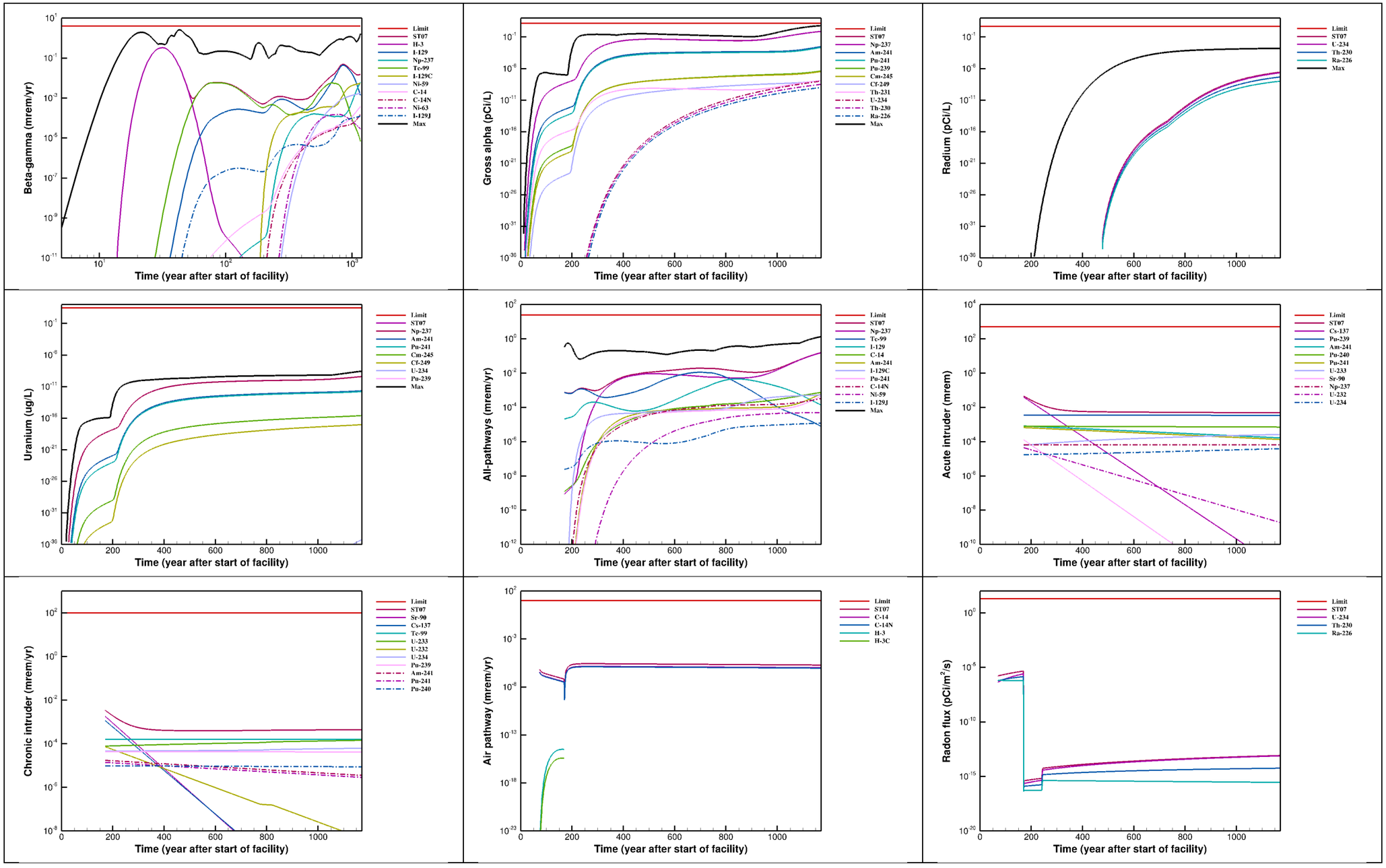


Figure I-14. Doses and Concentrations for ST07 and Top Contributing Radionuclides

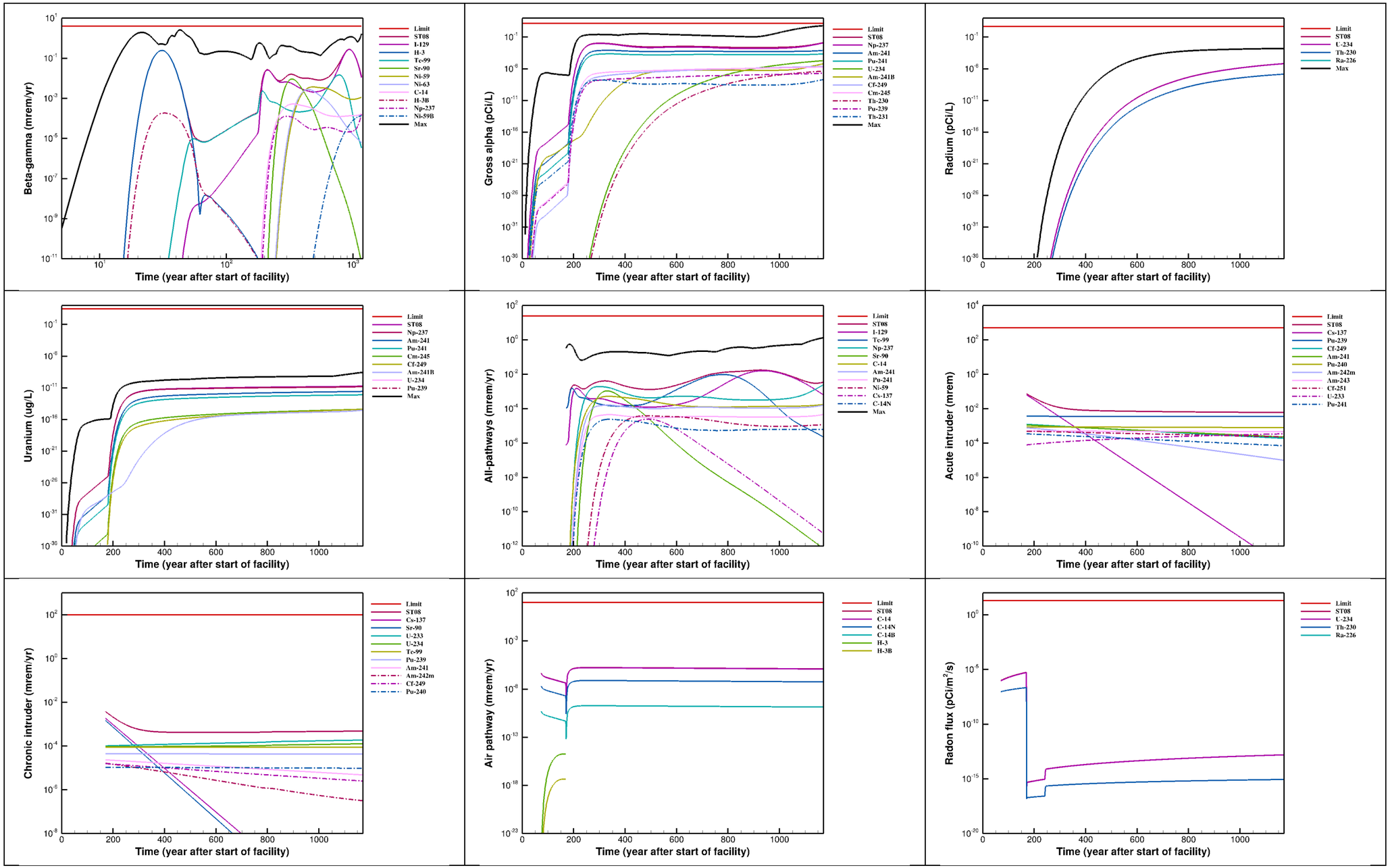


Figure I-15. Doses and Concentrations for ST08 and Top Contributing Radionuclides

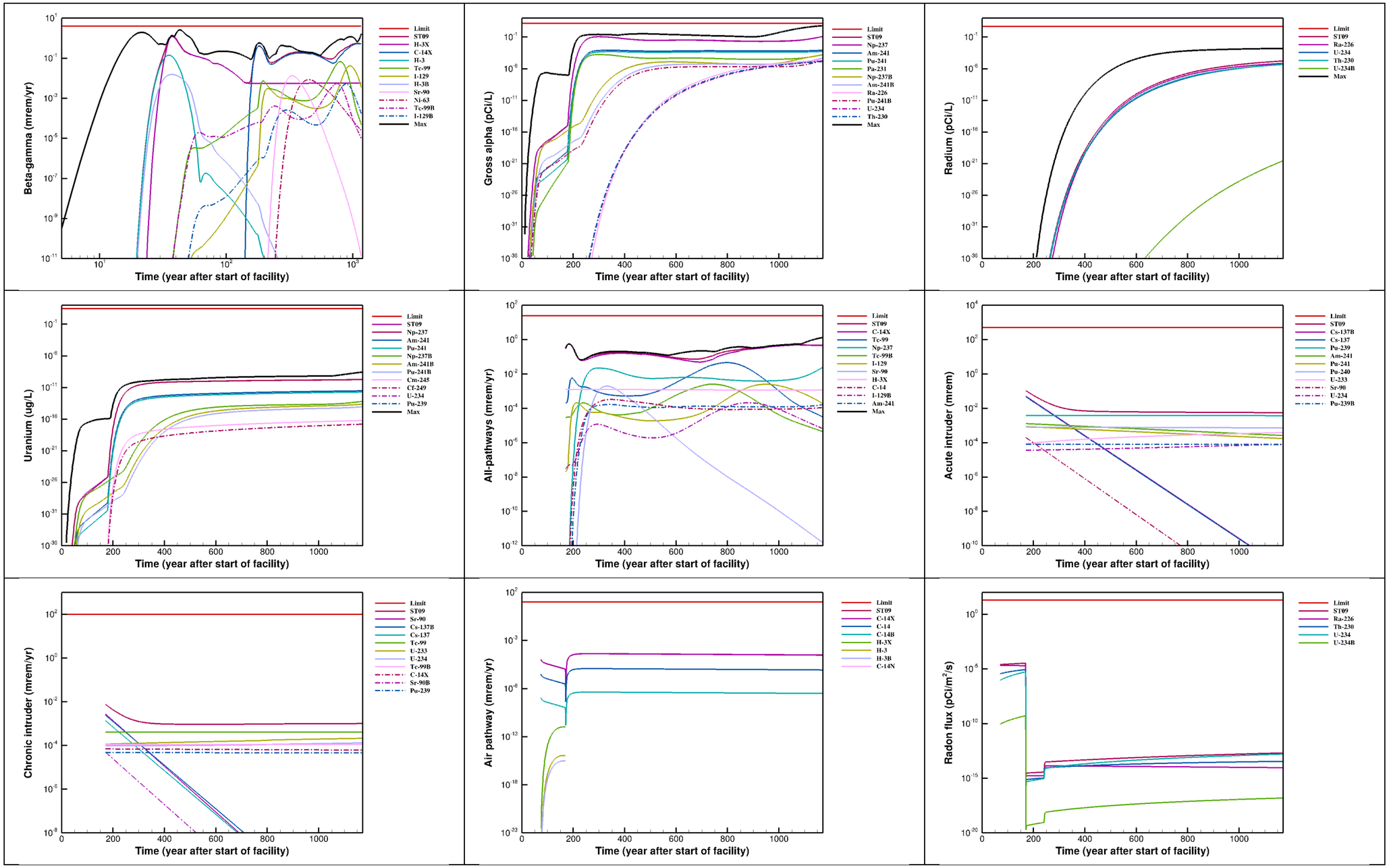


Figure I-16. Doses and Concentrations for ST09 and Top Contributing Radionuclides

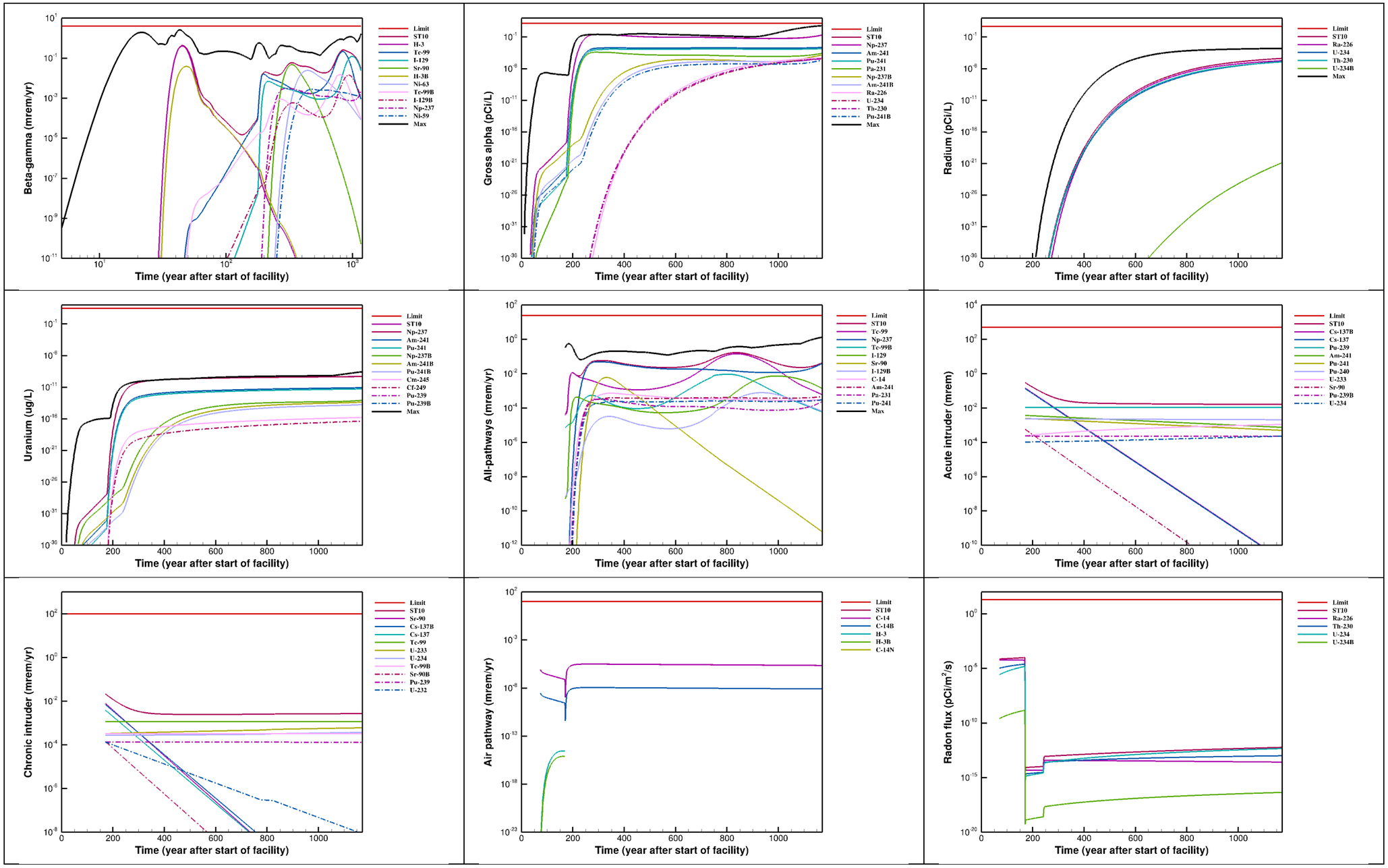


Figure I-17. Doses and Concentrations for ST10 and Top Contributing Radionuclides

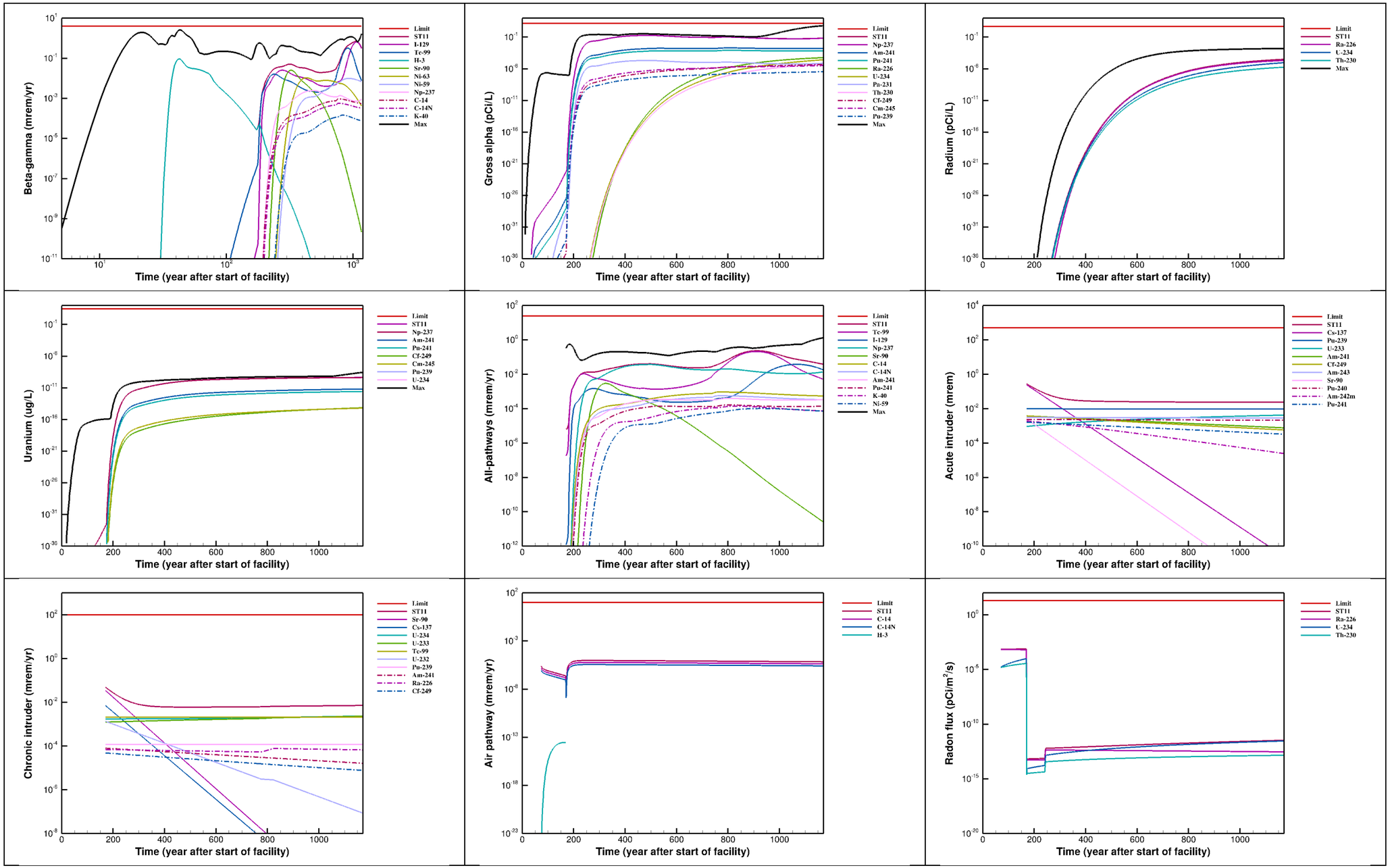


Figure I-18. Doses and Concentrations for ST11 and Top Contributing Radionuclides

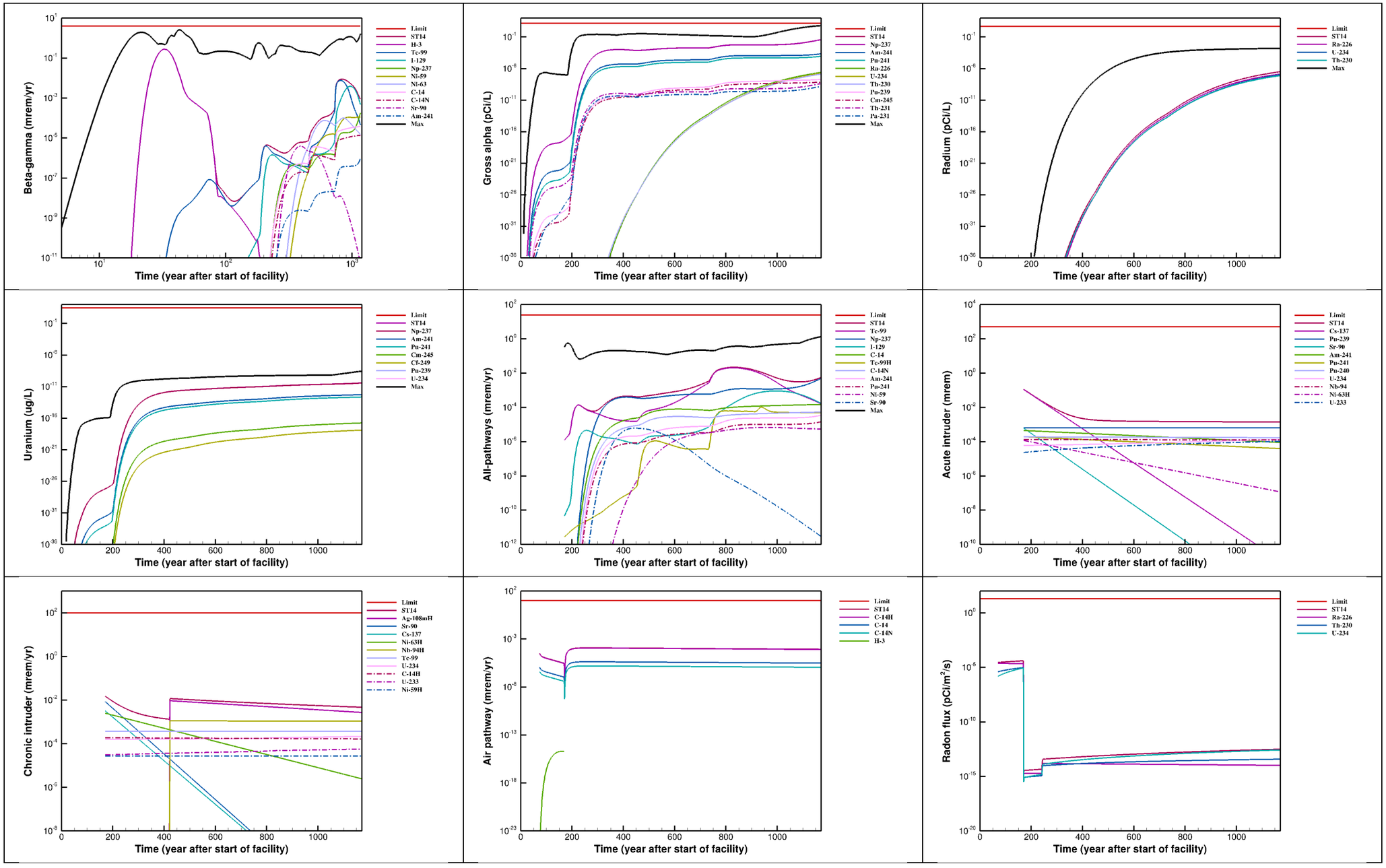


Figure I-19. Doses and Concentrations for ST14 and Top Contributing Radionuclides

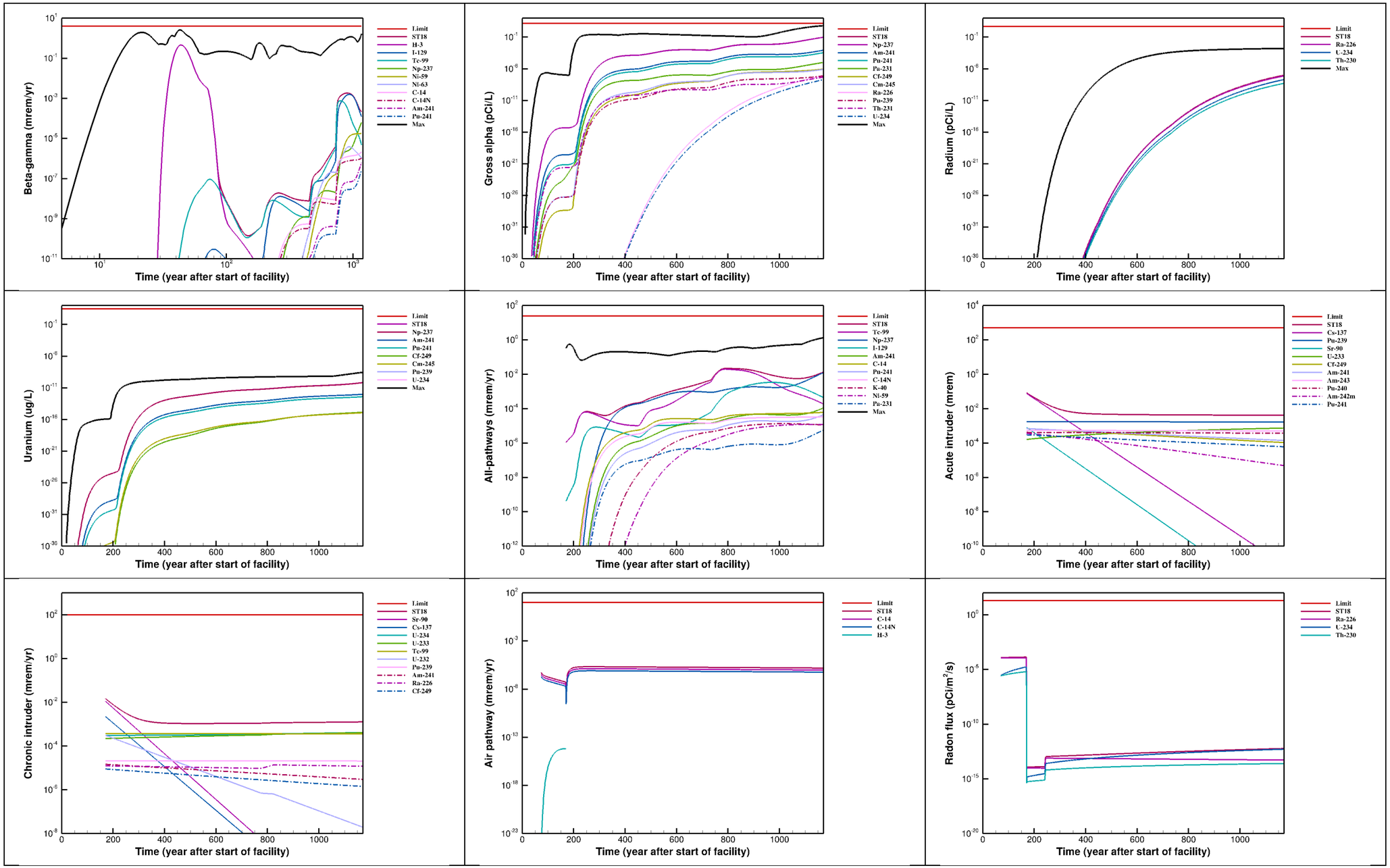


Figure I-20. Doses and Concentrations for ST18 and Top Contributing Radionuclides

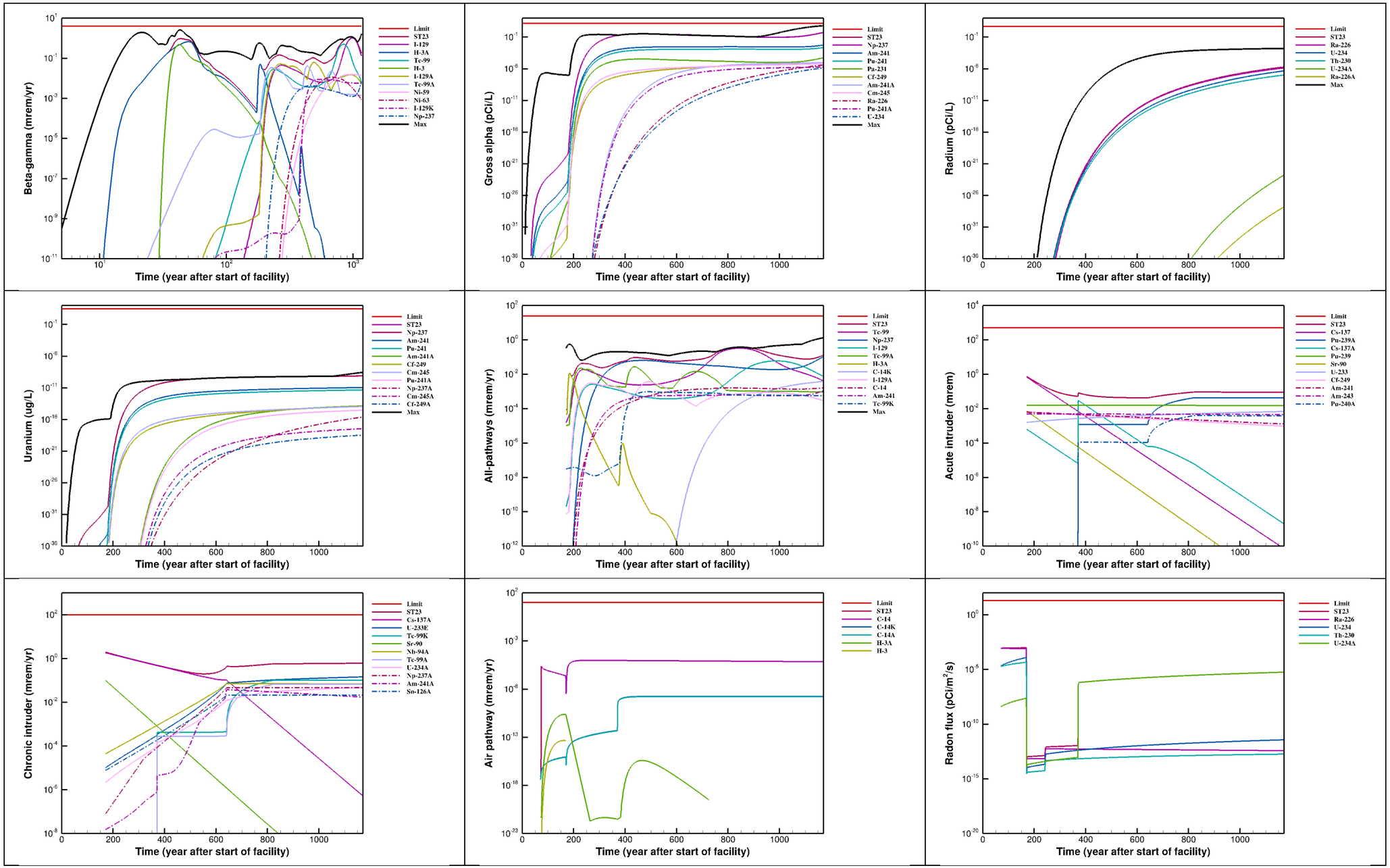


Figure I-21. Doses and Concentrations for ST23 and Top Contributing Radionuclides

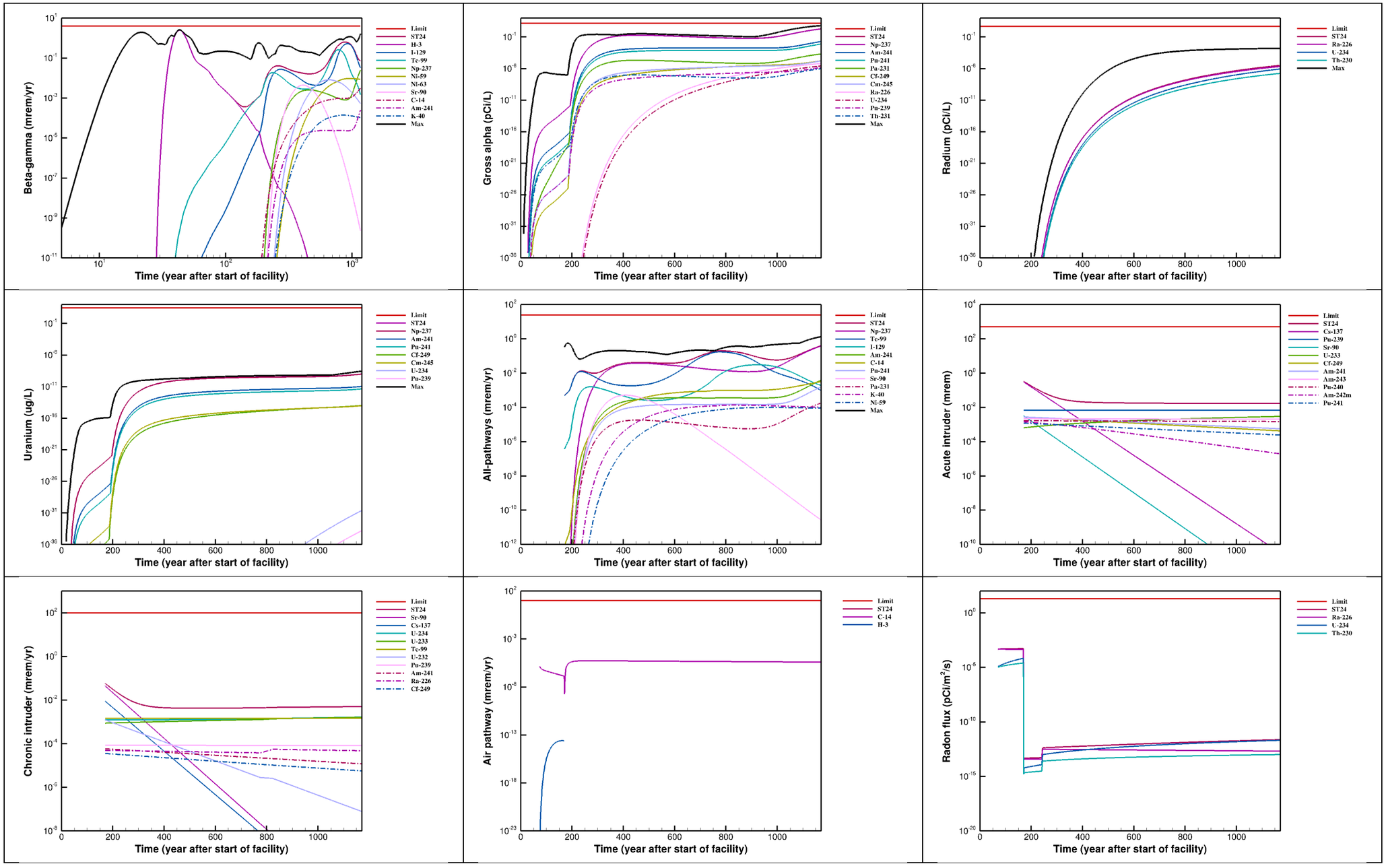


Figure I-22. Doses and Concentrations for ST24 and Top Contributing Radionuclides

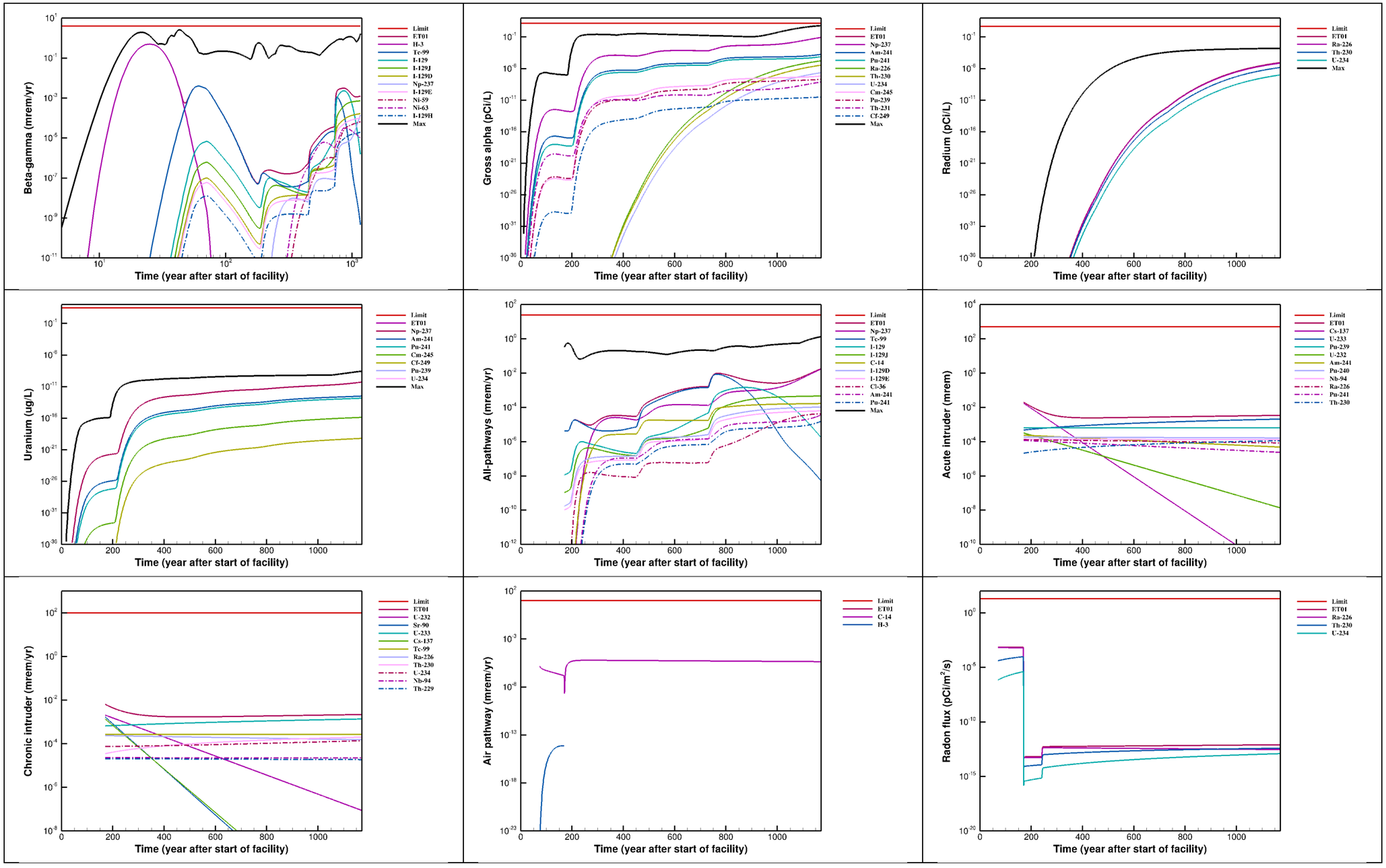


Figure I-23. Doses and Concentrations for ET01 and Top Contributing Radionuclides

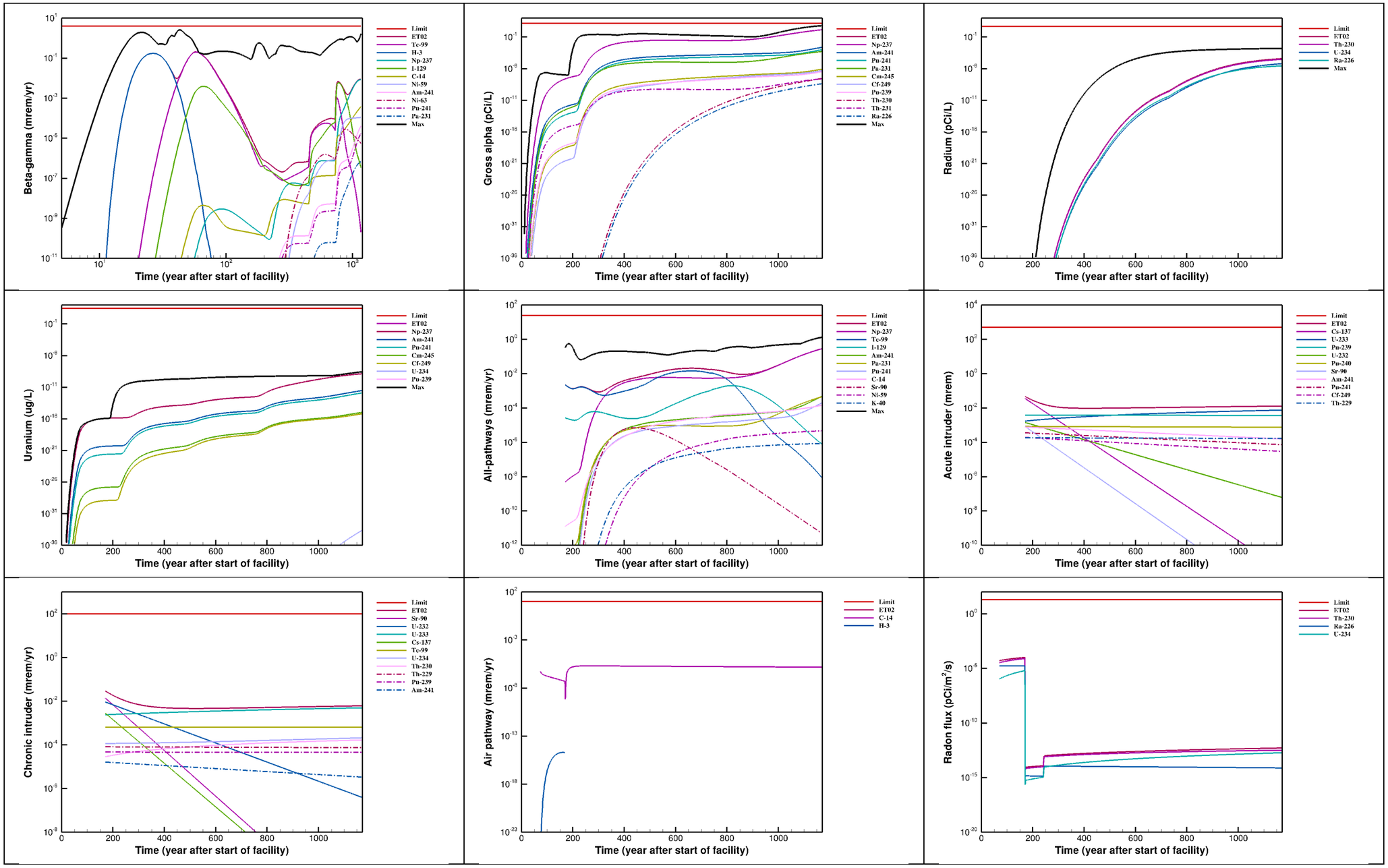


Figure I-24. Doses and Concentrations for ET02 and Top Contributing Radionuclides

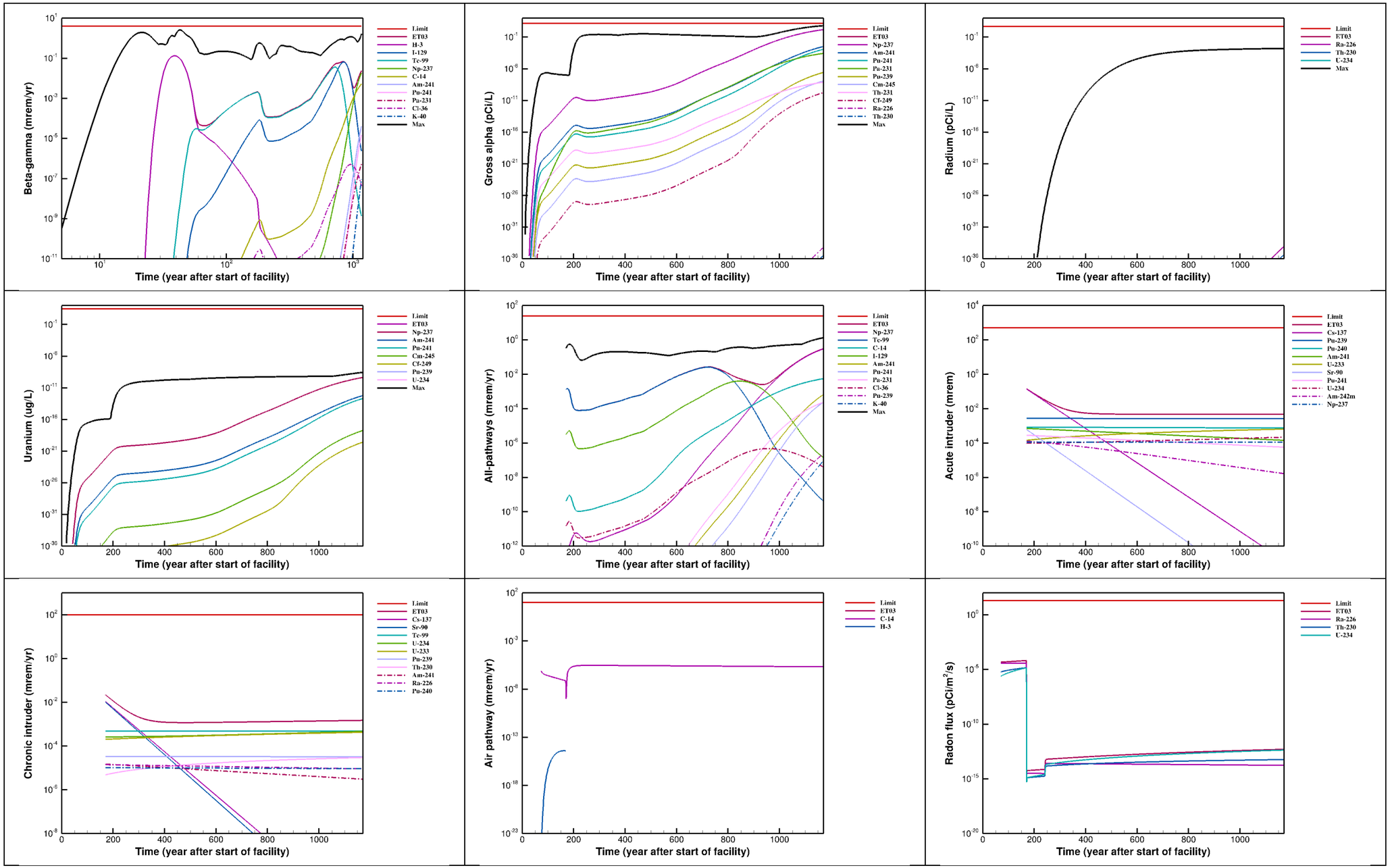


Figure I-25. Doses and Concentrations for ET03 and Top Contributing Radionuclides

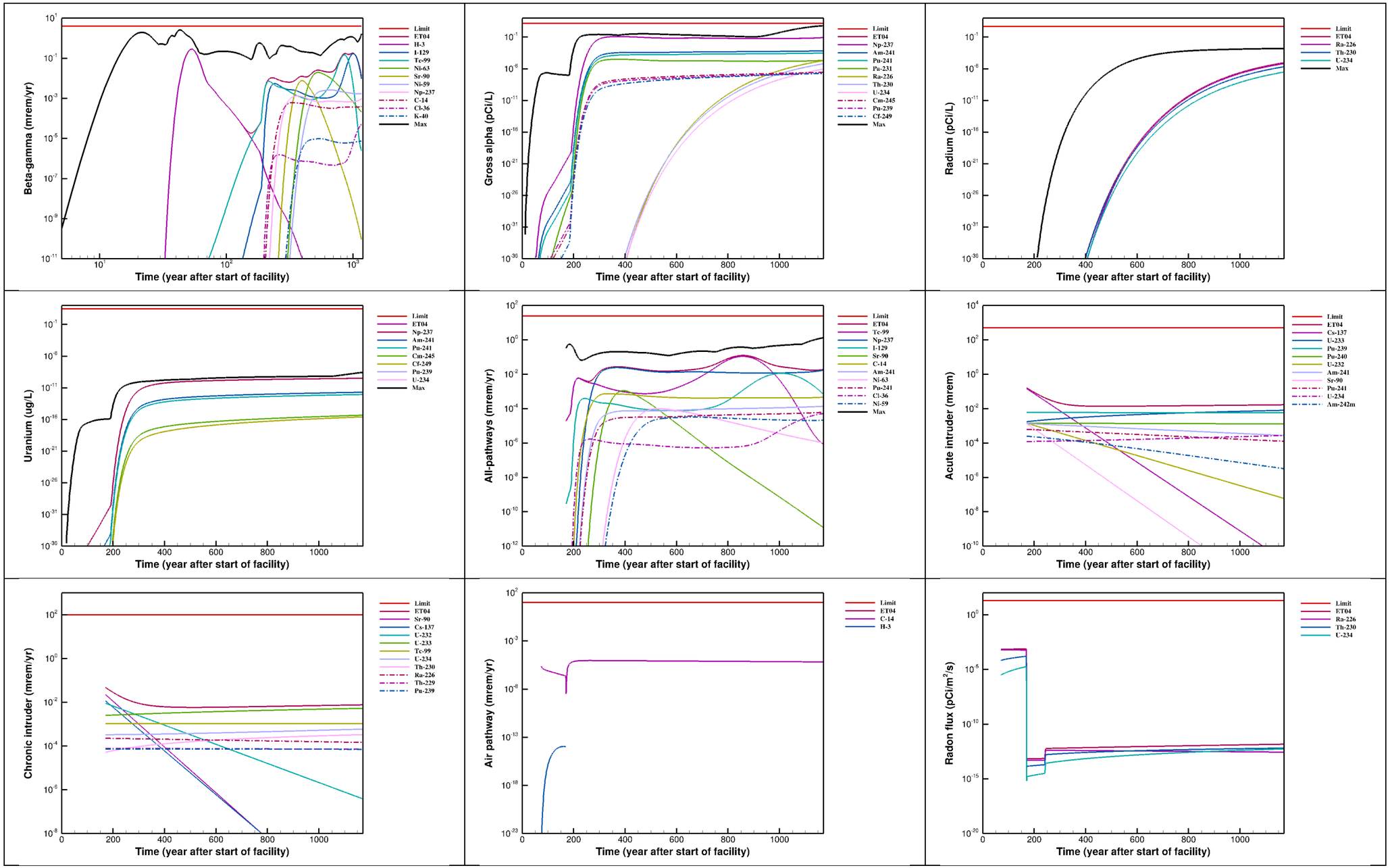


Figure I-26. Doses and Concentrations for ET04 and Top Contributing Radionuclides

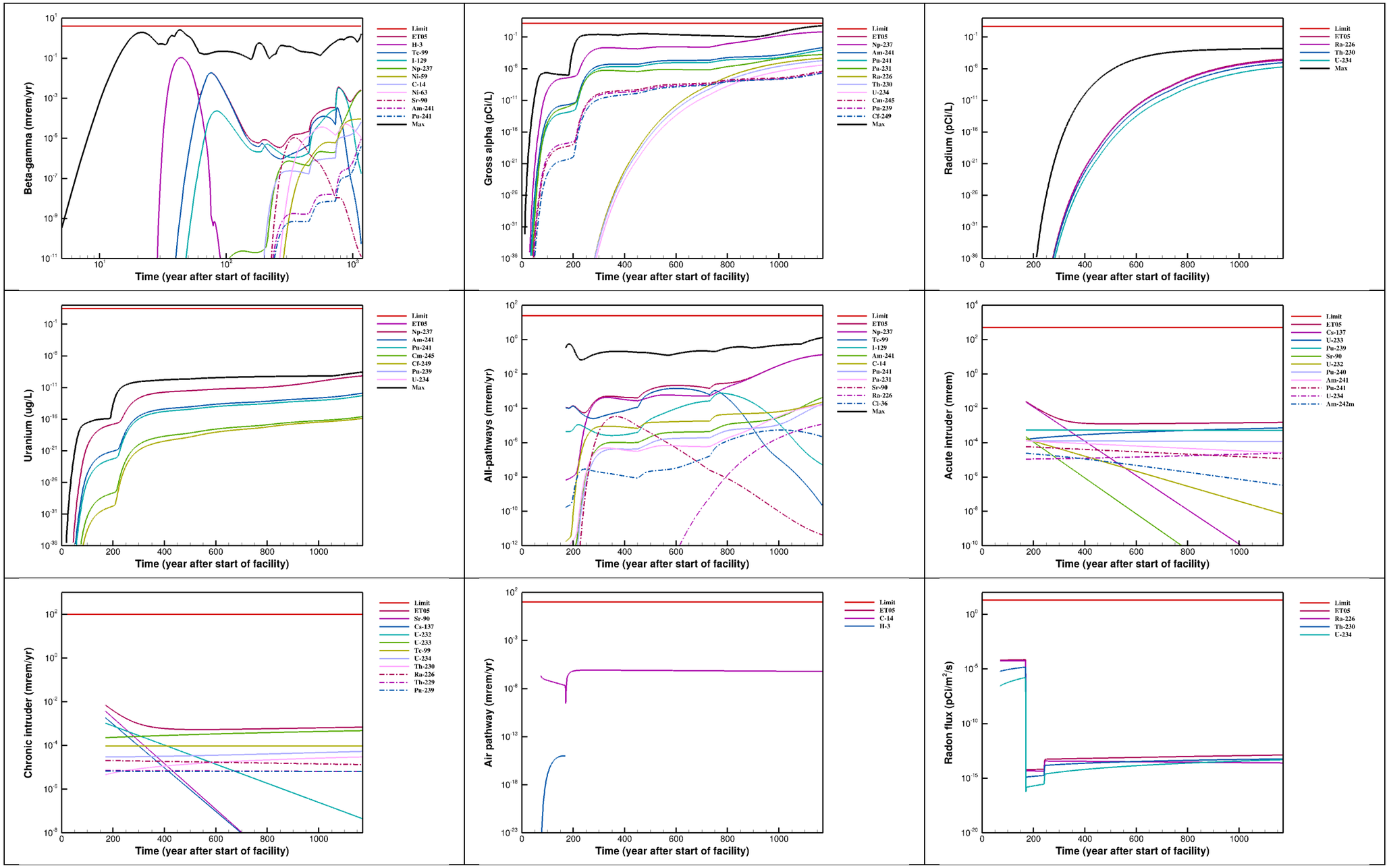


Figure I-27. Doses and Concentrations for ET05 and Top Contributing Radionuclides

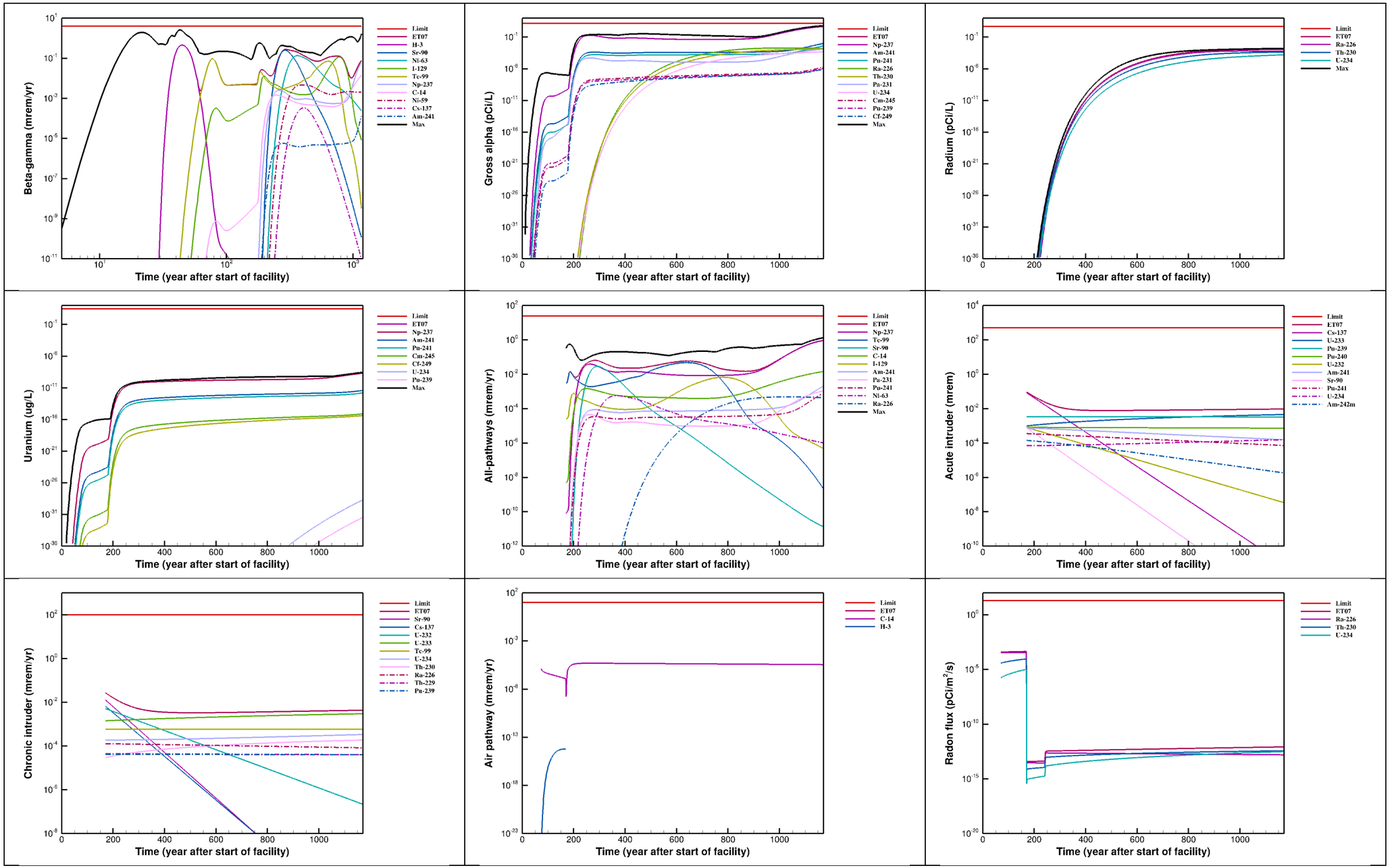


Figure I-28. Doses and Concentrations for ET07 and Top Contributing Radionuclides

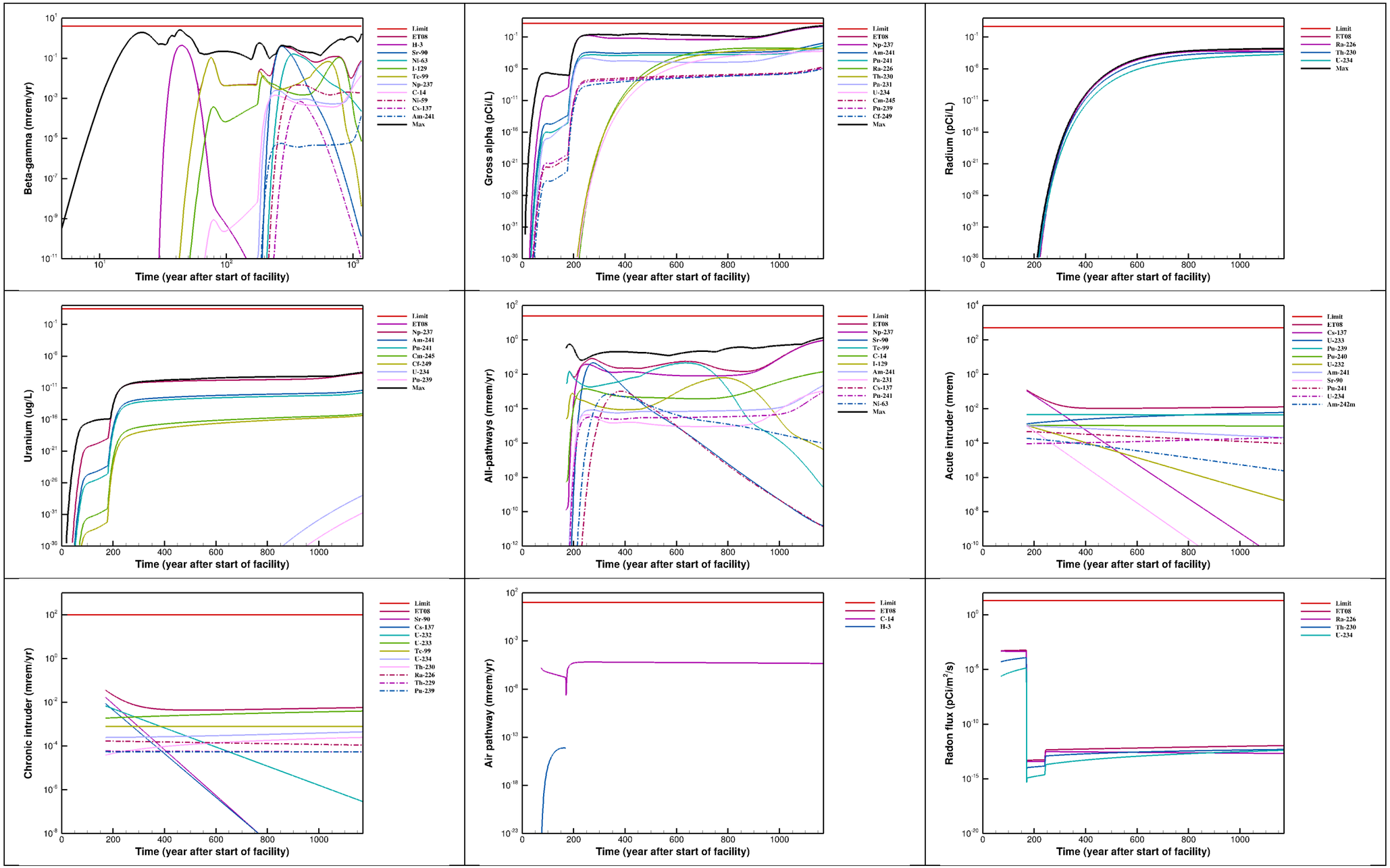


Figure I-29. Doses and Concentrations for ET08 and Top Contributing Radionuclides

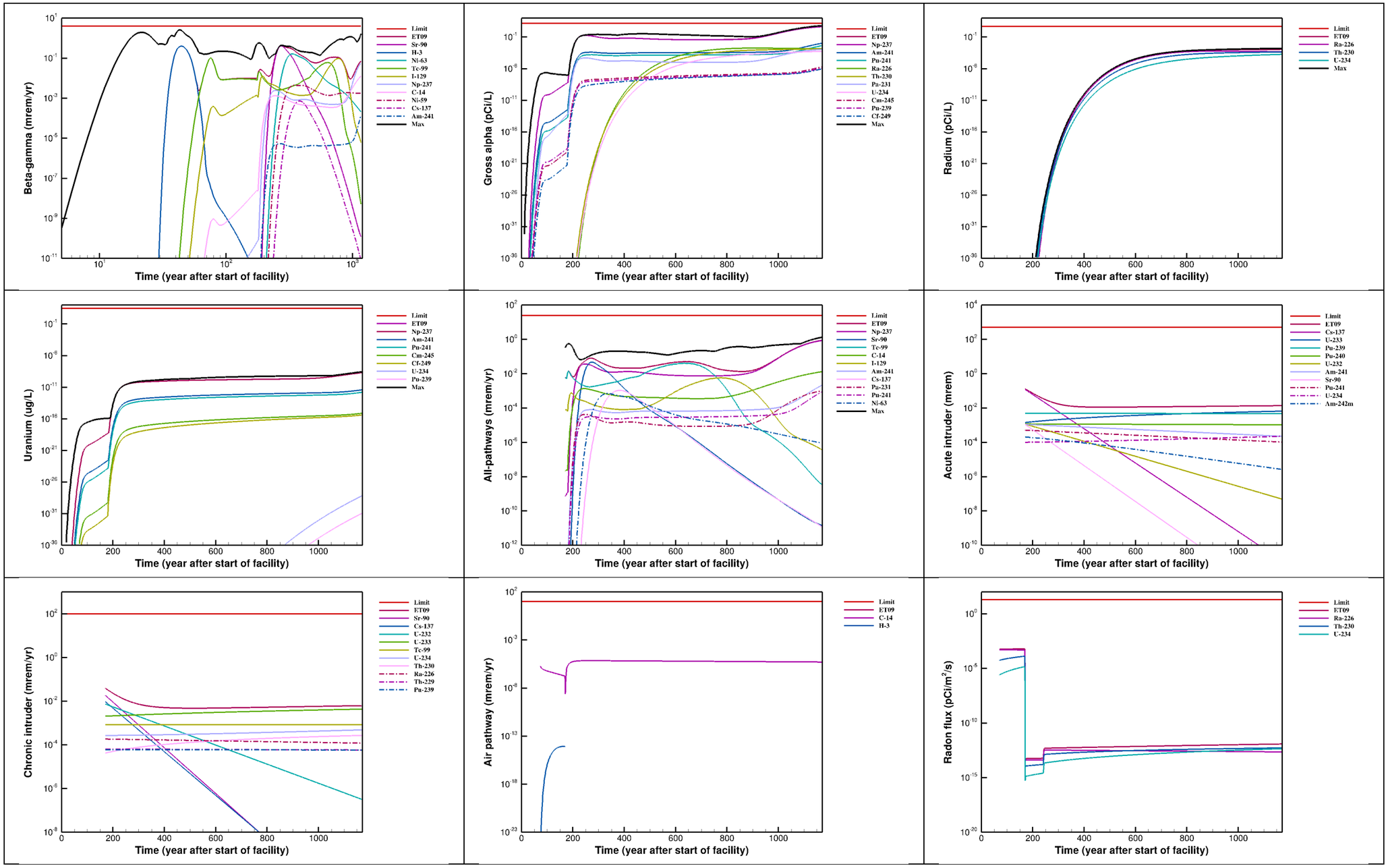


Figure I-30. Doses and Concentrations for ET09 and Top Contributing Radionuclides

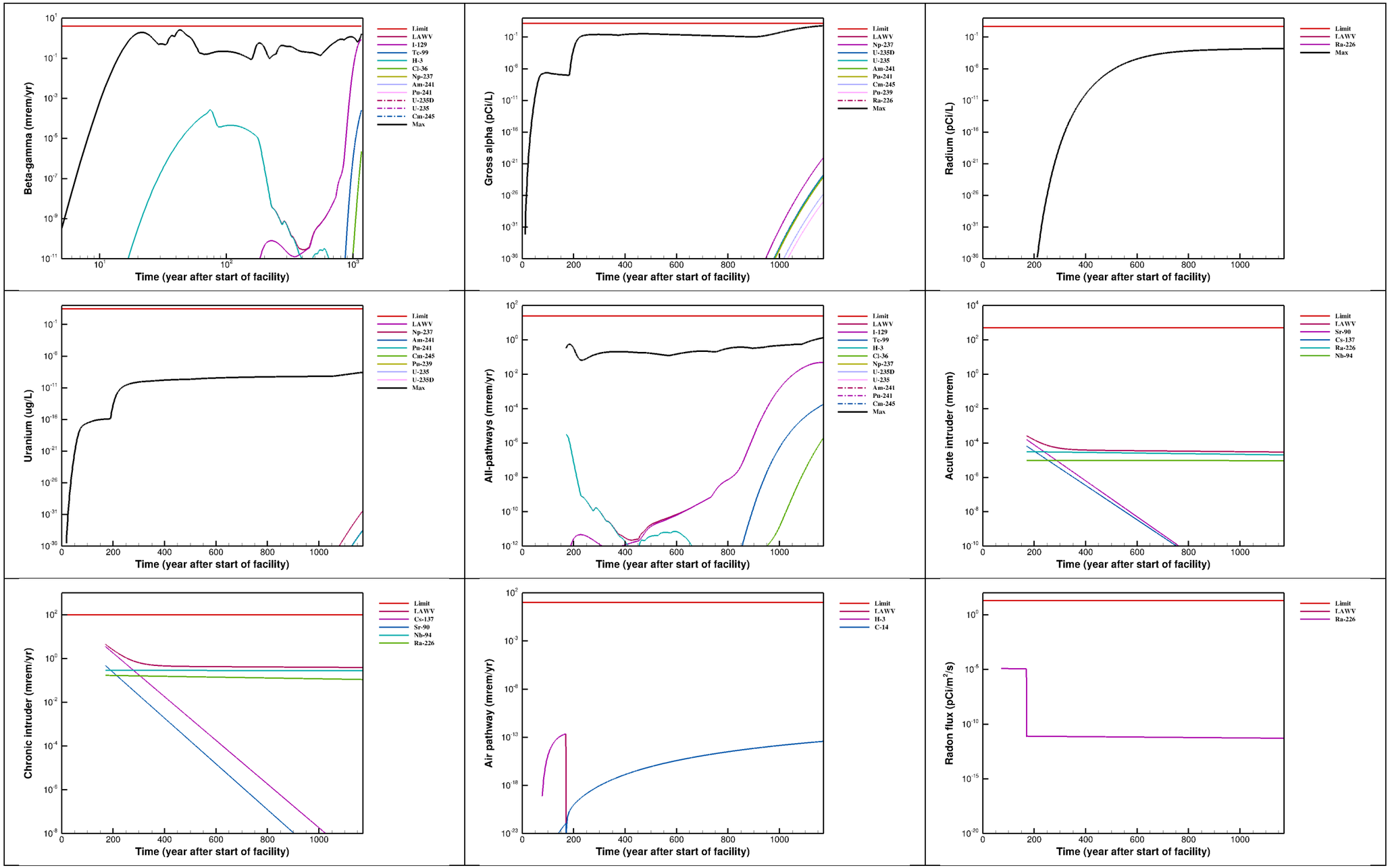


Figure I-31. Doses and Concentrations for LAWV and Top Contributing Radionuclides

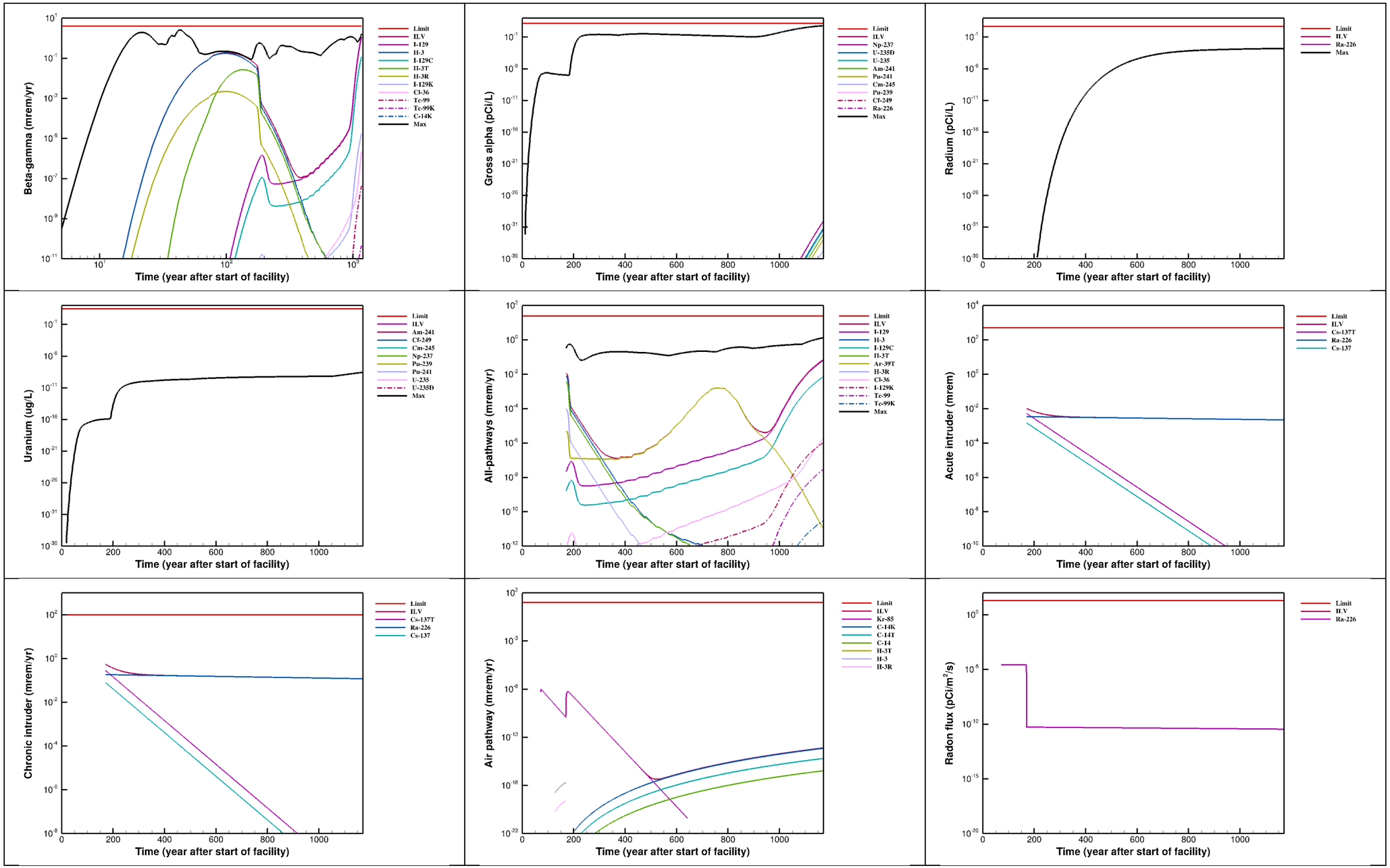


Figure I-32. Doses and Concentrations for ILV and Top Contributing Radionuclides

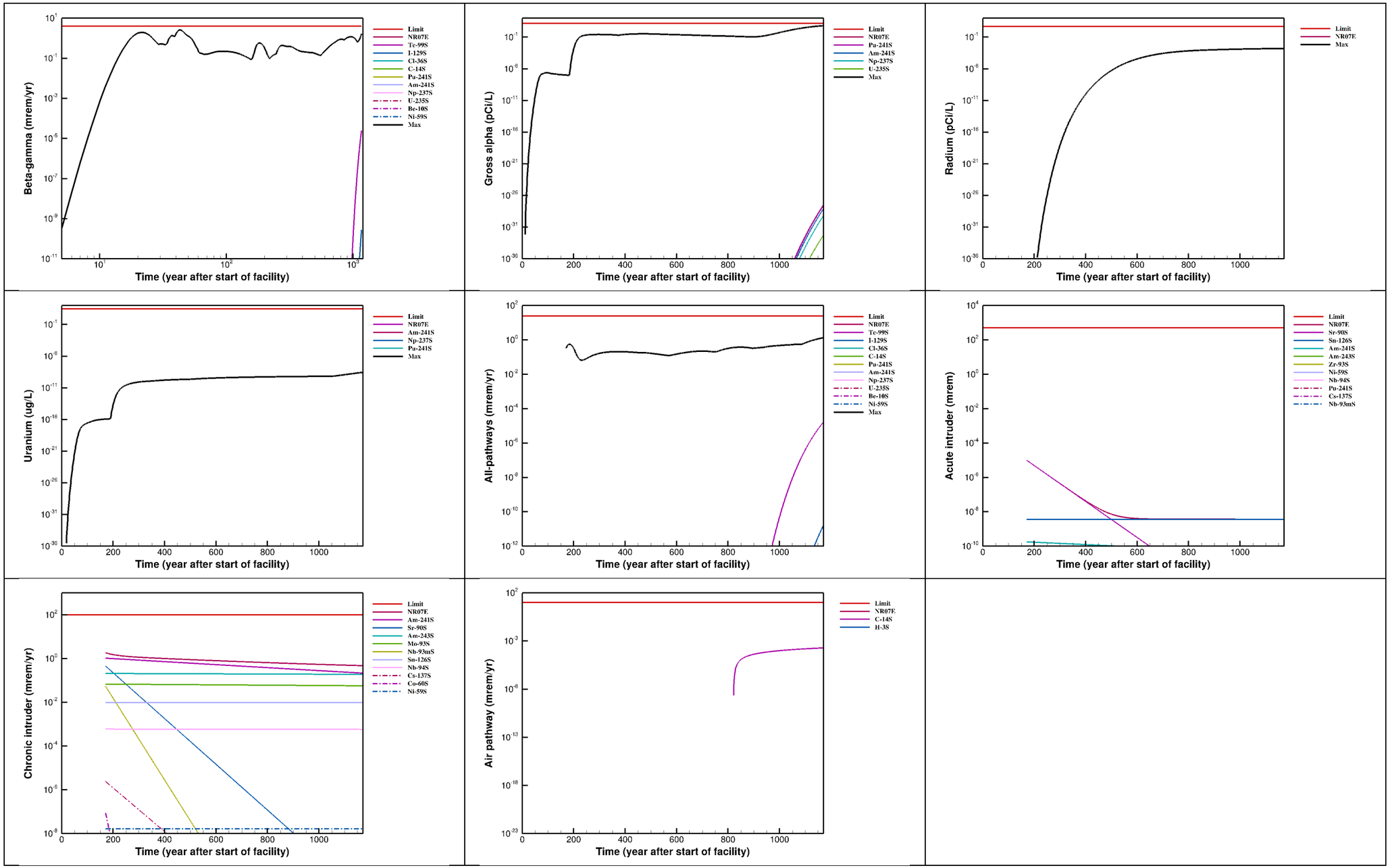


Figure I-33. Doses and Concentrations for NR07E and Top Contributing Radionuclides

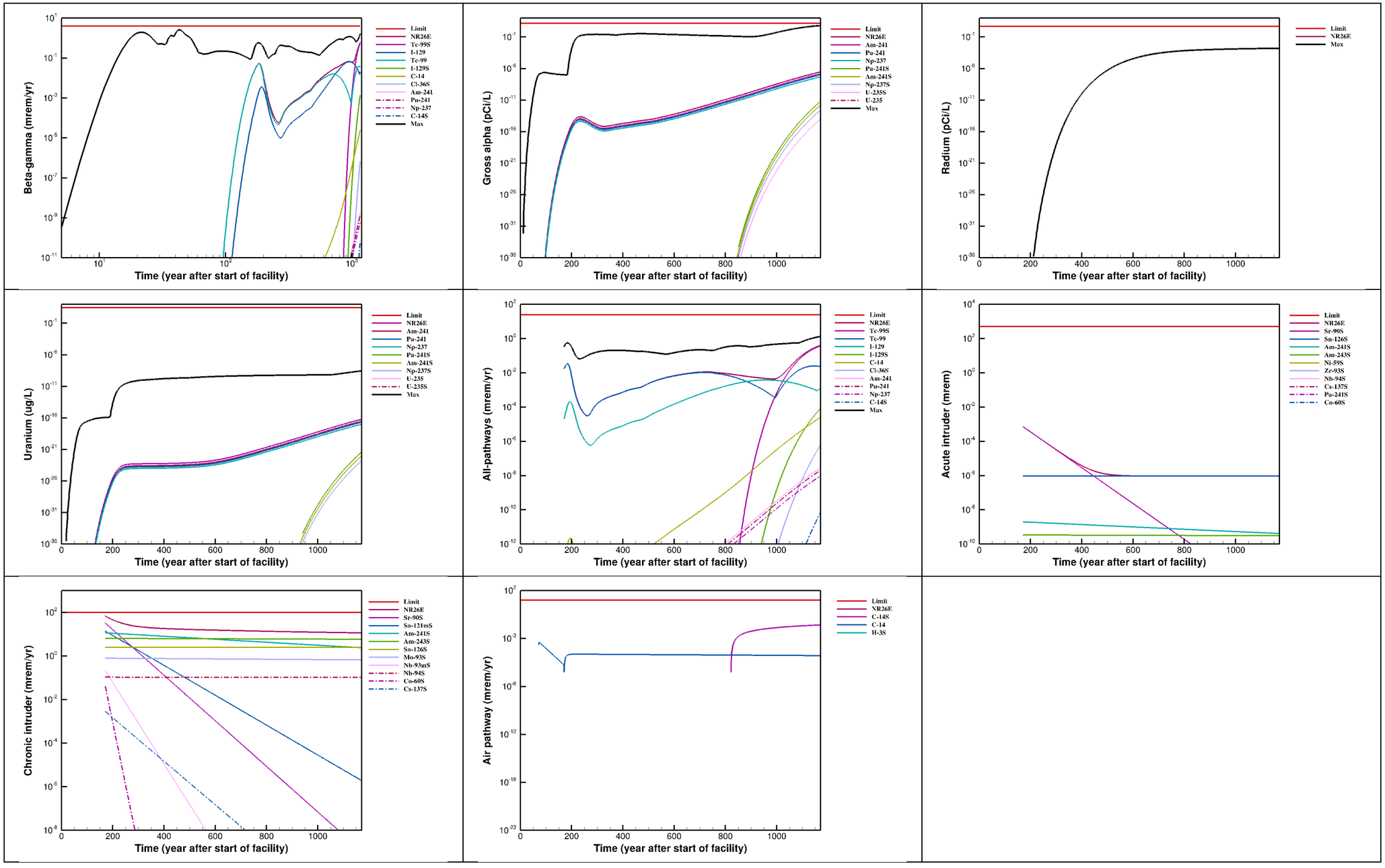


Figure I-34. Doses and Concentrations for NR26E and Top Contributing Radionuclides

I.4.1.3. Doses and Concentrations for Disposal Units and Top-Ten Radionuclides for Groundwater Pathways During Post-Compliance Period

Figure I-50 through Figure I-61 illustrate transient concentrations and doses of the top-ten ranked radionuclides within each DU for the five GW pathways during both the compliance and post-compliance periods. The solid-red curve in each graph is labeled by PO for each GW pathway. The Total curve (black dash-dot) in each graph is the summation of concentrations or doses for each GW radionuclide in the DU.

For every case (DU and parent radionuclide combination), a PORFLOW STATistics file is generated in which the maximum radionuclide concentrations (parent and short-chain progeny) are stored at every time step. At each time step, these are maximum concentrations (gmol ft^{-3} per gmole of parent) computed based on the region "at and beyond" the 100-meter POA. The parent and short-chain progeny concentrations are converted to activities and then expanded to full-chain progeny activities assuming secular equilibrium. The full-chain progeny activities are converted to dose factors (concentration or dose per Ci of parent) for each GW pathway and summed to each parent radionuclide. These dose factors along with CWTS adjusted closure inventories are used in computing dose history profiles for each GW pathway.

GW pathway dose history profiles are created for each DU using (1) dose factors computed without PIFs and (2) projected CWTS closure inventories with biases applied. PORFLOW STATistics files are used in lieu of HISTory files beyond the compliance period because of the large memory requirements to store dose factors derived from HISTory files. The resulting DU GW pathway dose and concentration profiles with top contributing radionuclides are displayed in Figure I-50 through Figure I-61.

Five DUs exceed the beta-gamma PO during the post-compliance period as listed in Table I-54. SOFs range from 2 to 4,027 for the LAWV and NR26E, respectively. Table I-55 through Table I-59 provide the top-ten contributing radionuclides for each of the five DUs.

Table I-54. Deterministic Beta-Gamma Peak Doses for Disposal Units Exceeding the Performance Objective During Post-Compliance Period

DU	Beta-Gamma Dose (mrem yr^{-1})	SOF (-)	Time of Peak Dose (Year)
NR26E	16,106	4,027	4,198
NR07E	1,069	267	5,082
ILV	39	10	3,476
ST14	26	6	1,946
LAWV	8	2	3,506

For NR26E, a ranking of parent radionuclide contributions to the beta-gamma total dose yields the top-ten radionuclide contributors (Figure I-61) as well as the peak doses and times of peak dose for the top-ten radionuclides (Table I-55). Only parent radionuclides whose dose or concentration exceeds the PO during the post-compliance period (Ni-59S and C-14S) are highlighted in orange. Only parent radionuclides from SWFs have members that exceed the PO. The SWF radionuclides Ni-59S and C-14S (i.e., neutron activation products within the welded steel casks that are

surface-corrosion limited) significantly exceed the PO beginning roughly 2,200 years after the end of the compliance period (i.e., Year ~3,400).

Table I-55. Deterministic Peak Doses for NR26E and Top-Ten Contributing Radionuclides for Beta-Gamma Groundwater Pathway

DU/Radionuclide	Beta-Gamma Dose (mrem yr^{-1})	SOF (-)	% of NR26E	Time of Peak Dose (Year)
NR26E	16,106	4,027	100.00%	4,198
Ni-59S	16,021	4,005	99.47%	
C-14S	98	25	0.61%	3,368
Ni-59	4	1	0.02%	3,415
C-14	2	0	0.01%	2,584
Tc-99S	1	0	0.00%	1,304
I-129	0	0	0.00%	1,306
Cl-36S				1,946
Tc-99				184
I-129S				1,450
Ni-63S				2,775

Notes:
In addition to the DU peak dose, parent radionuclides whose dose exceeds the PO during the post-compliance period are highlighted in orange.

For NR07E, a ranking of parent radionuclide contributions to the beta-gamma total dose yields the top-ten radionuclide contributors (Figure I-60) as well as the peak doses and times of peak dose for the top-ten radionuclides (Table I-56). Only parent radionuclides whose dose exceeds the PO during the post-compliance period (Ni-59S and C-14S) are highlighted in orange. The SWF radionuclides Ni-59S and C-14S (i.e., neutron activation products within the welded steel casks that are surface-corrosion limited) significantly exceed the PO beginning roughly 3,000 years after the end of the compliance period (i.e., Year ~4,200).

Table I-56. Deterministic Peak Doses for NR07E and Top-Ten Contributing Radionuclides for Beta-Gamma Groundwater Pathway

DU/Radionuclide	Beta-Gamma Dose (mrem yr^{-1})	SOF (-)	% of NR07E	Time of Peak Dose (Year)
NR07E	1,069	267	100.00%	5,082
Ni-59S	1,061	265	99.26%	
C-14S	9	2	0.81%	4,137
Tc-99S	0	0	0.00%	1,328
I-129S				1,553
Pu-241S				2,510
Am-241S				2,496
Ni-63S				2,793
Cl-36S				2,160
Np-237S				2,427
U-235S				17,629

Notes:
In addition to the DU peak dose, parent radionuclides whose dose exceeds the PO during the post-compliance period are highlighted in orange.

For ILV, a ranking of parent radionuclide contributions to the beta-gamma total dose yields the top-ten radionuclide contributors (Figure I-59) as well as the peak doses and times of peak dose for the top-ten radionuclides (Table I-57). Only parent radionuclides whose dose exceeds the PO

during the post-compliance period (C-14K) are highlighted in orange. The largest contributor is the SWF radionuclide C-14K (K- and L-Basin Resin) whose peak dose occurs in Year 3,466.

Table I-57. Deterministic Peak Doses for ILV and Top-Ten Contributing Radionuclides for Beta-Gamma Groundwater Pathway

DU/Radionuclide	Beta-Gamma Dose (mrem yr^{-1})	SOF (-)	% of ILV	Time of Peak Dose (Year)
ILV	39	10	100.00%	3,476
C-14K	38	9	96.81%	3,466
I-129	3	1	7.16%	1,268
Ni-59	2	0	4.99%	4,386
I-129C	1		1.90%	2,276
Tc-99	0		1.12%	5,916
C-14			0.60%	6,326
Np-237			0.57%	6,086
H-3			0.46%	98
Ra-226			0.20%	7,966
K-40			0.11%	2,465

Notes:
In addition to the DU peak dose, parent radionuclides whose dose exceeds the PO during the post-compliance period are highlighted in orange.

For ST14, a ranking of parent radionuclide contributions to the beta-gamma total dose yields the top-ten radionuclide contributors (Figure I-46) as well as the peak doses and times of peak dose for the top-ten radionuclides (Table I-58). Ni-59H (highlighted in orange) is the only parent radionuclide to exceed the PO during the post-compliance period (Year 1,946). Three parent radionuclides (i.e., C-14H, Ni-59H, and Ni-63H) associated with the HWCTR SWF are top-ten contributors. The three are neutron activation products (reactor internals) that are surface-corrosion limited and begin their release into the VZ once welds associated with the blind flanges are pitted through.

Table I-58. Deterministic Peak Doses for ST14 and Top-Ten Contributing Radionuclides for Beta-Gamma Groundwater Pathway

DU/Radionuclide	Beta-Gamma Dose (mrem yr^{-1})	SOF (-)	% of ST14	Time of Peak Dose (Year)
ST14	26	6	100.00%	1,946
Ni-59H	25	6	99.25%	
H-3	0	0	1.10%	33
C-14H			0.57%	2,128
Ni-59			0.27%	2,569
Ni-63H			0.17%	1,895
Tc-99			0.12%	828
I-129			0.06%	994
Np-237				1,482
C-14				2,216
C-14N			0.02%	2,227

Notes:
In addition to the DU peak dose, parent radionuclides whose dose exceeds the PO during the post-compliance period are highlighted in orange.

A ranking of parent radionuclide contributions to the beta-gamma total dose for the LAWV yields the top-ten radionuclide contributors (Figure I-58) as well as the peak doses and times of peak dose

for the top-ten radionuclides (Table I-59). Ni-59 (highlighted in orange) is the only parent radionuclide whose peak dose exceeds the PO during the post-compliance period (in Year 3,516).

Table I-59. Deterministic Peak Doses for LAWV and Top-Ten Contributing Radionuclides for Beta-Gamma Groundwater Pathway

DU/Radionuclide	Beta-Gamma Dose (mrem yr^{-1})	SOF (-)	% of ST14	Time of Peak Dose (Year)
LAWV	8	2	100.00%	3,506
Ni-59			94.08%	3,516
I-129	1	0	10.83%	1,204
Np-237	0	0	4.93%	3,496
Tc-99			2.67%	3,166
C-14			1.38%	3,106
Cl-36			0.16%	1,546
Ra-226			0.08%	9,386
U-235D			0.01%	3,526
Am-241				3,496
U-235				3,526

Notes:

In addition to the DU peak dose, parent radionuclides whose dose exceeds the PO during the post-compliance period are highlighted in orange.

Two DUs exceed the PO for the gross-alpha pathway during the post-compliance period as indicated in Table I-60. SOFs range from 1.2 to 2.0 for the ILV and LAWV, respectively. Table I-61 and Table I-62 list the top-ten radionuclide contributors to total gross-alpha concentration for the LAWV and ILV, respectively.

Table I-60. Deterministic Gross-Alpha Peak Concentrations for Disposal Units Exceeding the Performance Objective During Post-Compliance Period

DU	Gross-Alpha Concentration (pCi L^{-1})	SOF (-)	Time of Peak Concentration (Year)
LAWV	30.5	2.0	3,496
ILV	17.7	1.2	6,086

Table I-61. Deterministic Peak Concentrations for LAWV and Top Contributing Radionuclides for Gross-Alpha Groundwater Pathway

DU/Radionuclide	Gross-Alpha Concentration (pCi L^{-1})	SOF (-)	% of LAWV	Time of Peak Concentration (Year)
LAWV	30.5	2.0	100.00%	3,496
Np-237	29.8		97.79%	
U-235D	0.3	0.0	1.13%	
U-235	0.2		0.76%	
Ra-226	0.2		0.72%	9,006
Am-241	0.1		0.17%	3,496
Pu-241	0.0		0.14%	
Cm-245			0.00%	
Pu-239			0.00%	33,259

Notes:

In addition to the DU peak concentration, parent radionuclides whose concentration exceeds the PO during the post-compliance period are highlighted in orange.

Table I-62. Deterministic Peak Concentrations for ILV and Top Contributing Radionuclides for Gross-Alpha Groundwater Pathway

DU/Radionuclide	Gross-Alpha Concentration (pCi L^{-1})	SOF (-)	% of ILV	Time of Peak Concentration (Year)
ILV	17.7	1.2	100.00%	6,086
Np-237	16.6	1.1	93.94%	
Ra-226	6.6	0.4	37.17%	7,936
U-235D	0.6	0.0	3.47%	6,096
U-235	0.4		1.99%	
Am-241	0.1		0.58%	6,106
Pu-241	0.0		0.09%	
Cm-245			0.02%	
Pu-239			0.00%	
Cf-249				

Notes:

In addition to the DU peak concentration, parent radionuclides whose concentration exceeds the PO during the post-compliance period are highlighted in orange.

A ranking of parent radionuclide contributions to gross-alpha total concentration for the LAWV results in the top-ten radionuclide contributors (Figure I-58) as well as the peak doses and times of peak dose for the top-ten radionuclides (Table I-61). Np-237 (highlighted in orange) is the only parent radionuclide whose peak dose in Year 3,496 exceeds the PO during the post-compliance period.

For the ILV, the top-ten radionuclide contributors to gross-alpha total concentration (Figure I-59) as well as the peak doses and times of peak dose for the top-ten radionuclides (Table I-62). Np-237 (highlighted in orange) is the only parent radionuclide whose peak dose in Year 6,086 exceeds the PO during the post-compliance period.

Only two DUs exceed the all-pathways PO during the post-compliance period as shown in Table I-63. Total SOFs range from 1.5 for the NR26E to 10.1 for the ILV. Table I-64 and Table I-65 list the top-ten contributing radionuclides for NR26E and the ILV, respectively.

Table I-63. Deterministic All-Pathways Peak Doses for Disposal Units Exceeding the Performance Objective During Post-Compliance Period

DU	All-Pathways Dose (mrem yr^{-1})	SOF (-)	Time of Peak Dose (Year)
NR26E	251.6	10.1	4,047
ILV	37.9	1.5	3,466

A ranking of parent radionuclide contributions to all-pathways total dose for NR26E results in the top-ten radionuclide contributors (Figure I-61) as well as the peak doses and times of peak dose for the top-ten radionuclides (Table I-64). Ni-59S and C-14S (highlighted in orange) are two SWF parent radionuclides whose peak doses in Years 4,198 and 3,368, respectively, exceed the PO during the post-compliance period.

Table I-64. Deterministic Peak Doses for NR26E and Top-Ten Contributing Radionuclides for All-Pathways Groundwater Exposure Scenario

DU/Radionuclide	All-Pathways Dose (mrem yr^{-1})	SOF (-)	% of NR26E	Time of Peak Dose (Year)
NR26E	251.6	10.1	100.00%	4,047
Ni-59S	166.3	6.7	66.11%	4,198
C-14S	98.6	3.9	39.20%	3,368
C-14	1.6	0.1	0.65%	2,584
Tc-99S	0.5	0.0	0.20%	1,304
Cl-36S	0.1		0.03%	1,946
Ni-59	0.0		0.02%	3,415
Tc-99			0.01%	184
Pu-241S				2,298
Am-241S			0.00%	2,298
I-129				1306

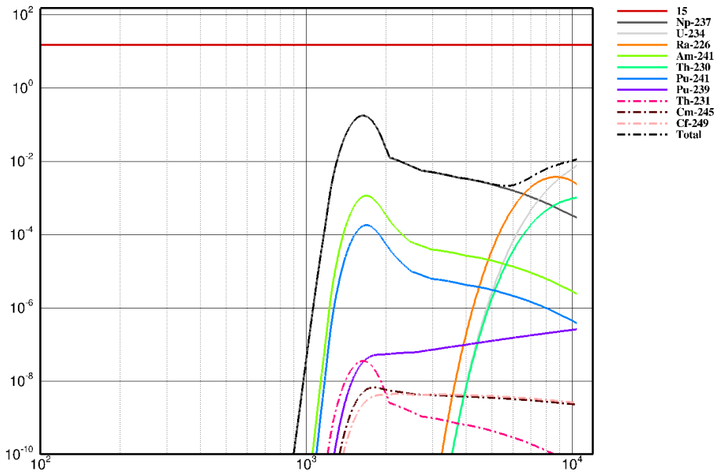
Notes:
In addition to the DU peak dose, parent radionuclides whose dose exceeds the PO during the post-compliance period are highlighted in orange.

Similarly, a ranking of parent radionuclide contributions to all-pathways total dose for the ILV yields the top-ten radionuclide contributors displayed in Figure I-59. Table I-65 summarizes peak doses and times of peak dose for the top-ten contributing radionuclides. C-14K (highlighted in orange) is the only parent radionuclide whose peak dose in Year 3,466 exceeds the PO during the post-compliance period.

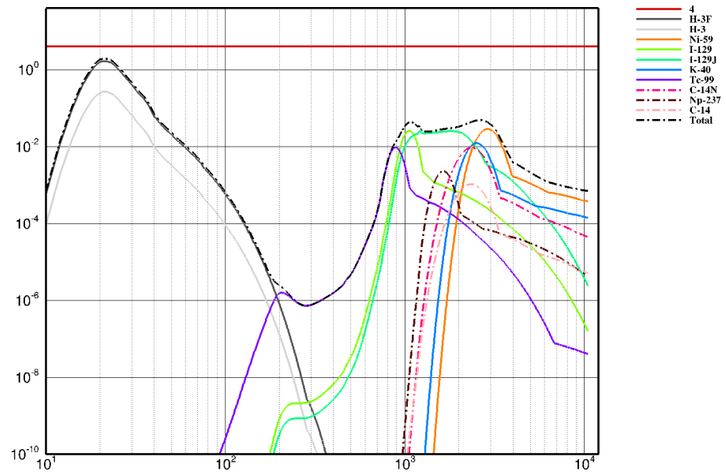
Table I-65. Deterministic Peak Doses for ILV and Top-Ten Contributing Radionuclides for All-Pathways Groundwater Exposure Scenario

DU/Radionuclide	All-Pathways Dose (mrem yr^{-1})	SOF (-)	% of ILV	Time of Peak Dose (Year)
ILV	37.9	1.5	100.00%	3,466
C-14K	37.8		99.80%	
Np-237	3.3	0.1	8.79%	6,086
Ra-226	1.7		4.46%	7,936
U-235D	0.5	0.0	1.41%	6,096
U-235	0.3		0.81%	
Tc-99			0.76%	5,916
C-14	0.2		0.62%	6,326
I-129			0.43%	1,268
I-129C	0.0		0.11%	2,276
K-40				2,465

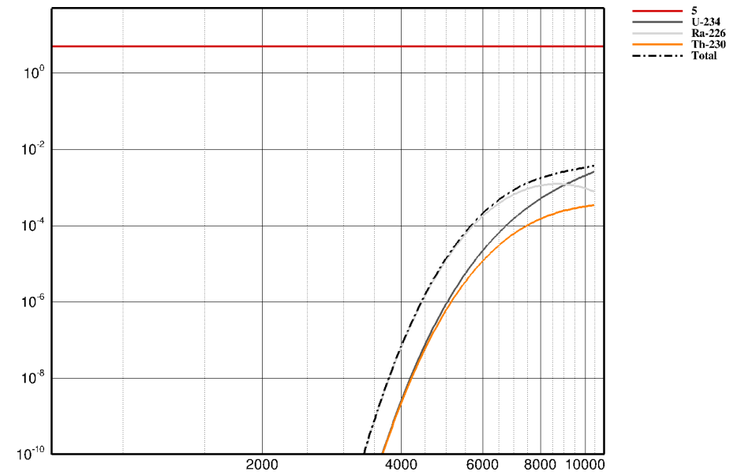
Notes:
In addition to the DU peak dose, parent radionuclides whose dose exceeds the PO during the post-compliance period are highlighted in orange.



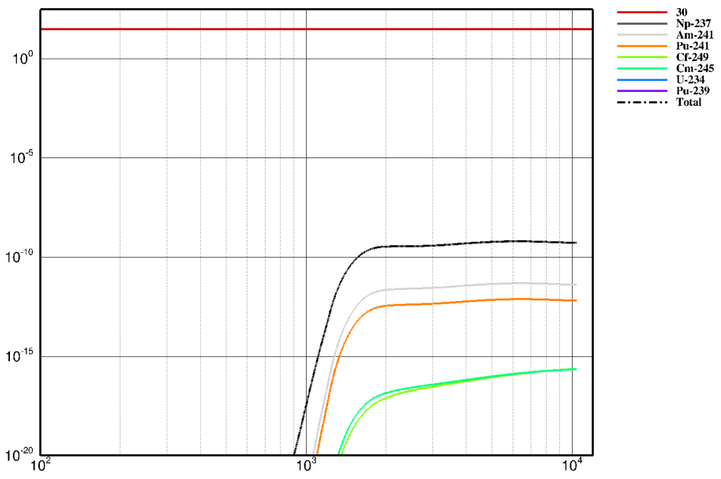
ST01 Gross-Alpha (pCi L^{-1})



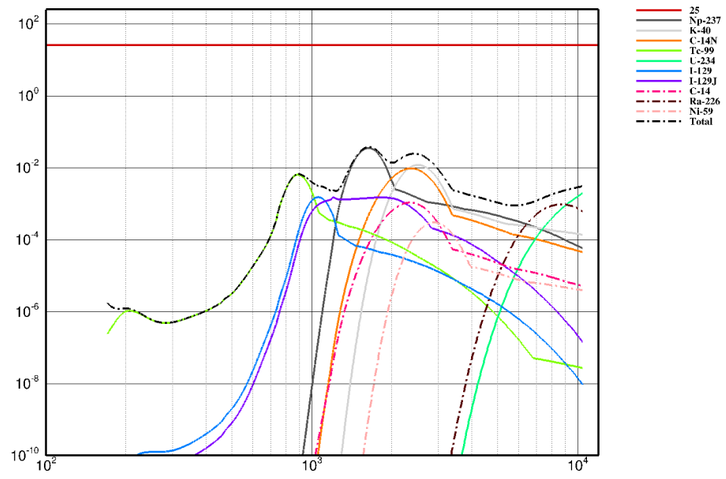
ST01 Beta-Gamma (mrem yr^{-1})



ST01 Radium (pCi L^{-1})



ST01 Uranium (µg L^{-1})



ST01 All-Pathways (mrem yr^{-1})

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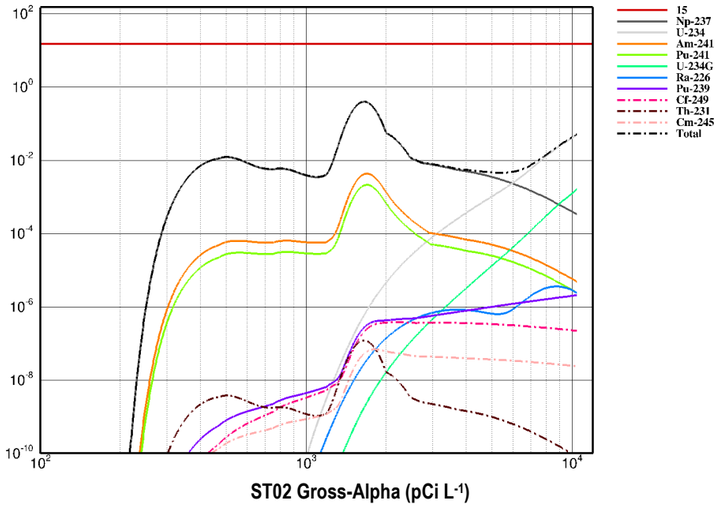
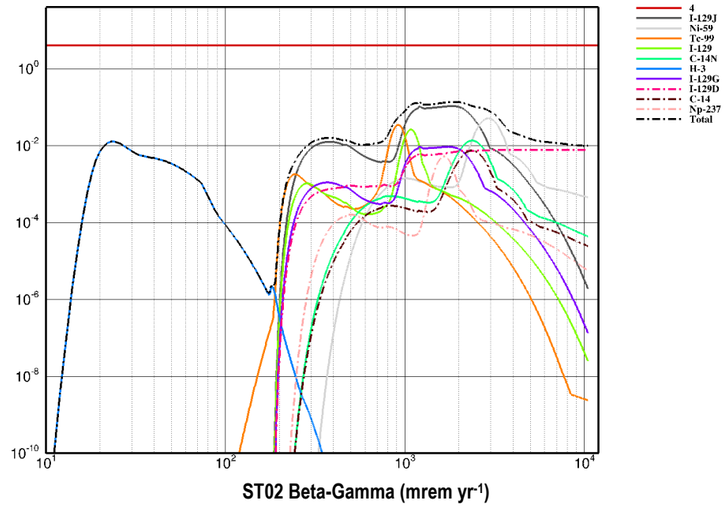
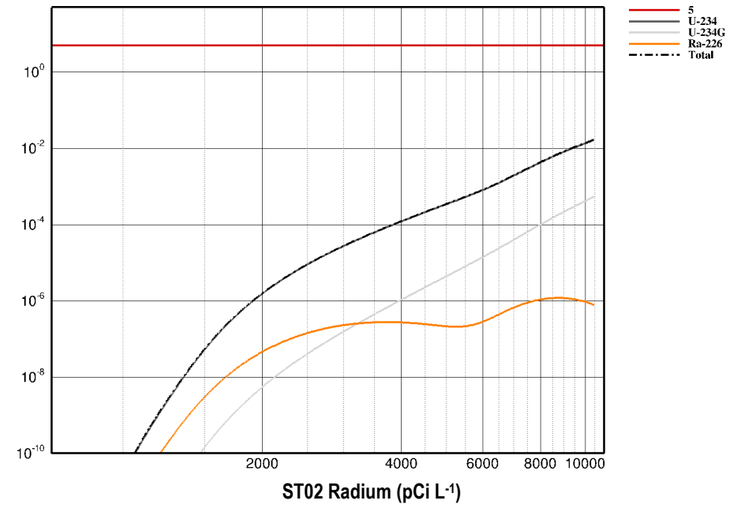
Figure I-35. Doses and Concentrations for Groundwater Pathways for ST01 and Top Contributing Radionuclides During Post-Compliance Period



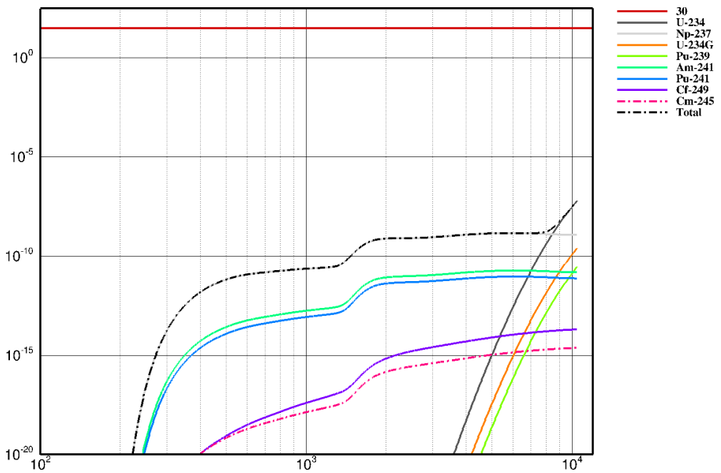
ST02 Gross-Alpha (pCi L^{-1})



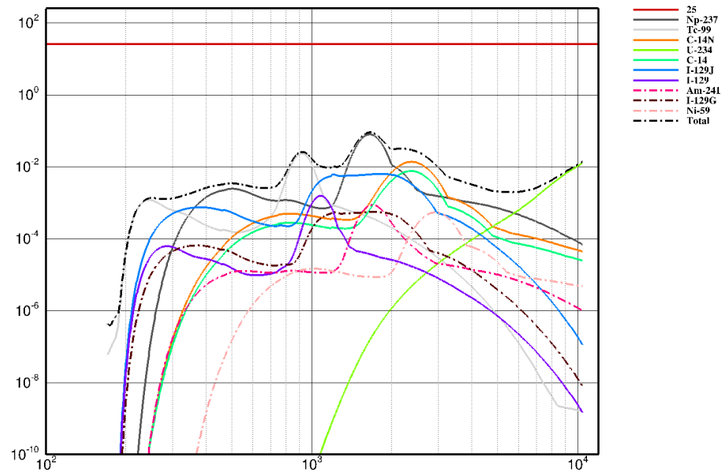
ST02 Beta-Gamma (mrem yr^{-1})



ST02 Radium (pCi L^{-1})



ST02 Uranium (µg L^{-1})



ST02 All-Pathways (mrem yr^{-1})

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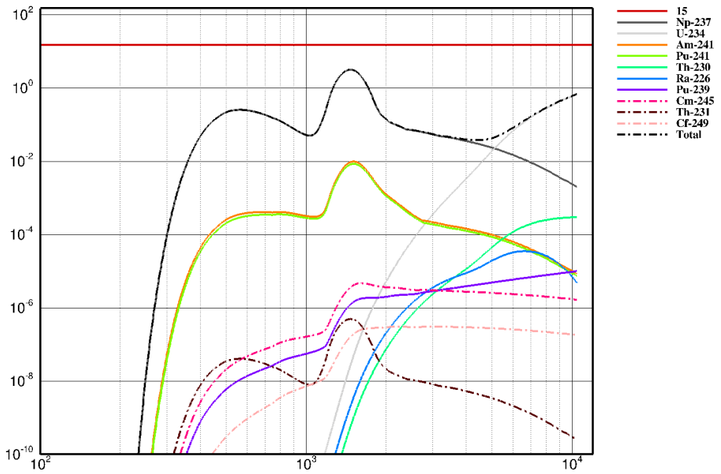
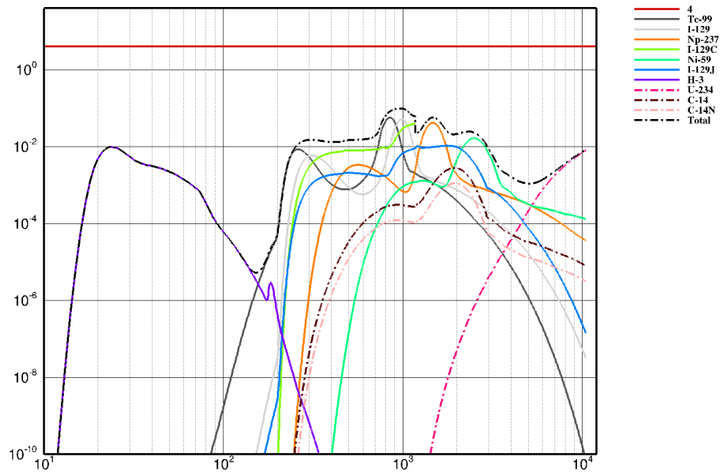
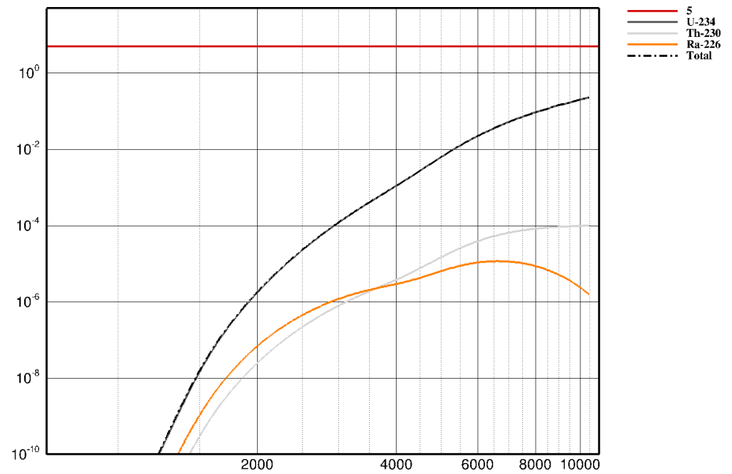
Figure I-36. Doses and Concentrations for Groundwater Pathways for ST02 and Top Contributing Radionuclides During Post-Compliance Period



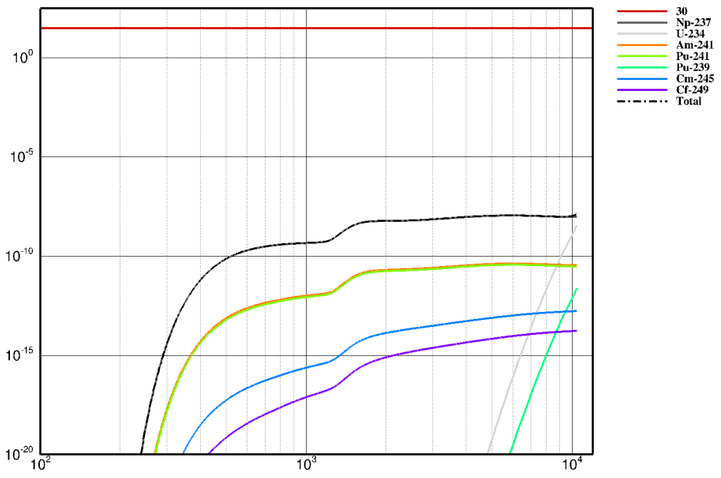
ST03 Gross-Alpha (pCi L^{-1})



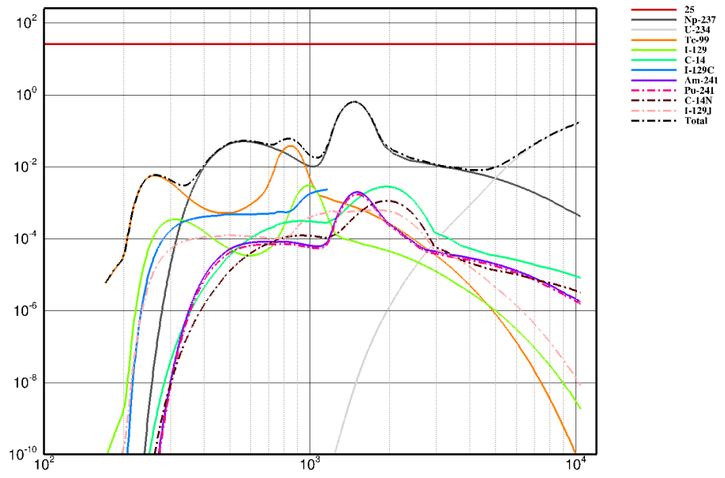
ST03 Beta-Gamma (mrem yr^{-1})



ST03 Radium (pCi L^{-1})



ST03 Uranium (µg L^{-1})



ST03 All-Pathways (mrem yr^{-1})

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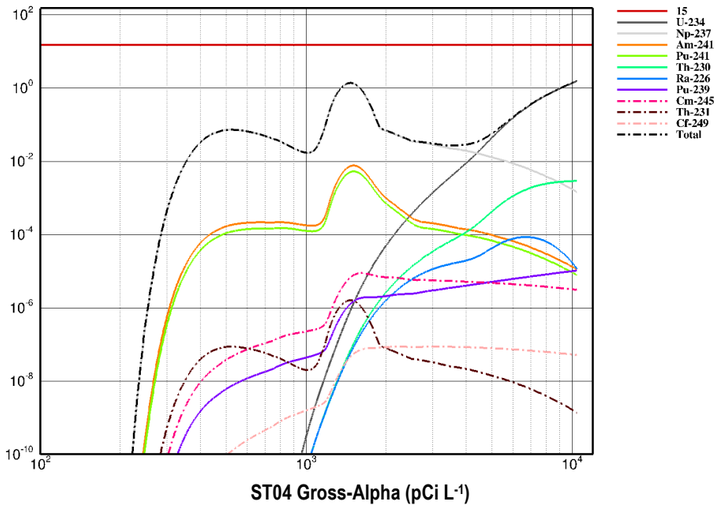
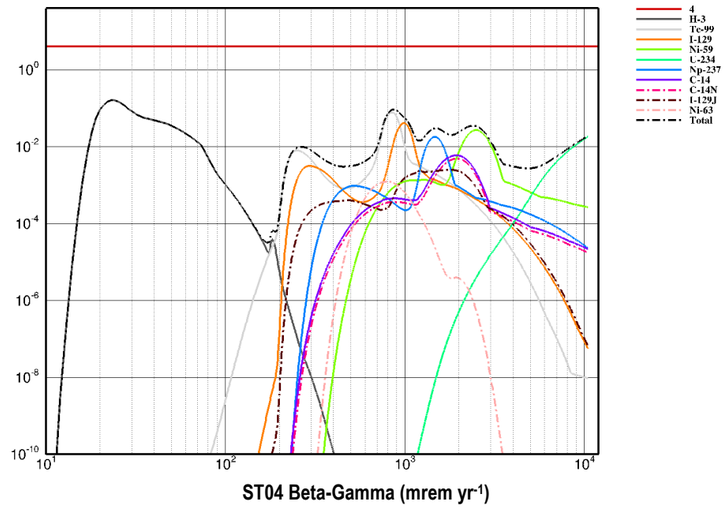
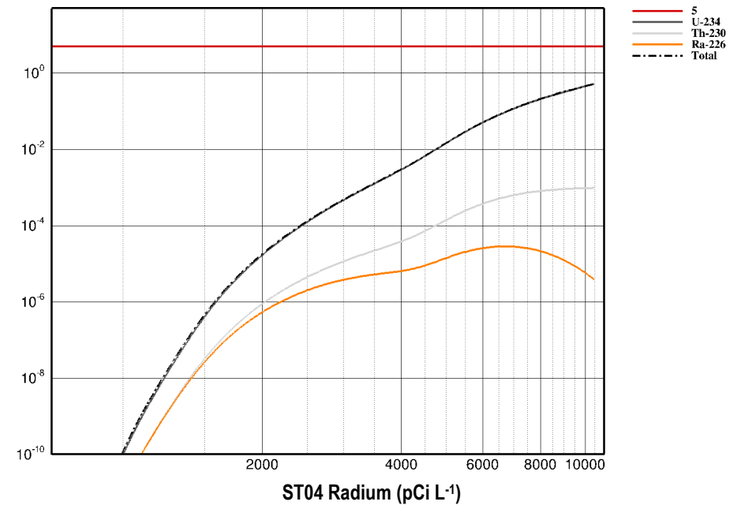
Figure I-37. Doses and Concentrations for Groundwater Pathways for ST03 and Top Contributing Radionuclides During Post-Compliance Period



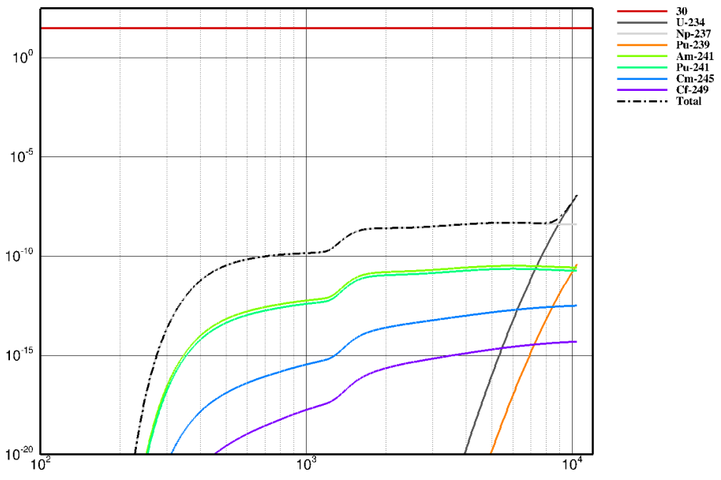
ST04 Gross-Alpha (pCi L^{-1})



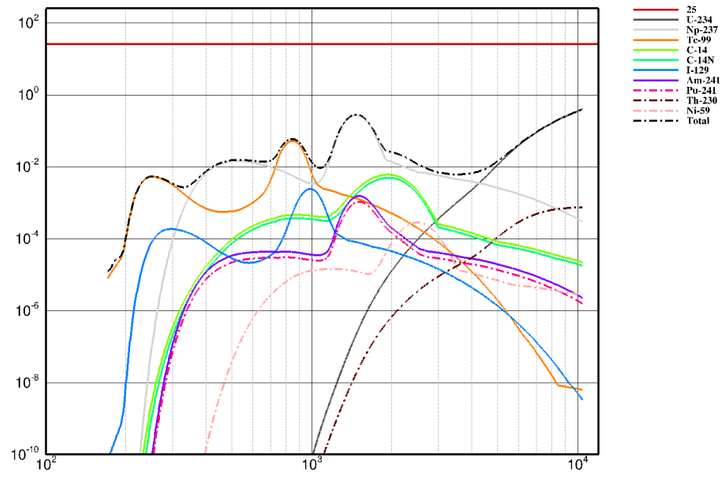
ST04 Beta-Gamma (mrem yr^{-1})



ST04 Radium (pCi L^{-1})



ST04 Uranium (µg L^{-1})



ST04 All-Pathways (mrem yr^{-1})

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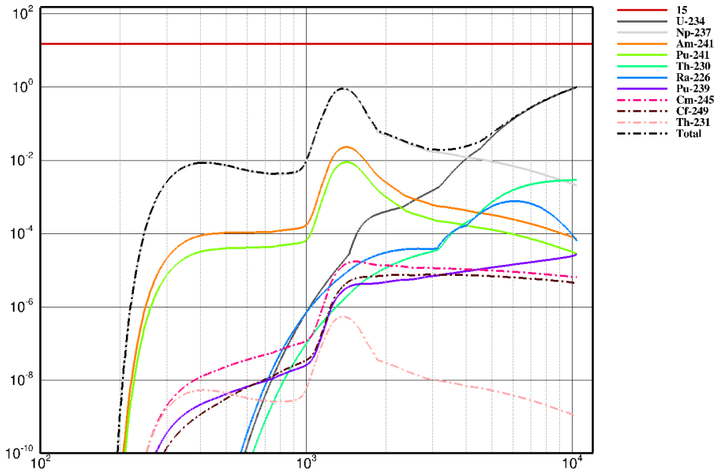
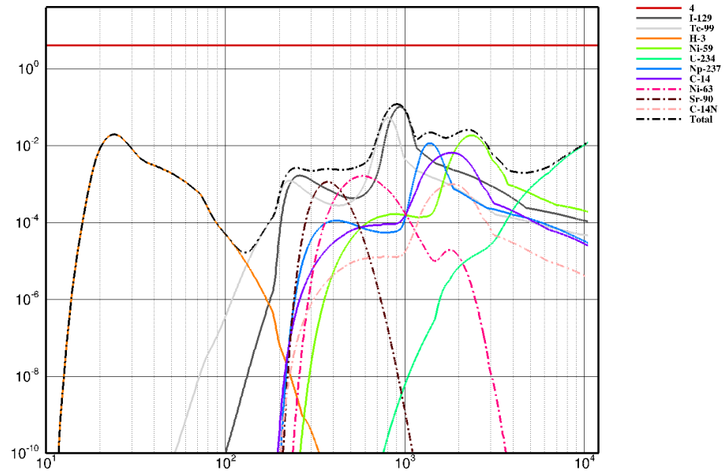
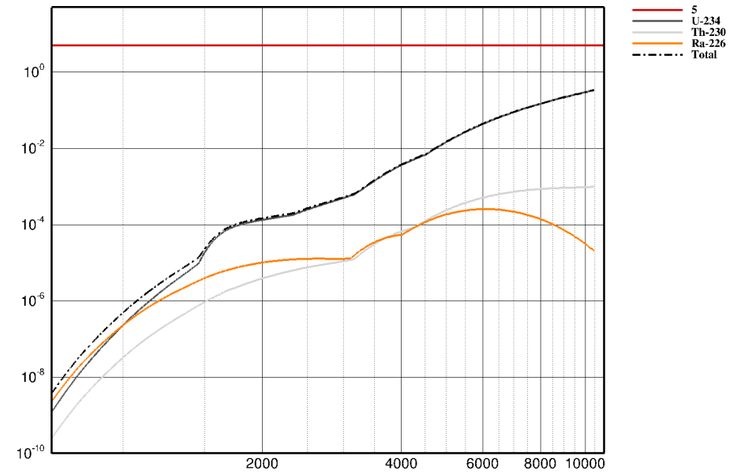
Figure I-38. Doses and Concentrations for Groundwater Pathways for ST04 and Top Contributing Radionuclides During Post-Compliance Period



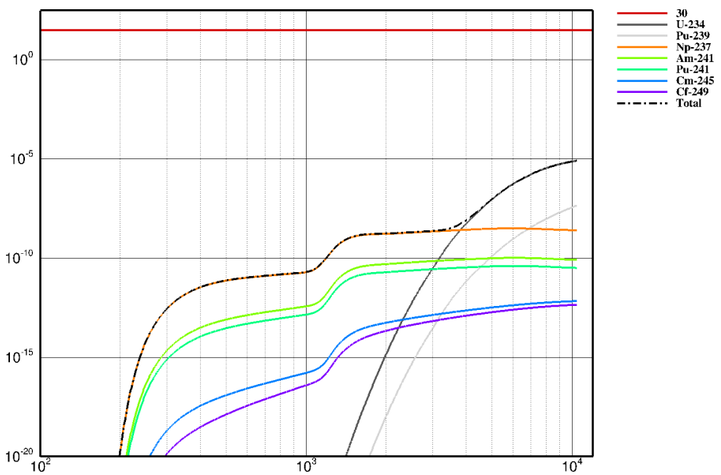
ST05 Gross-Alpha (pCi L^{-1})



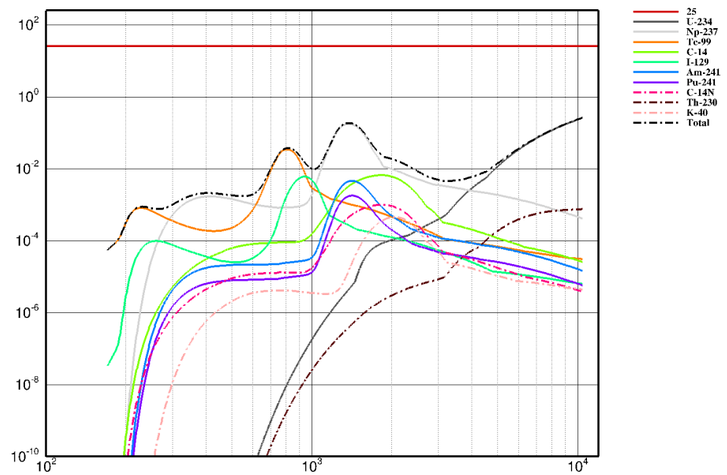
ST05 Beta-Gamma (mrem yr^{-1})



ST05 Radium (pCi L^{-1})



ST05 Uranium (µg L^{-1})



ST05 All-Pathways (mrem yr^{-1})

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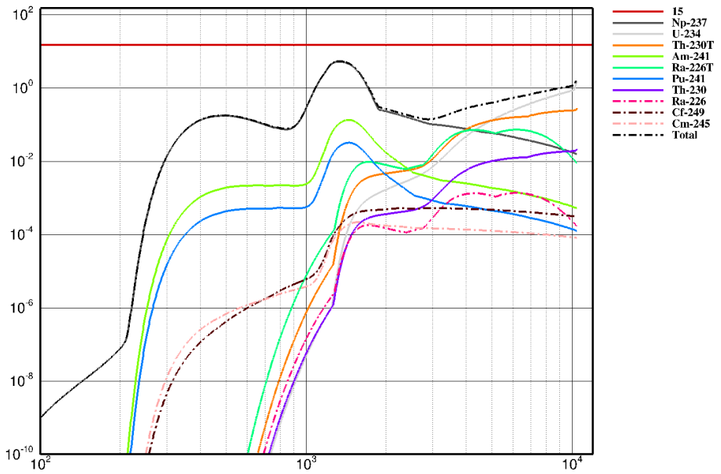
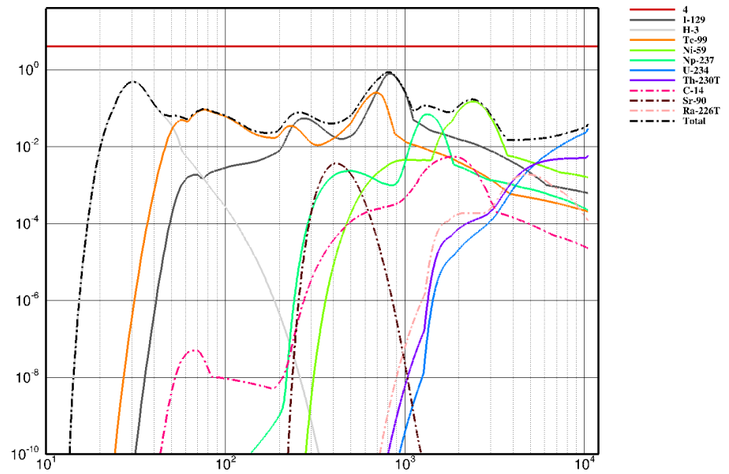
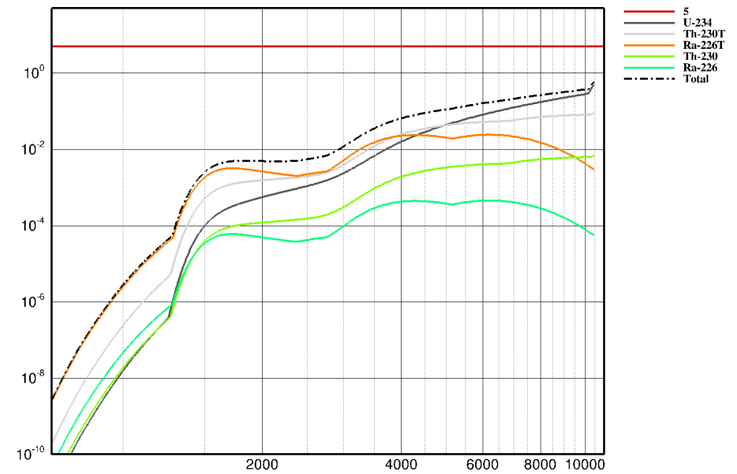
Figure I-39. Doses and Concentrations for Groundwater Pathways for ST05 and Top Contributing Radionuclides During Post-Compliance Period



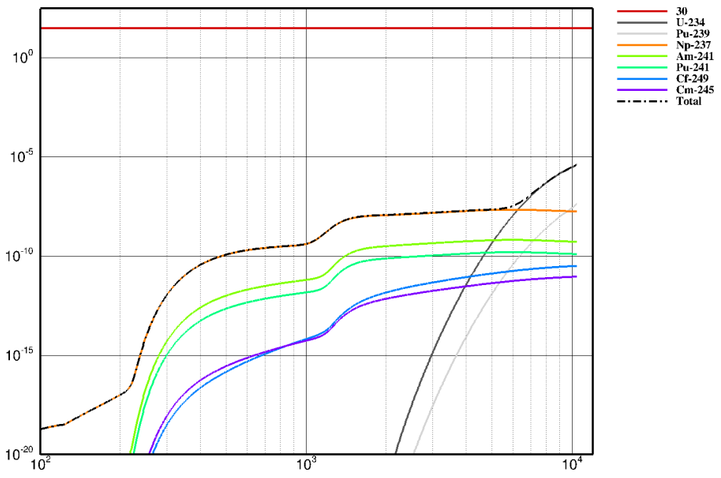
ST06 Gross-Alpha (pCi L^{-1})



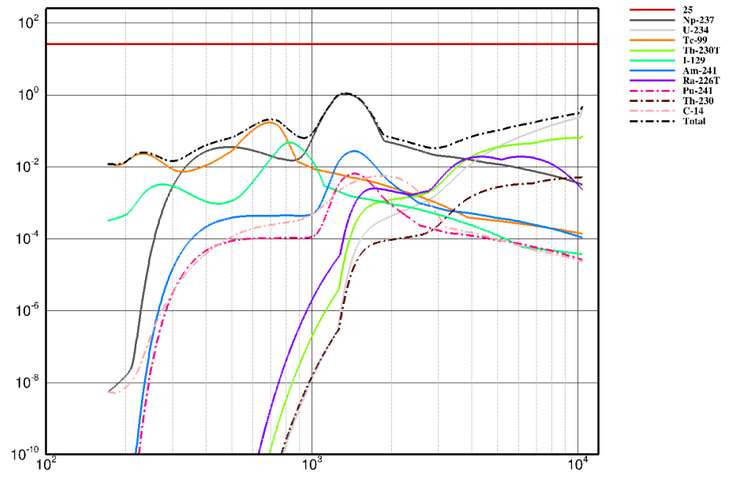
ST06 Beta-Gamma (mrem yr^{-1})



ST06 Radium (pCi L^{-1})



ST06 Uranium (µg L^{-1})



ST06 All-Pathways (mrem yr^{-1})

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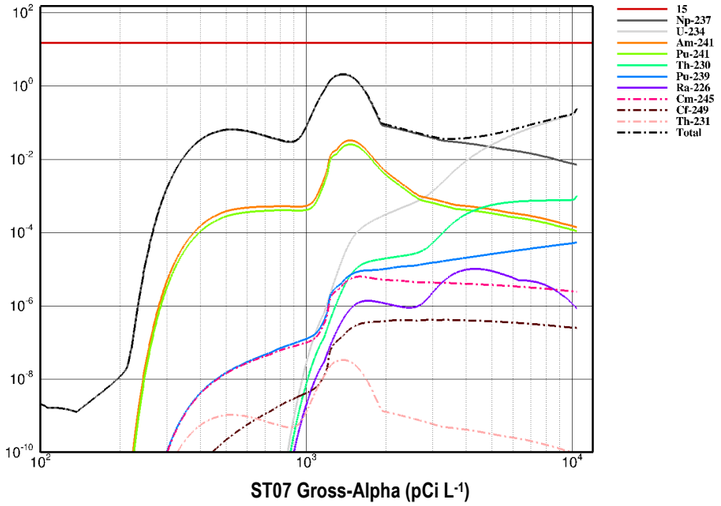
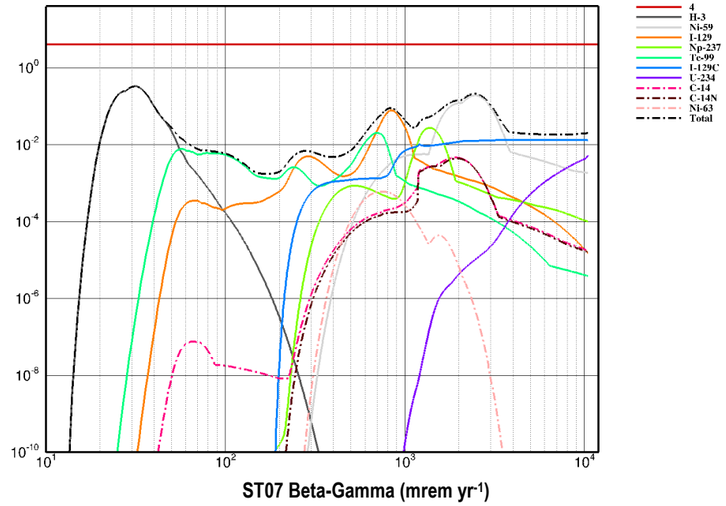
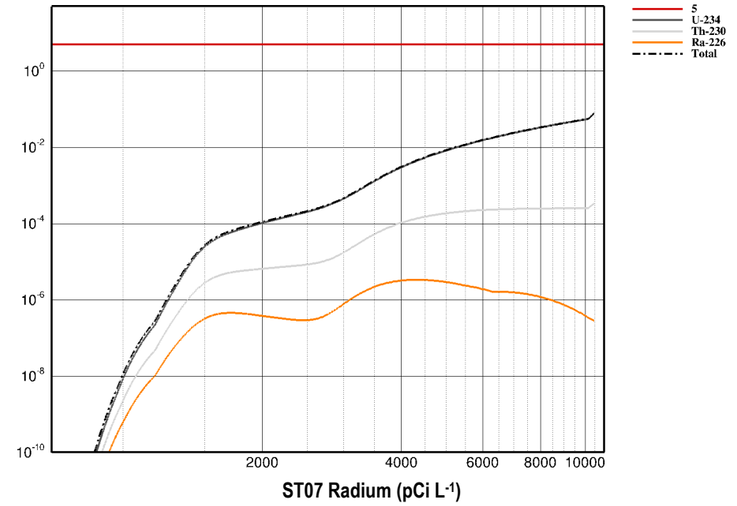
Figure I-40. Doses and Concentrations for Groundwater Pathways for ST06 and Top Contributing Radionuclides During Post-Compliance Period



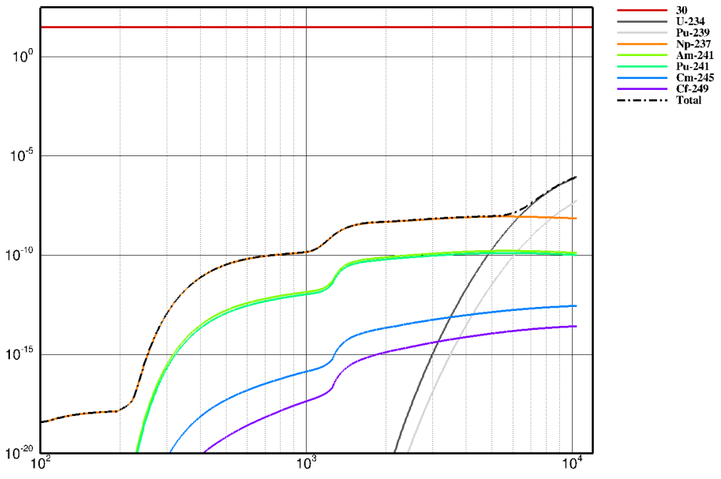
ST07 Gross-Alpha (pCi L^{-1})



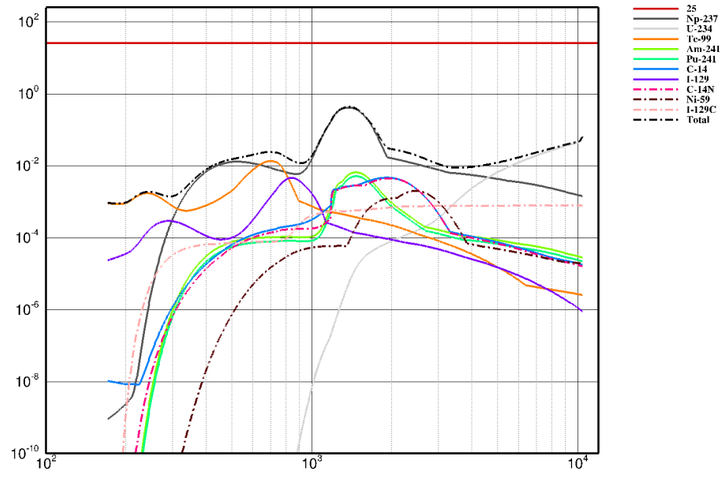
ST07 Beta-Gamma (mrem yr^{-1})



ST07 Radium (pCi L^{-1})



ST07 Uranium (µg L^{-1})



ST07 All-Pathways (mrem yr^{-1})

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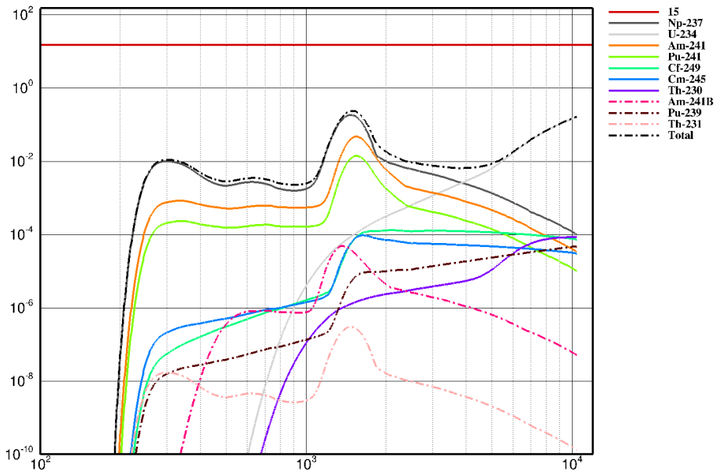
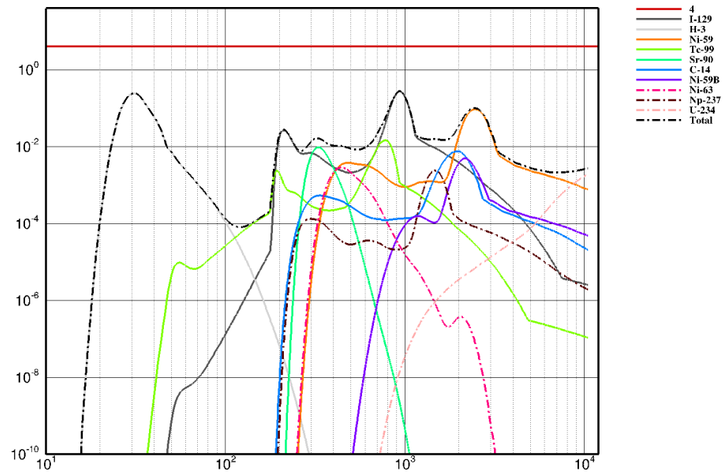
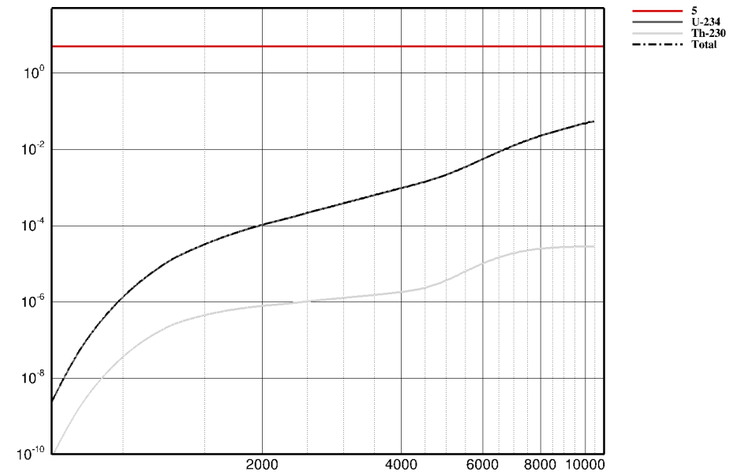
Figure I-41. Doses and Concentrations for Groundwater Pathways for ST07 and Top Contributing Radionuclides During Post-Compliance Period



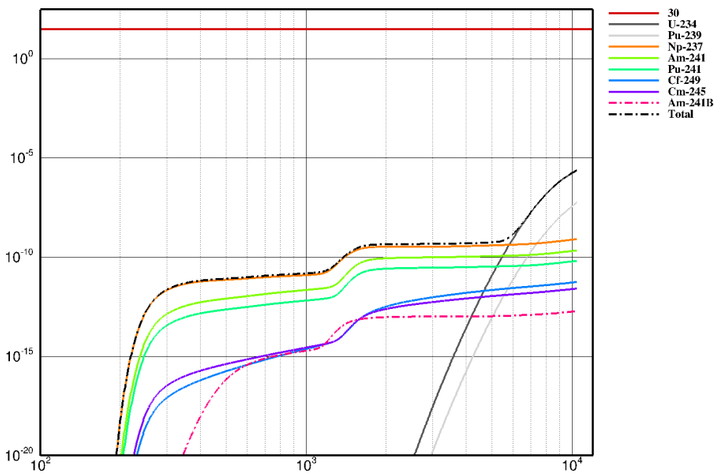
ST08 Gross-Alpha (pCi L^{-1})



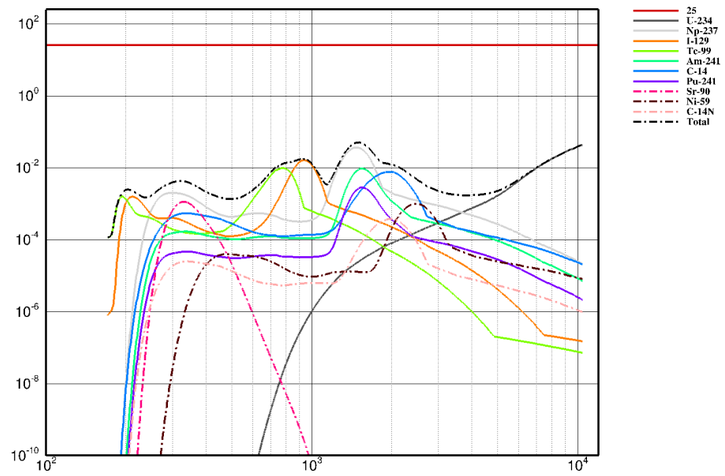
ST08 Beta-Gamma (mrem yr^{-1})



ST08 Radium (pCi L^{-1})



ST08 Uranium (µg L^{-1})



ST08 All-Pathways (mrem yr^{-1})

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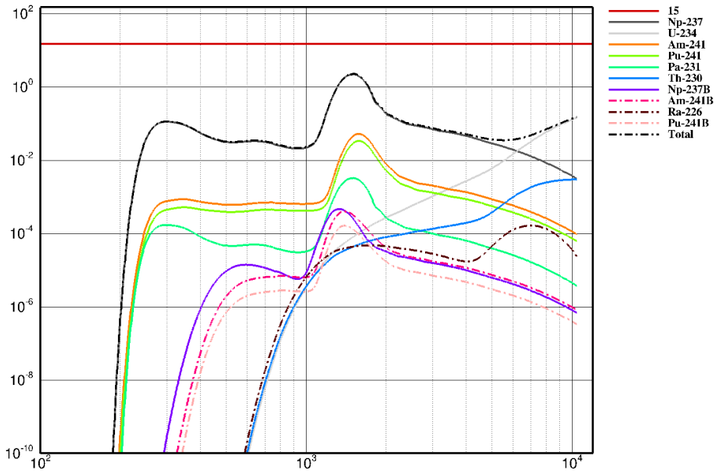
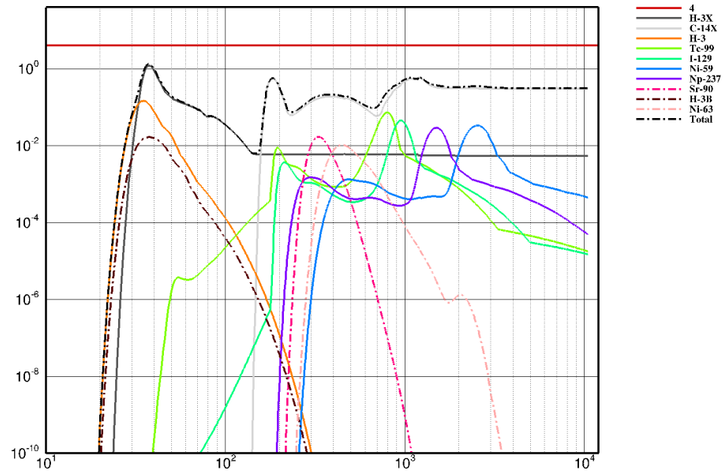
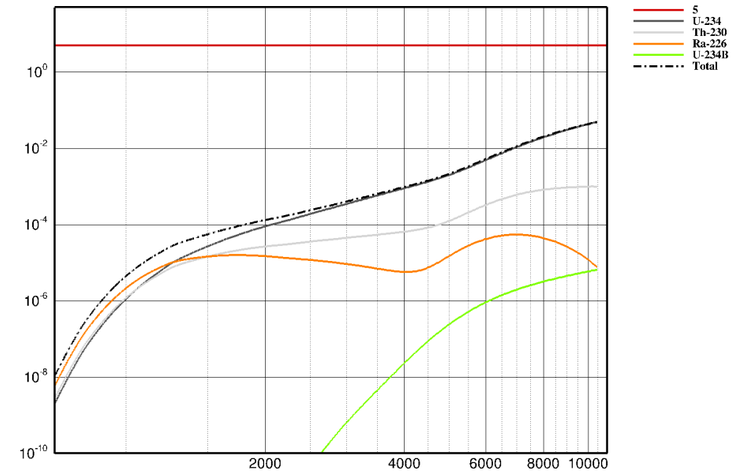
Figure I-42. Doses and Concentrations for Groundwater Pathways for ST08 and Top Contributing Radionuclides During Post-Compliance Period



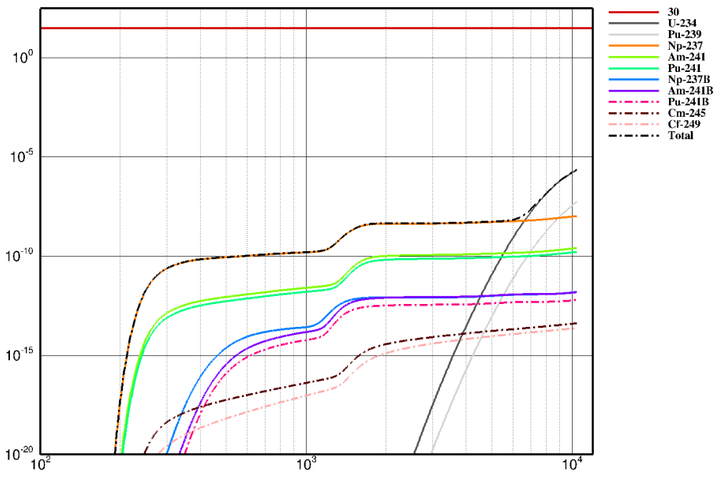
ST09 Gross-Alpha (pCi L^{-1})



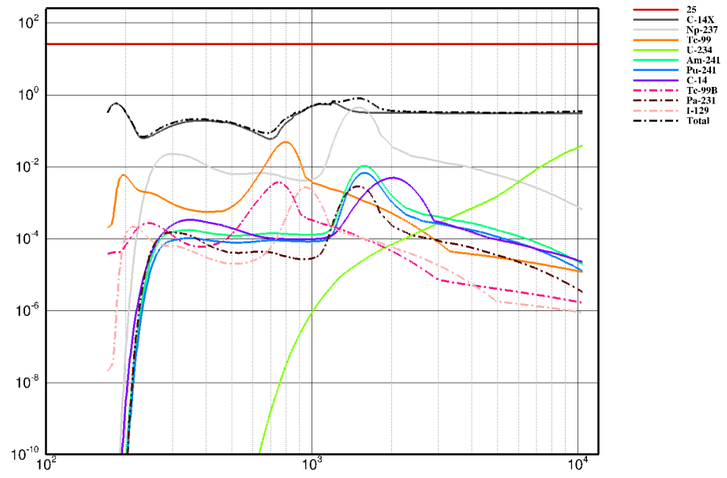
ST09 Beta-Gamma (mrem yr^{-1})



ST09 Radium (pCi L^{-1})



ST09 Uranium (µg L^{-1})



ST09 All-Pathways (mrem yr^{-1})

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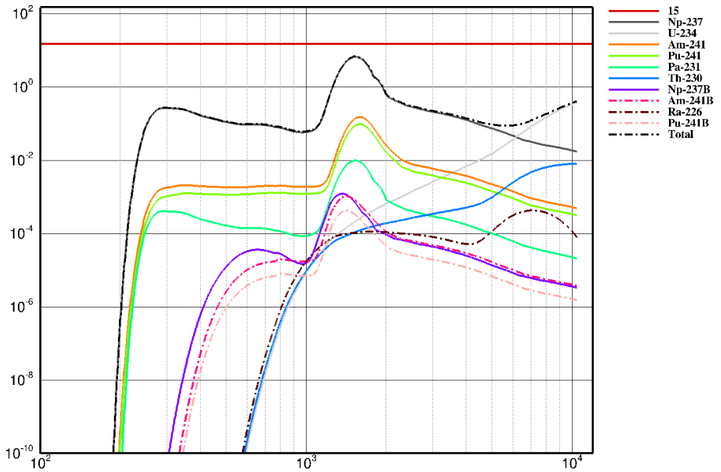
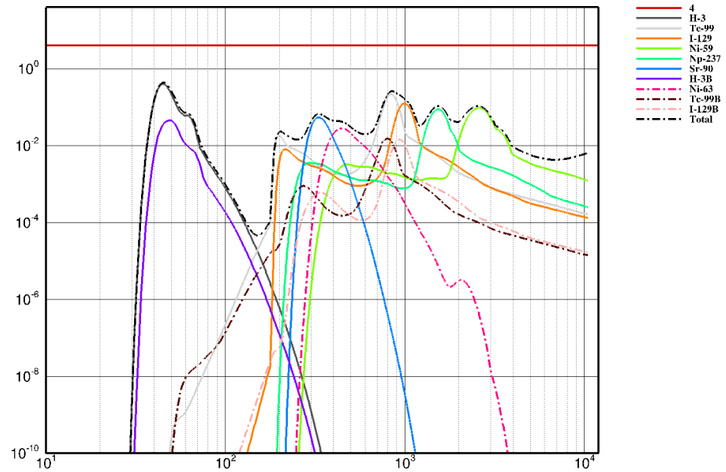
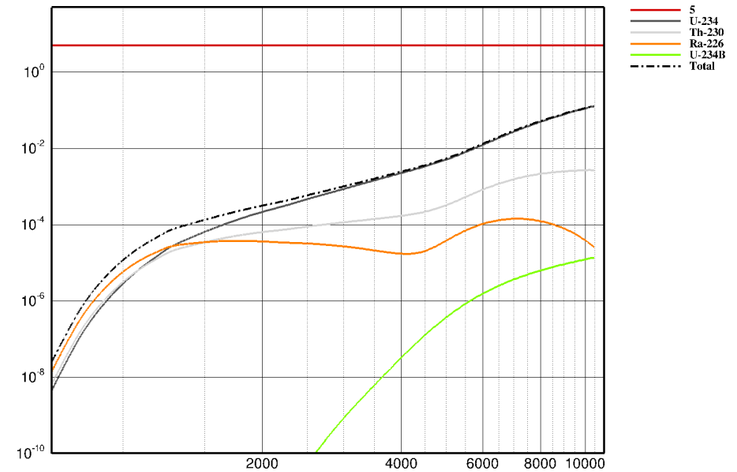
Figure I-43. Doses and Concentrations for Groundwater Pathways for ST09 and Top Contributing Radionuclides During Post-Compliance Period



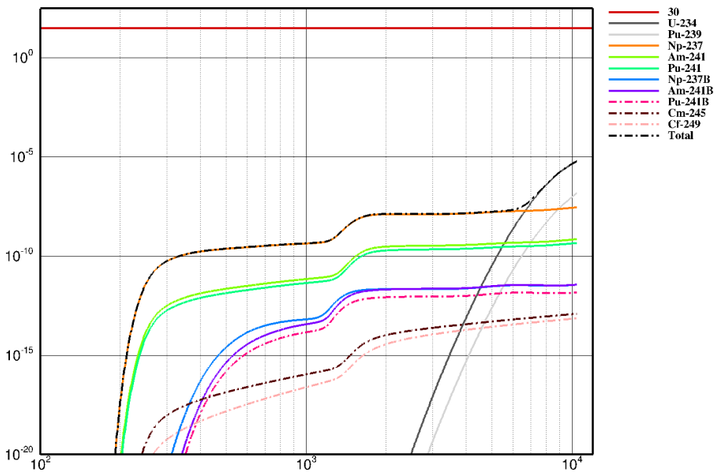
ST10 Gross-Alpha (pCi L^{-1})



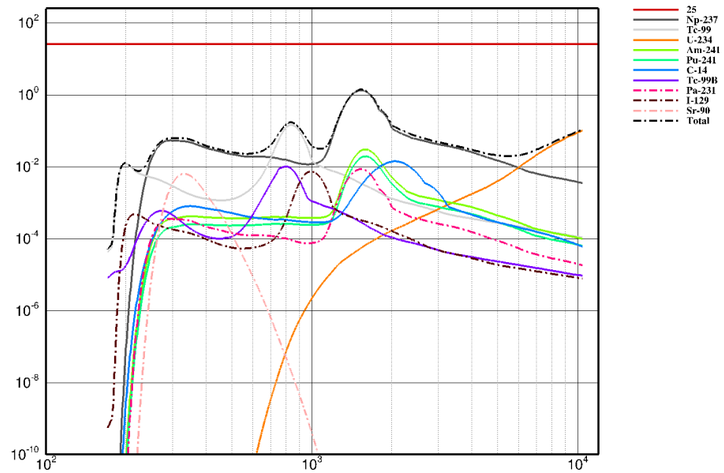
ST10 Beta-Gamma (mrem yr^{-1})



ST10 Radium (pCi L^{-1})



ST10 Uranium (µg L^{-1})



ST10 All-Pathways (mrem yr^{-1})

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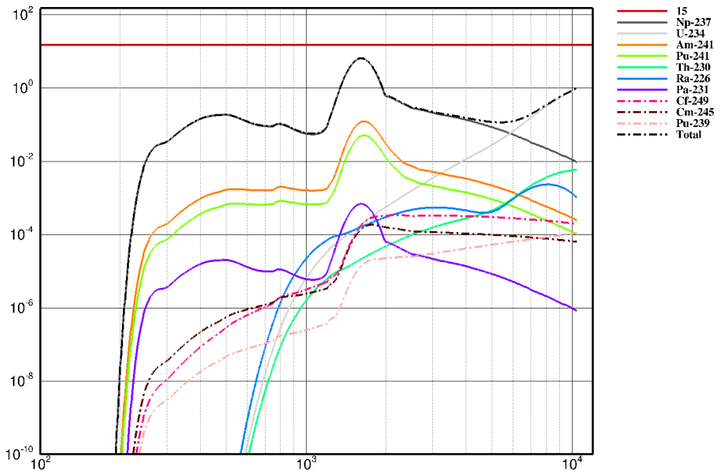
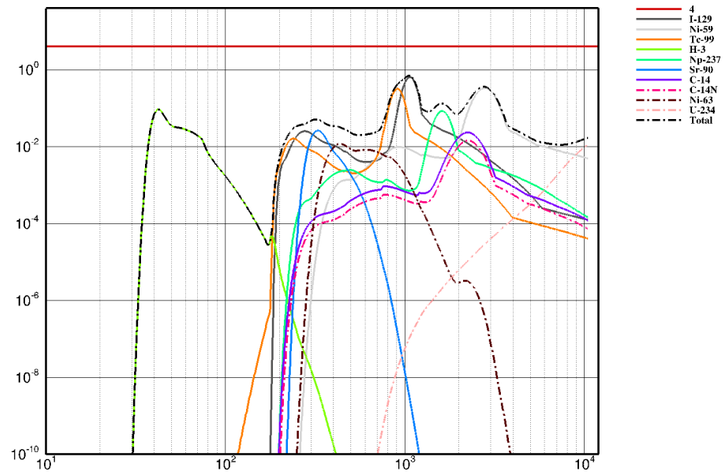
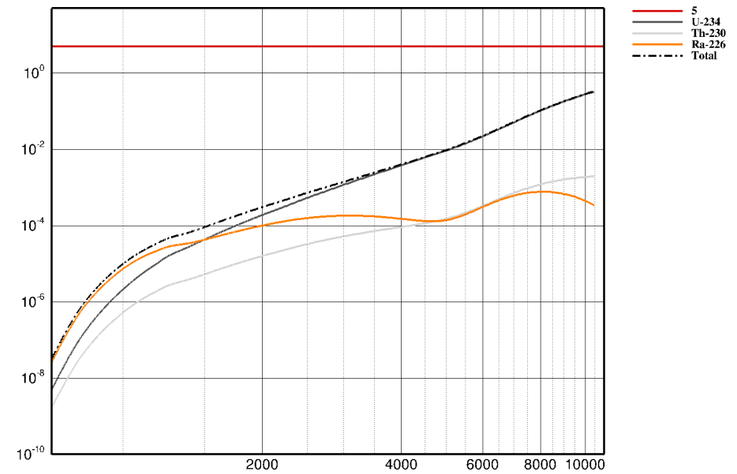
Figure I-44. Doses and Concentrations for Groundwater Pathways for ST10 and Top Contributing Radionuclides During Post-Compliance Period



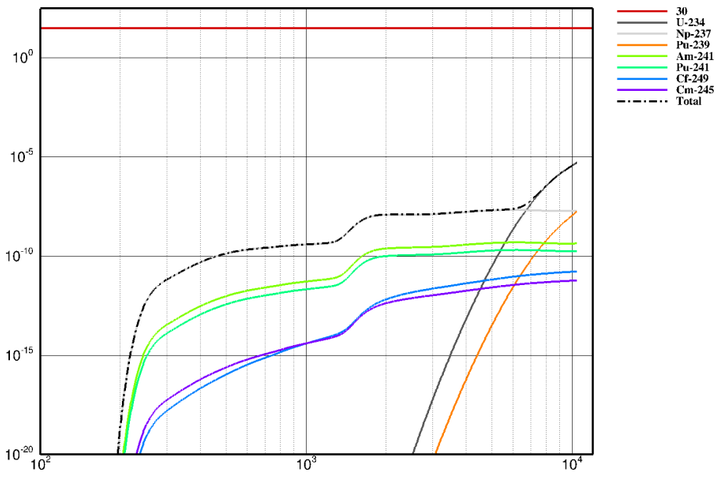
ST11 Gross-Alpha (pCi L^{-1})



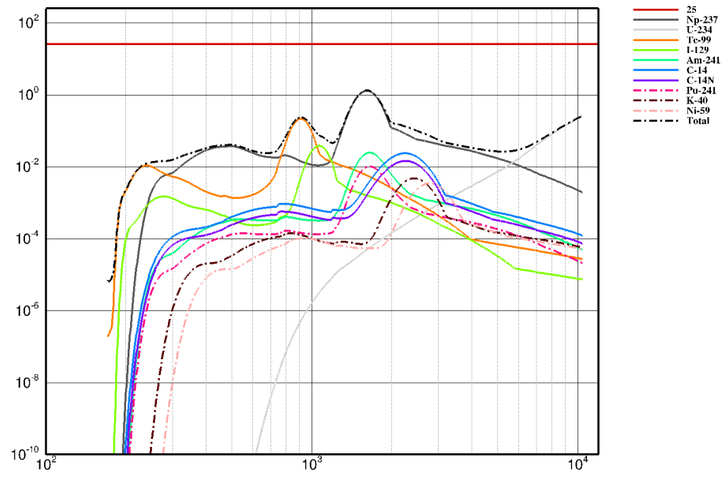
ST11 Beta-Gamma (mrem yr^{-1})



ST11 Radium (pCi L^{-1})



ST11 Uranium (µg L^{-1})



ST11 All-Pathways (mrem yr^{-1})

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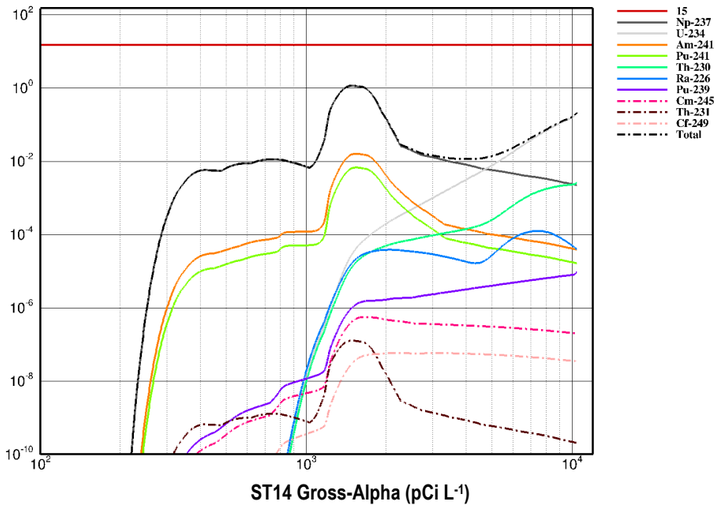
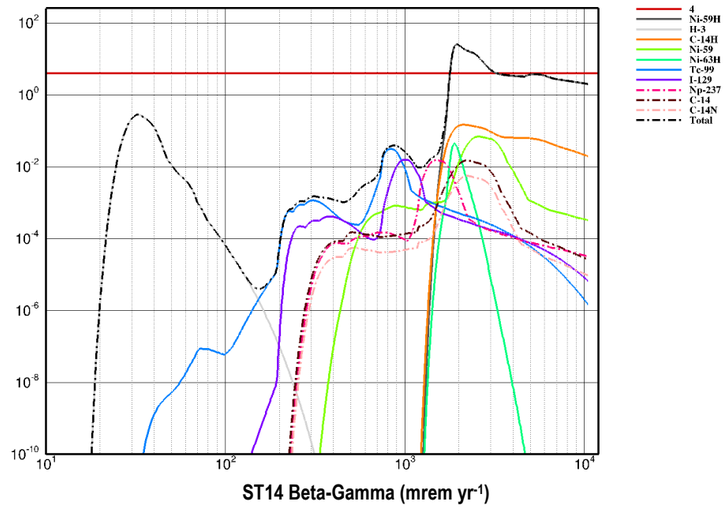
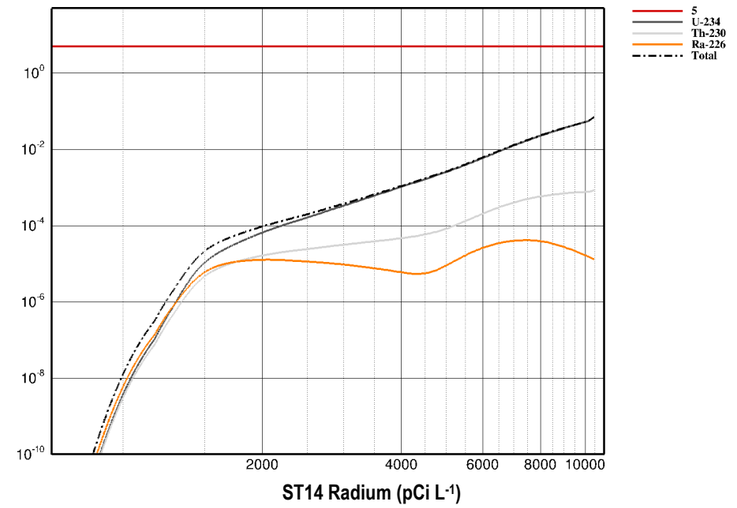
Figure I-45. Doses and Concentrations for Groundwater Pathways for ST11 and Top Contributing Radionuclides During Post-Compliance Period



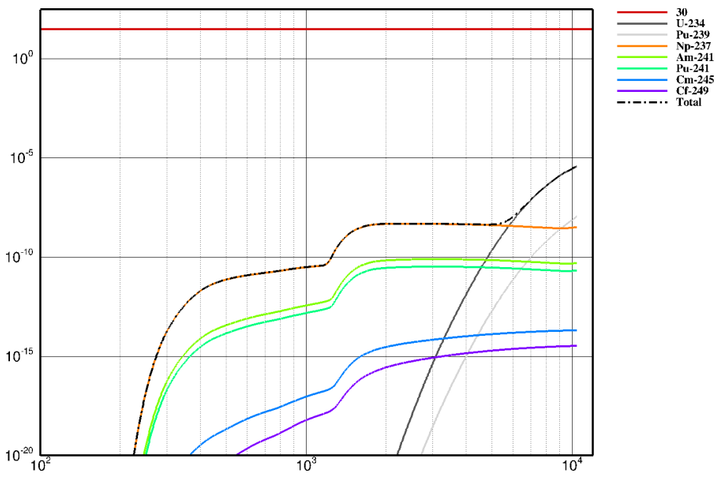
ST14 Gross-Alpha (pCi L^{-1})



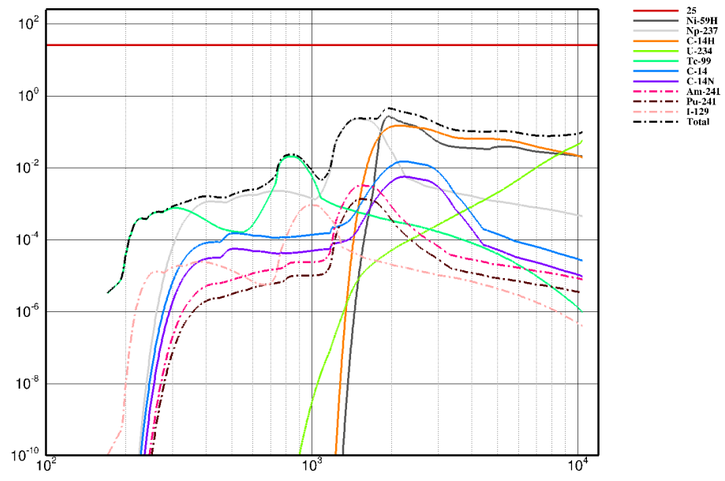
ST14 Beta-Gamma (mrem yr^{-1})



ST14 Radium (pCi L^{-1})



ST14 Uranium (µg L^{-1})



ST14 All-Pathways (mrem yr^{-1})

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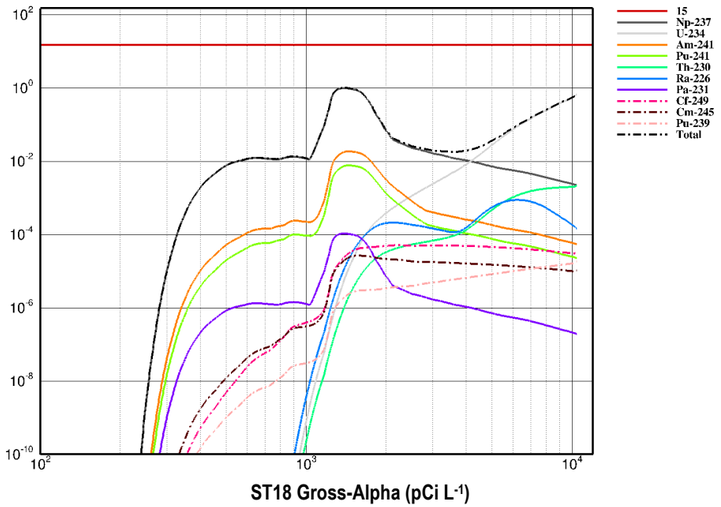
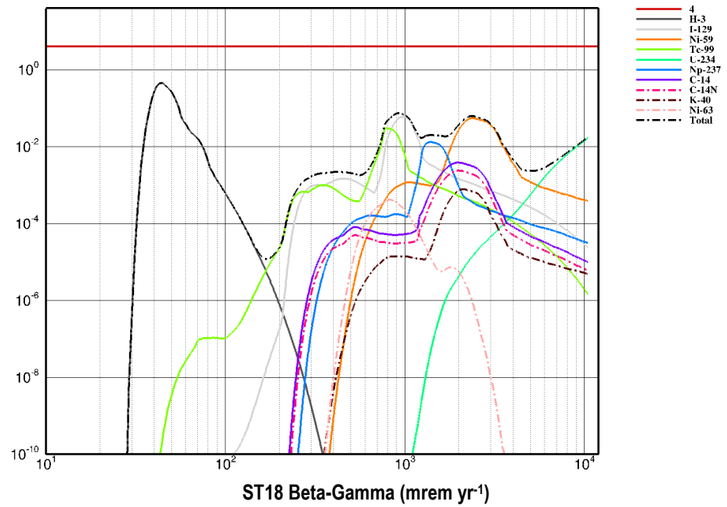
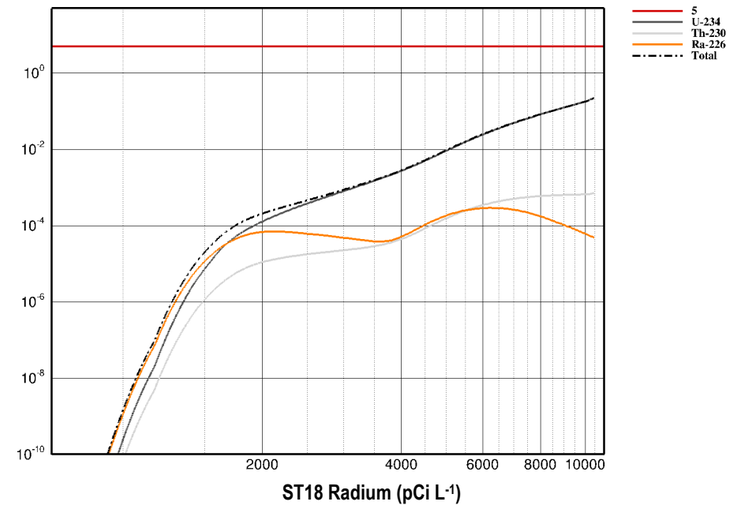
Figure I-46. Doses and Concentrations for Groundwater Pathways for ST14 and Top Contributing Radionuclides During Post-Compliance Period



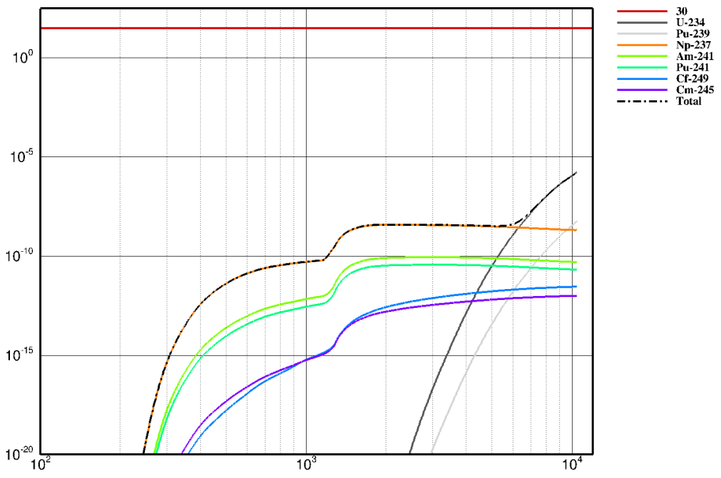
ST18 Gross-Alpha (pCi L^{-1})



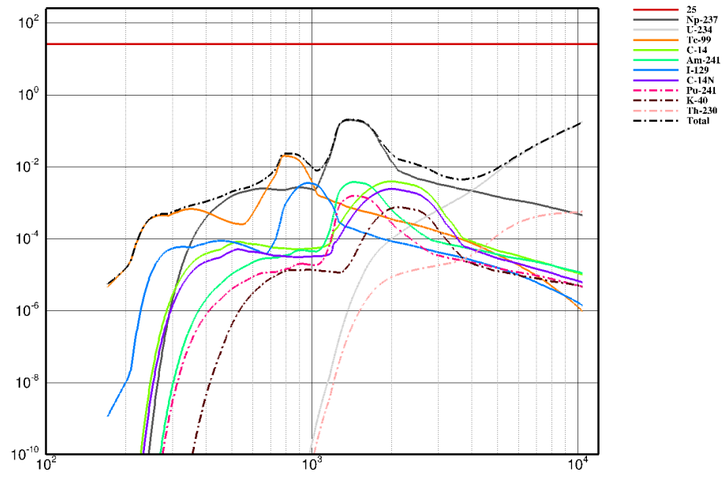
ST18 Beta-Gamma (mrem yr^{-1})



ST18 Radium (pCi L^{-1})



ST18 Uranium (µg L^{-1})



ST18 All-Pathways (mrem yr^{-1})

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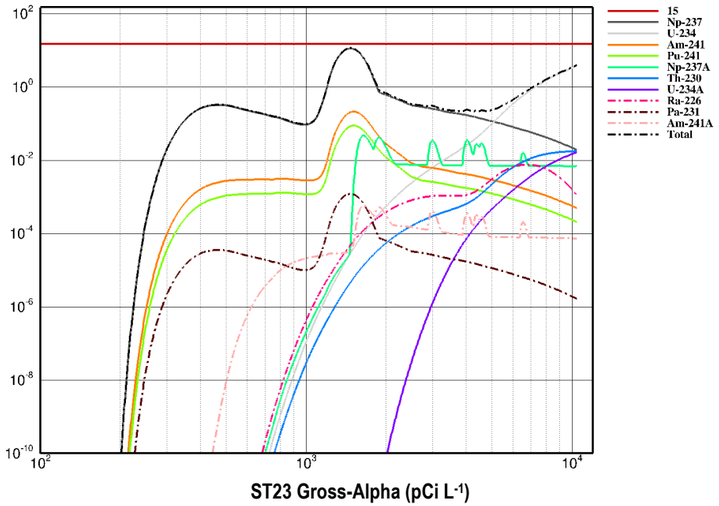
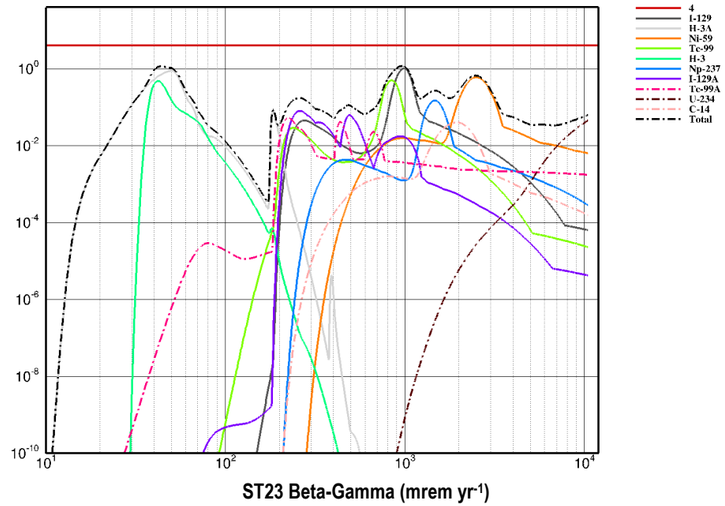
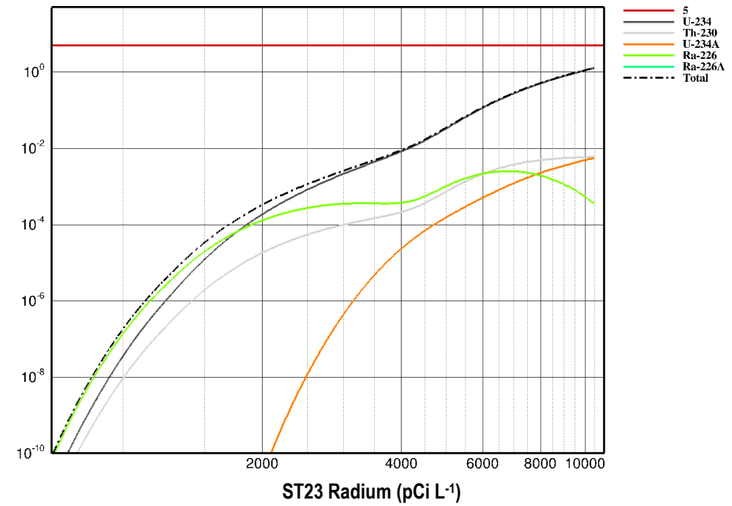
Figure I-47. Doses and Concentrations for Groundwater Pathways for ST18 and Top Contributing Radionuclides During Post-Compliance Period



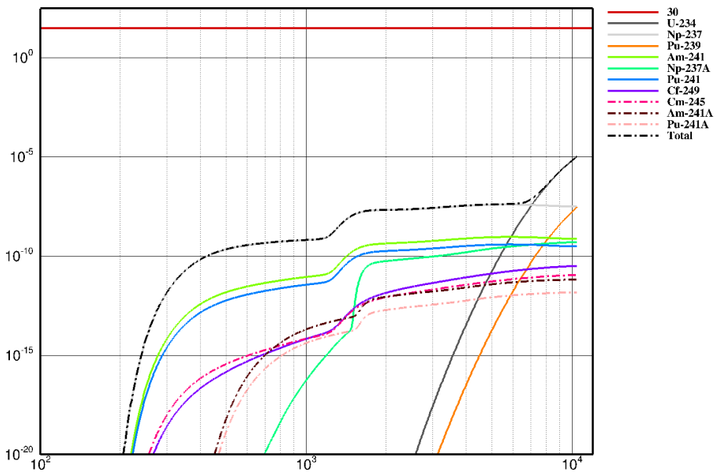
ST23 Gross-Alpha (pCi L^{-1})



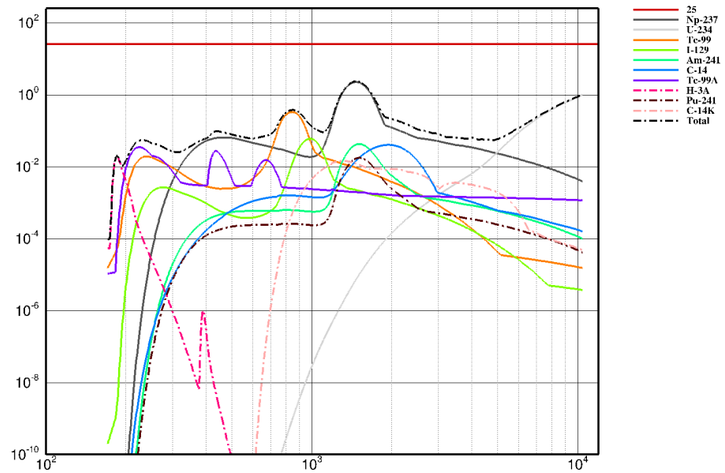
ST23 Beta-Gamma (mrem yr^{-1})



ST23 Radium (pCi L^{-1})



ST23 Uranium (µg L^{-1})



ST23 All-Pathways (mrem yr^{-1})

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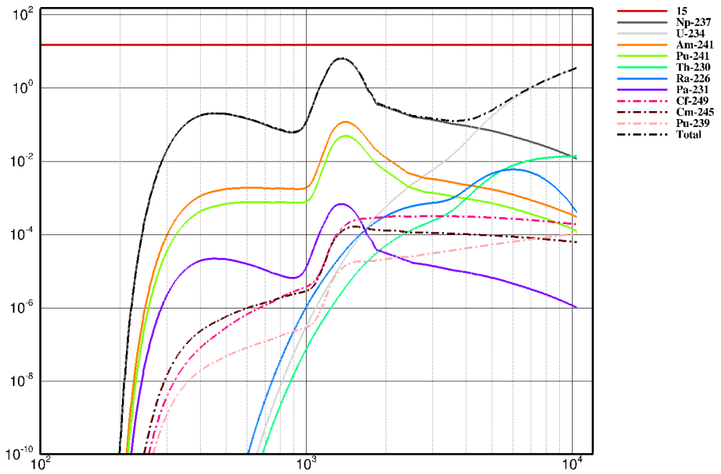
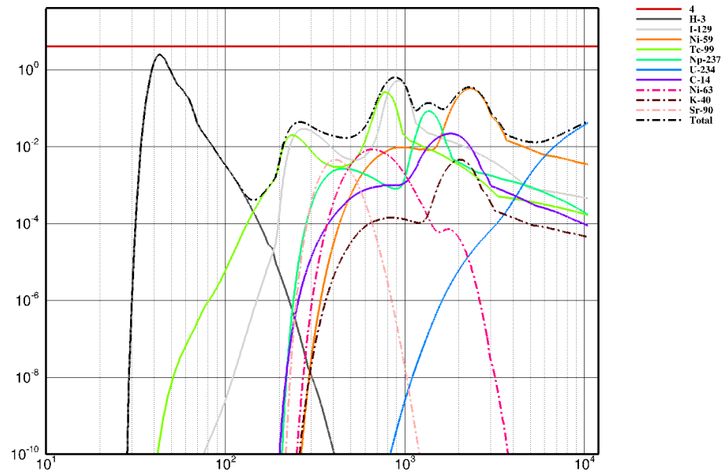
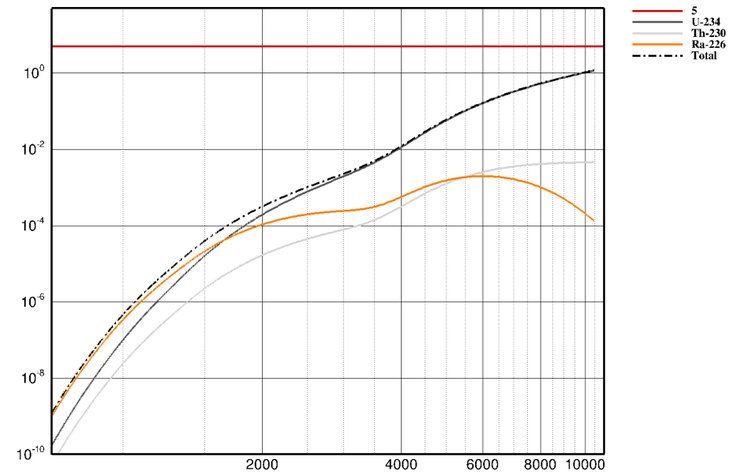
Figure I-48. Doses and Concentrations for Groundwater Pathways for ST23 and Top Contributing Radionuclides During Post-Compliance Period



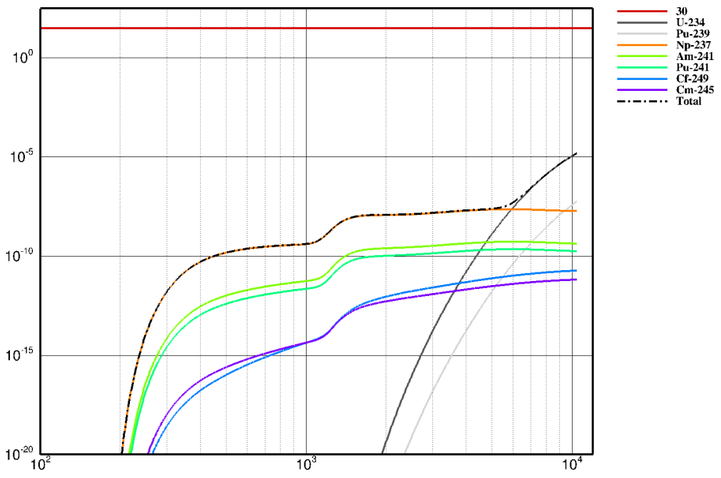
ST24 Gross-Alpha (pCi L^{-1})



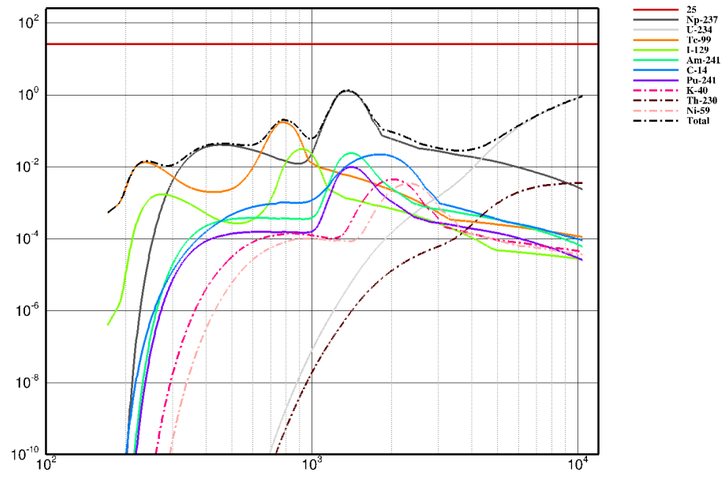
ST24 Beta-Gamma (mrem yr^{-1})



ST24 Radium (pCi L^{-1})



ST24 Uranium (µg L^{-1})



ST24 All-Pathways (mrem yr-1)

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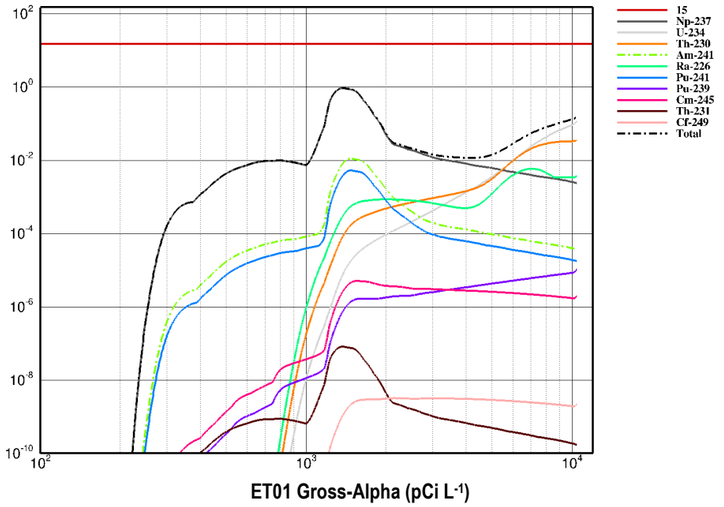
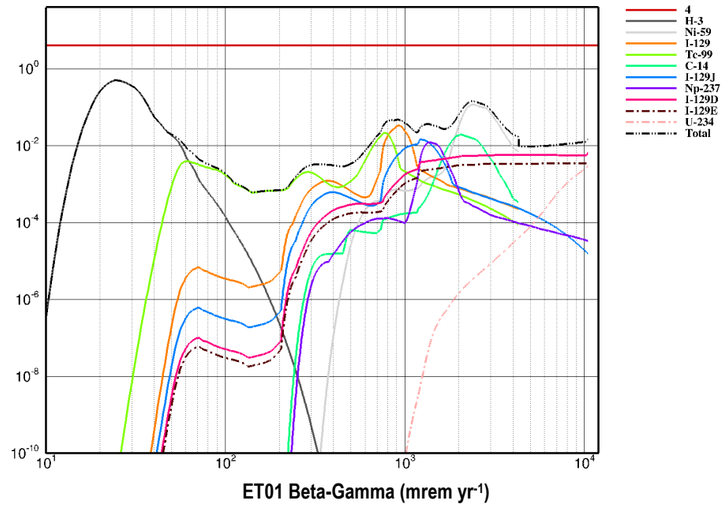
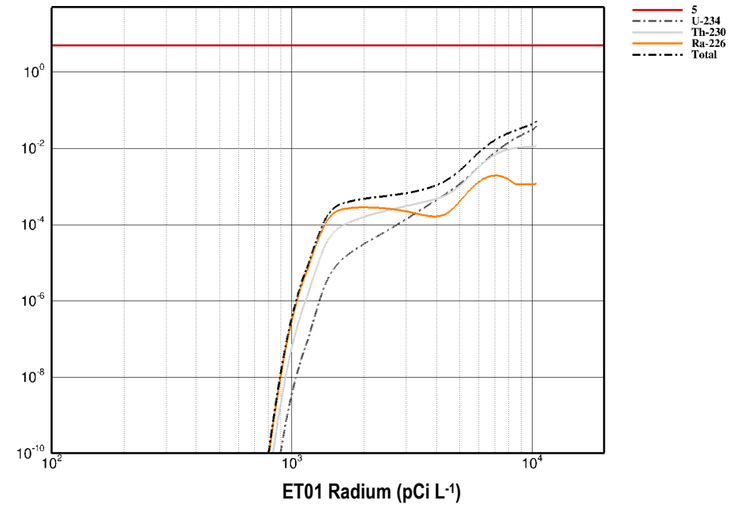
Figure I-49. Doses and Concentrations for Groundwater Pathways for ST24 and Top Contributing Radionuclides During Post-Compliance Period



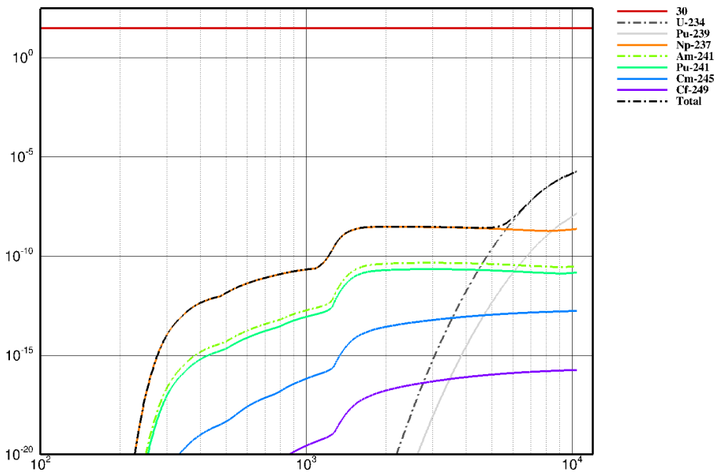
ET01 Gross-Alpha (pCi L^{-1})



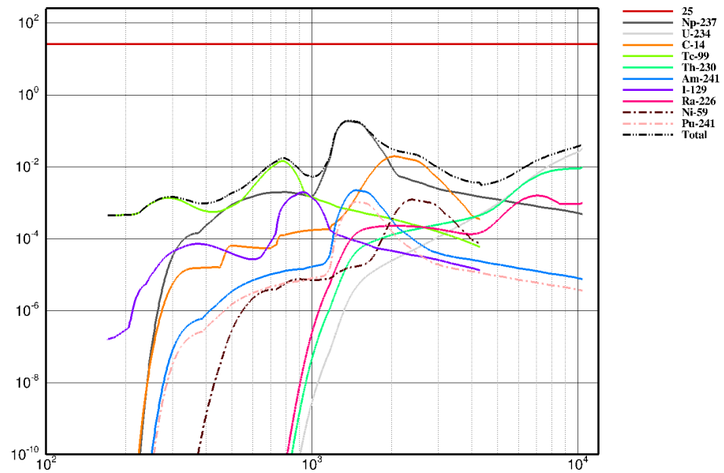
ET01 Beta-Gamma (mrem yr^{-1})



ET01 Radium (pCi L^{-1})



ET01 Uranium (µg L^{-1})



ET01 All-Pathways (mrem yr^{-1})

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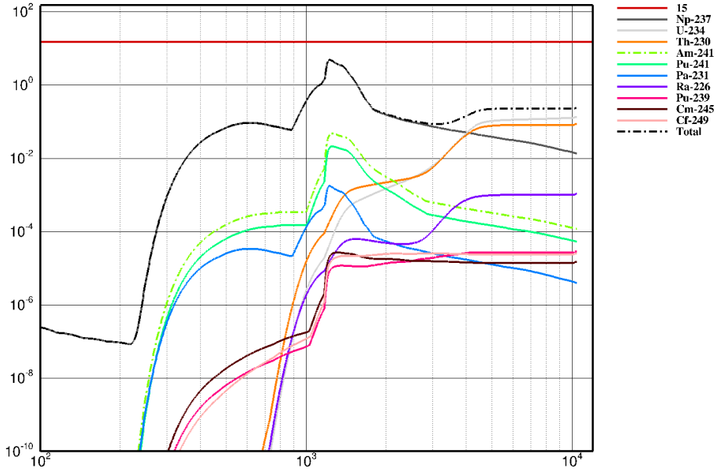
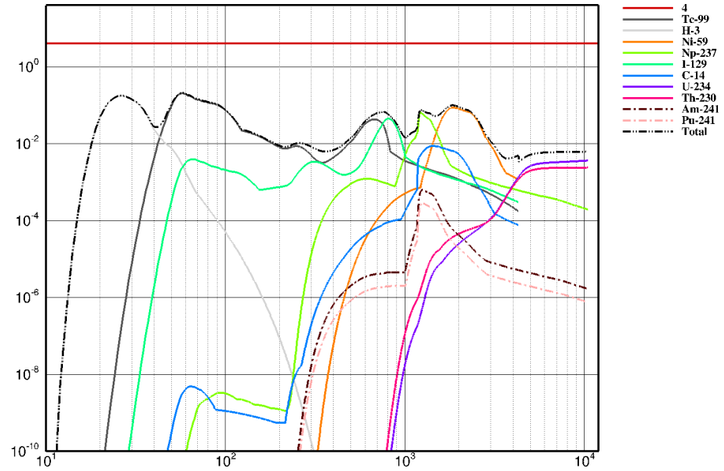
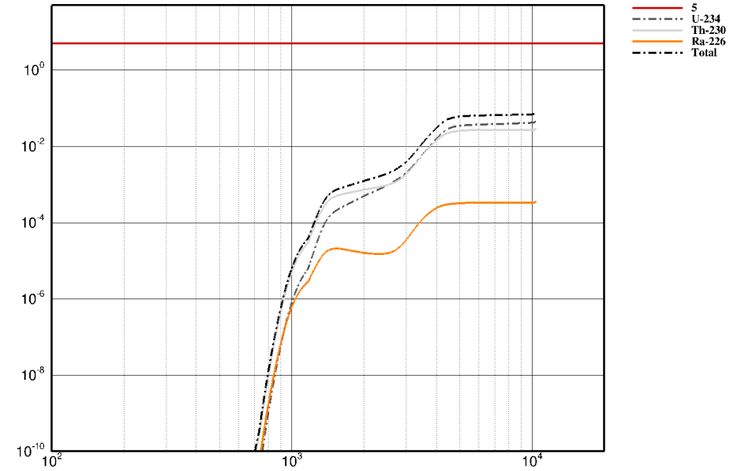
Figure I-50. Doses and Concentrations for Groundwater Pathways for ET01 and Top Contributing Radionuclides During Post-Compliance Period



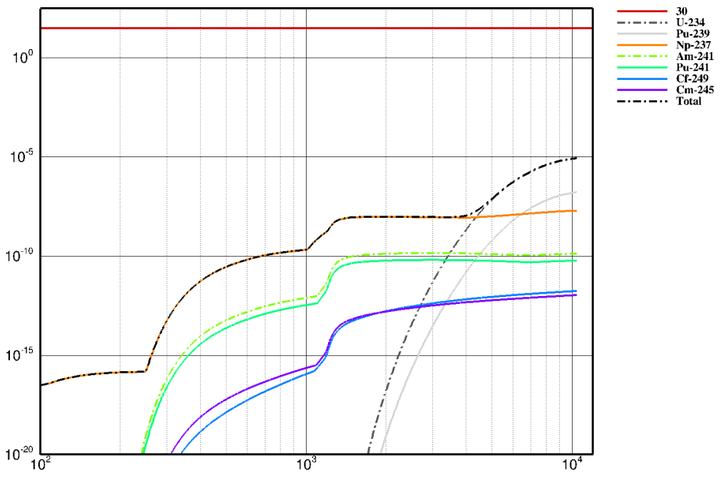
ET02 Gross-Alpha (pCi L^{-1})



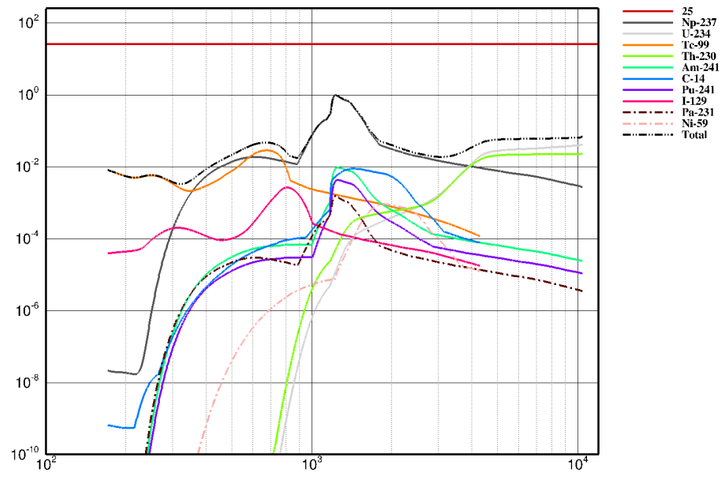
ET02 Beta-Gamma (mrem yr^{-1})



ET02 Radium (pCi L^{-1})



ET02 Uranium (µg L^{-1})



ET02 All-Pathways (mrem yr^{-1})

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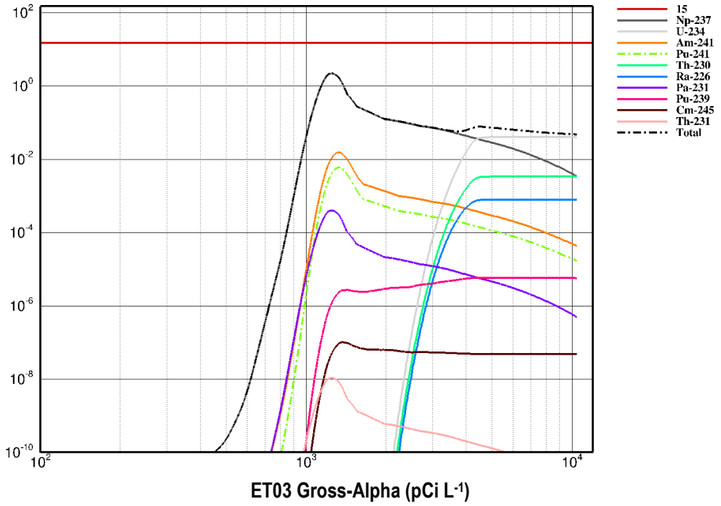
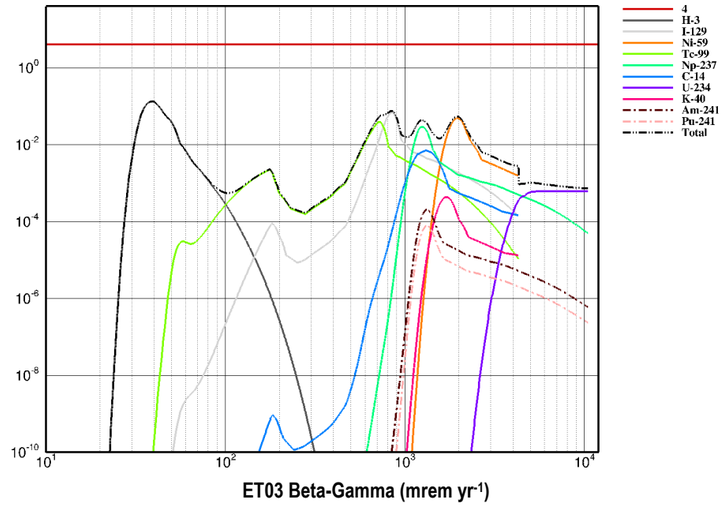
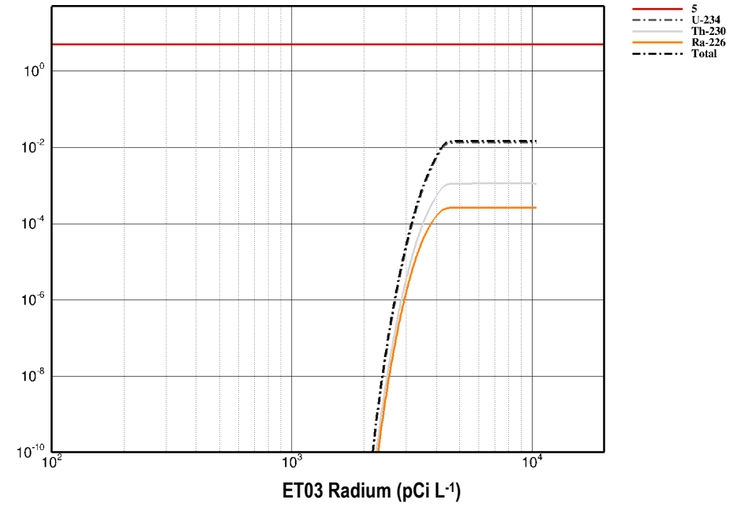
Figure I-51. Doses and Concentrations for Groundwater Pathways for ET02 and Top Contributing Radionuclides During Post-Compliance Period



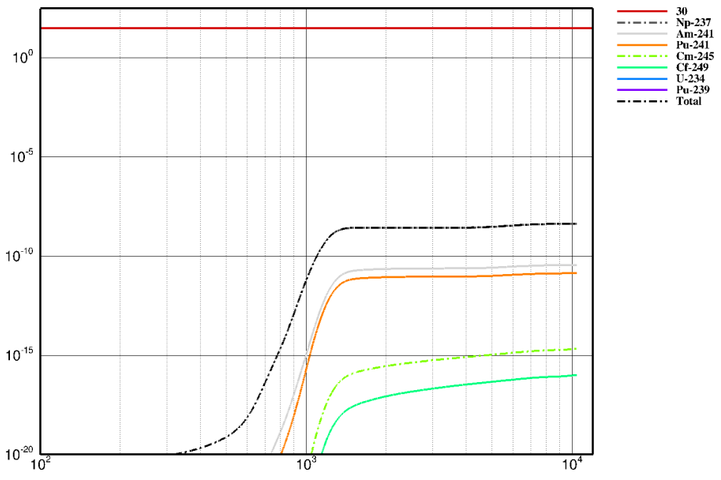
ET03 Gross-Alpha (pCi L^{-1})



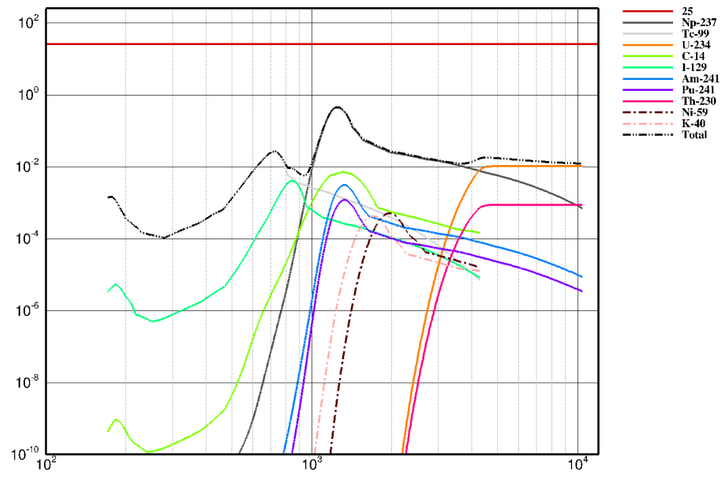
ET03 Beta-Gamma (mrem yr^{-1})



ET03 Radium (pCi L^{-1})



ET03 Uranium (µg L^{-1})



ET03 All-Pathways (mrem yr^{-1})

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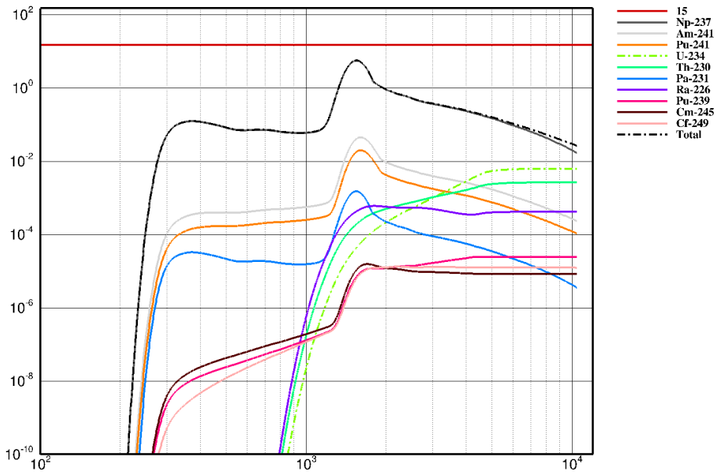
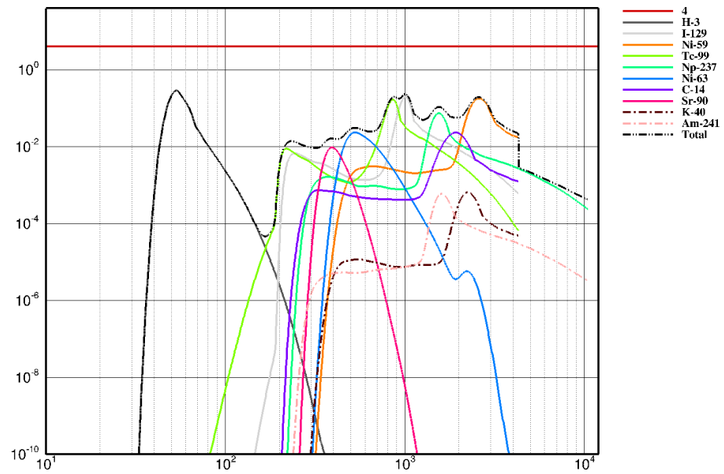
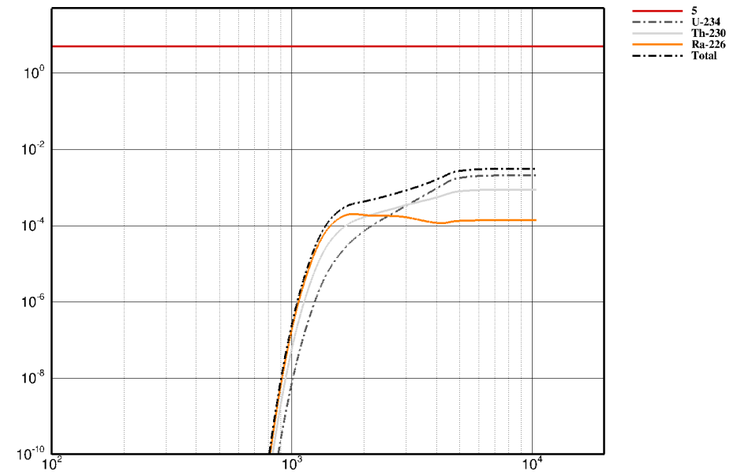
Figure I-52. Doses and Concentrations for Groundwater Pathways for ET03 and Top Contributing Radionuclides During Post-Compliance Period



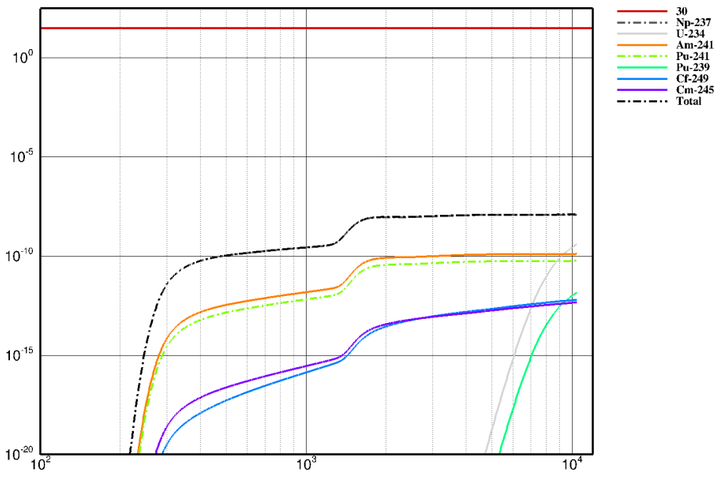
ET04 Gross-Alpha (pCi L^{-1})



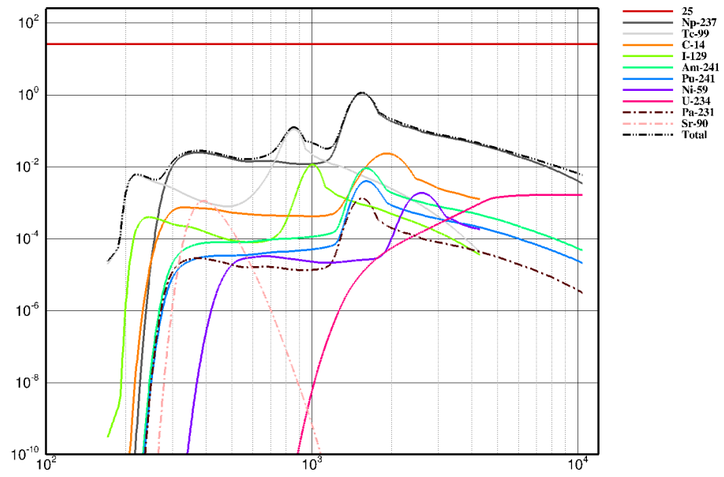
ET04 Beta-Gamma (mrem yr^{-1})



ET04 Radium (pCi L^{-1})



ET04 Uranium (µg L^{-1})



ET04 All-Pathways (mrem yr^{-1})

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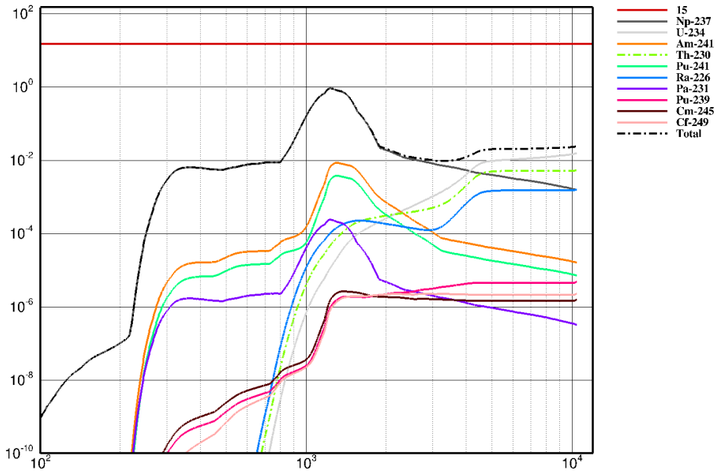
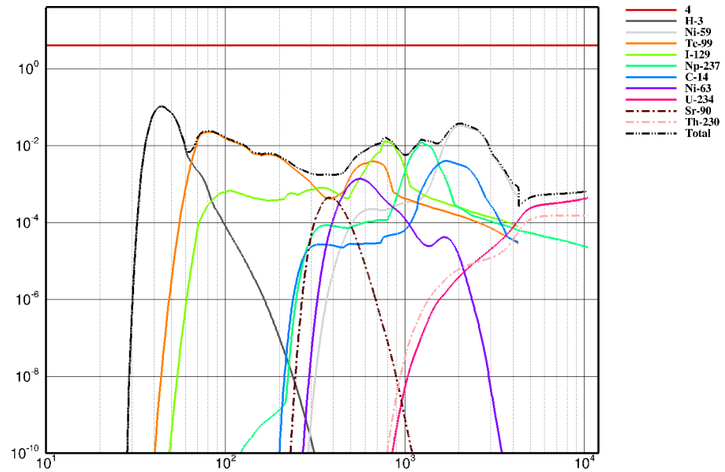
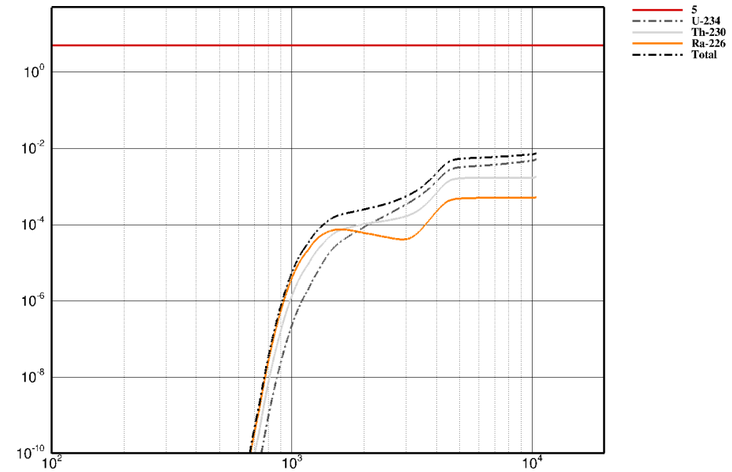
Figure I-53. Doses and Concentrations for Groundwater Pathways for ET04 and Top Contributing Radionuclides During Post-Compliance Period



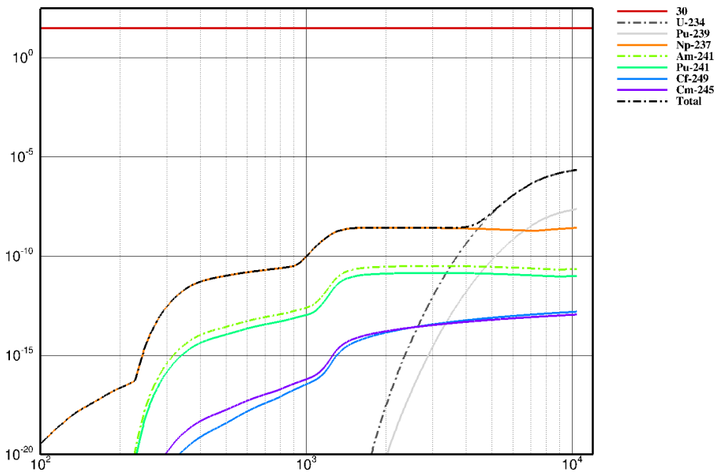
ET05 Gross-Alpha (pCi L^{-1})



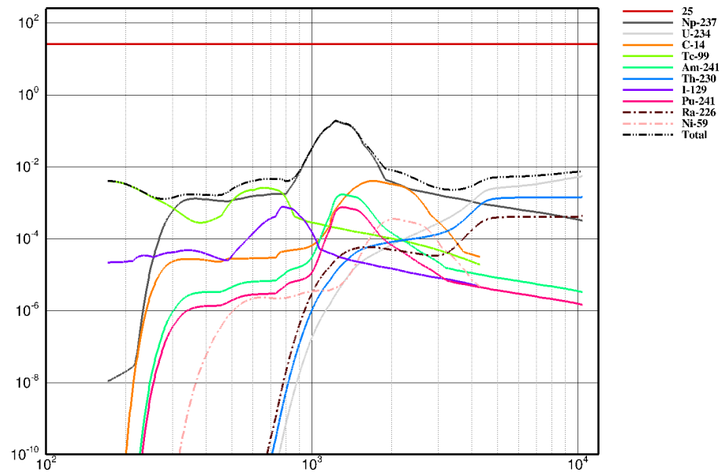
ET05 Beta-Gamma (mrem yr^{-1})



ET05 Radium (pCi L^{-1})



ET05 Uranium (µg L^{-1})



ET05 All-Pathways (mrem yr^{-1})

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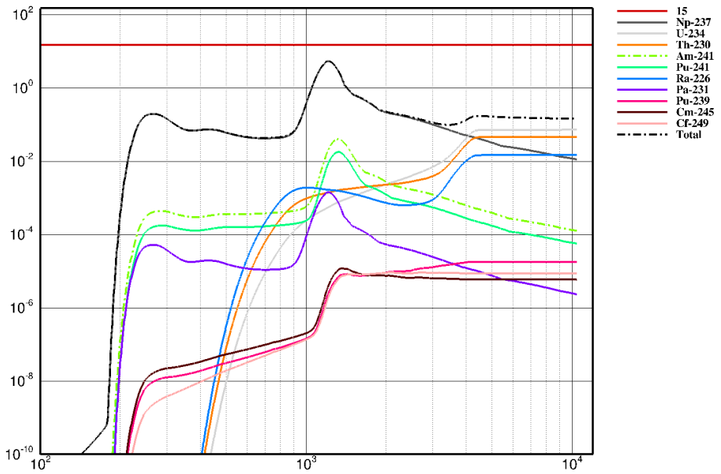
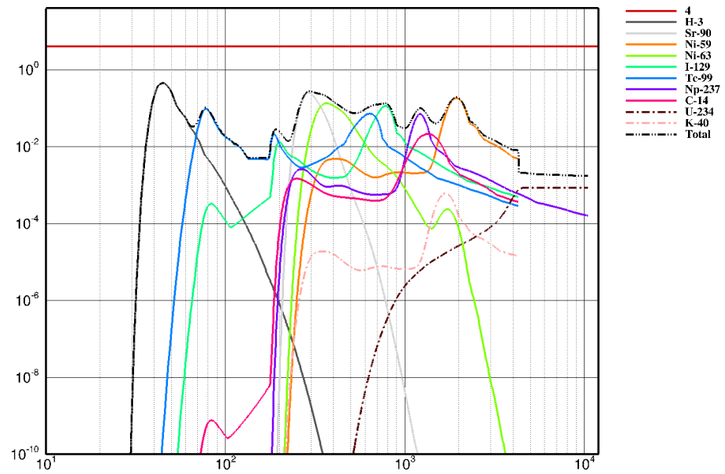
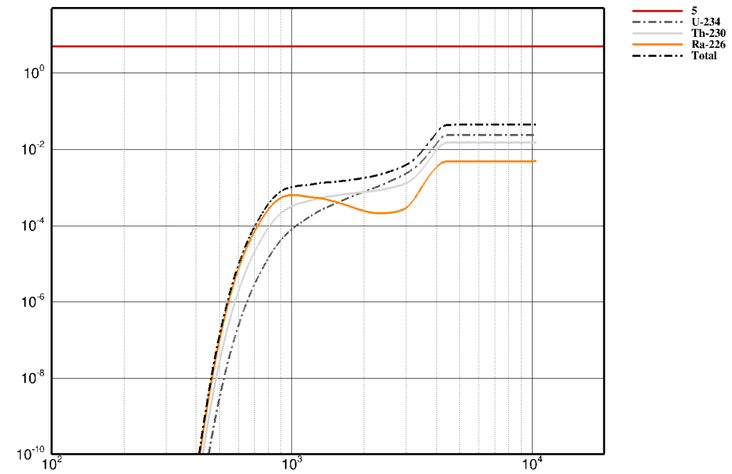
Figure I-54. Doses and Concentrations for Groundwater Pathways for ET05 and Top Contributing Radionuclides During Post-Compliance Period



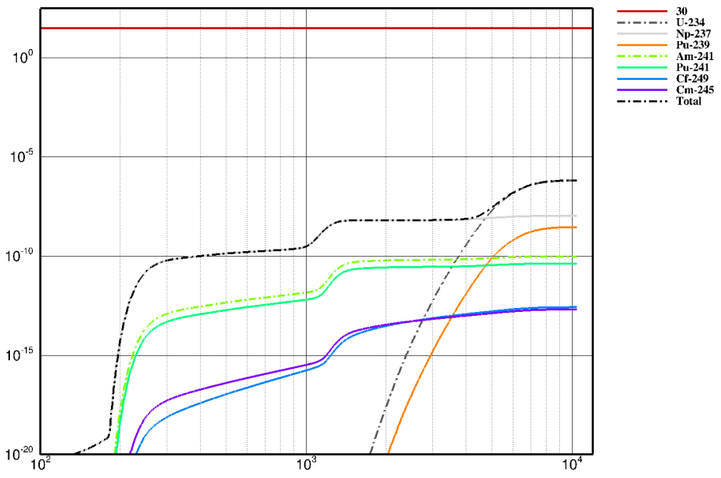
ET07 Gross-Alpha (pCi L^{-1})



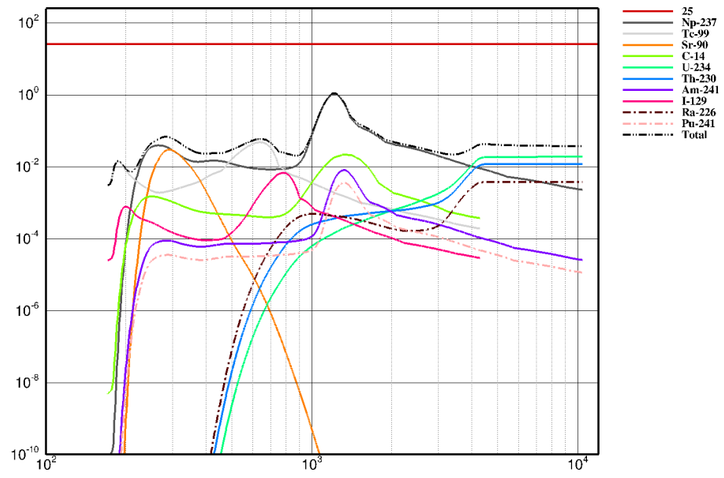
ET07 Beta-Gamma (mrem yr^{-1})



ET07 Radium (pCi L^{-1})



ET07 Uranium (µg L^{-1})



ET07 All-Pathways (mrem yr^{-1})

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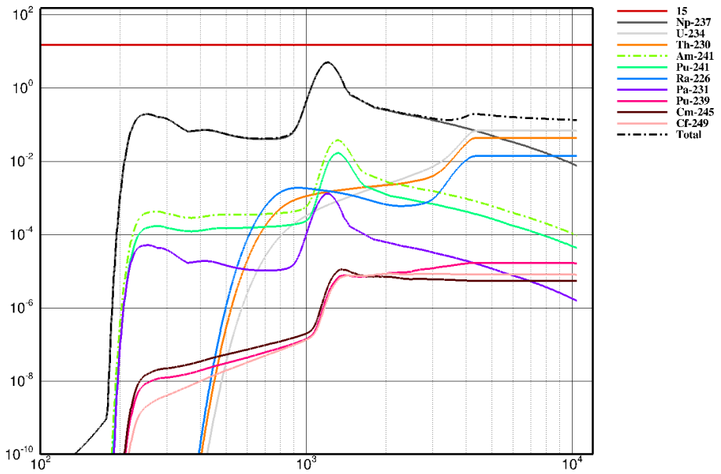
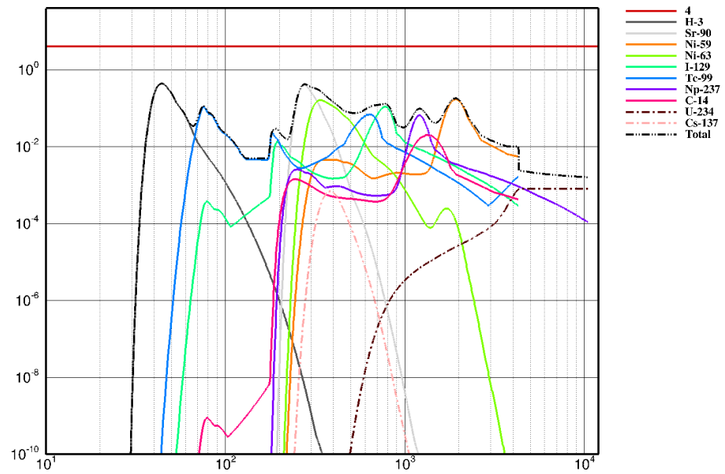
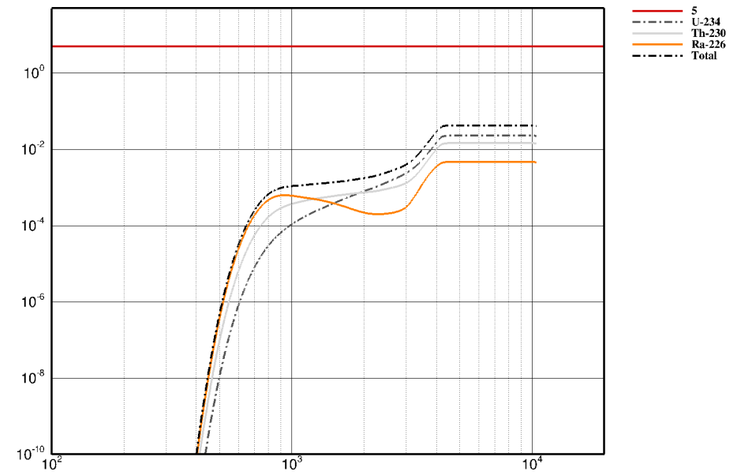
Figure I-55. Doses and Concentrations for Groundwater Pathways for ET07 and Top Contributing Radionuclides During Post-Compliance Period



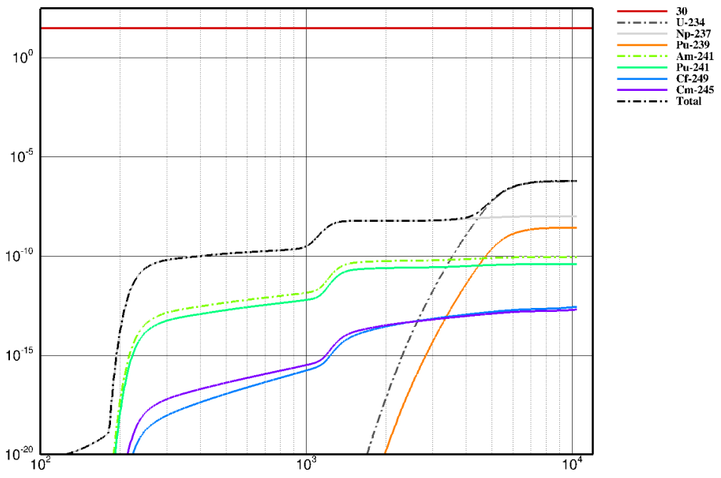
ET08 Gross-Alpha (pCi L^{-1})



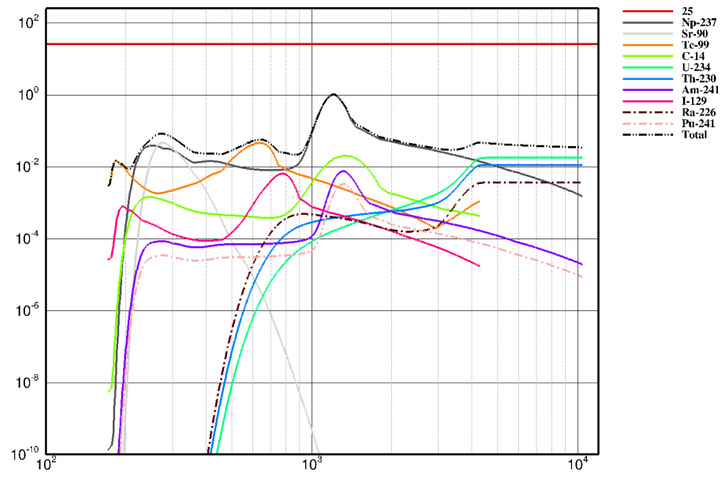
ET08 Beta-Gamma (mrem yr^{-1})



ET08 Radium (pCi L^{-1})



ET08 Uranium (µg L^{-1})



ET08 All-Pathways (mrem yr^{-1})

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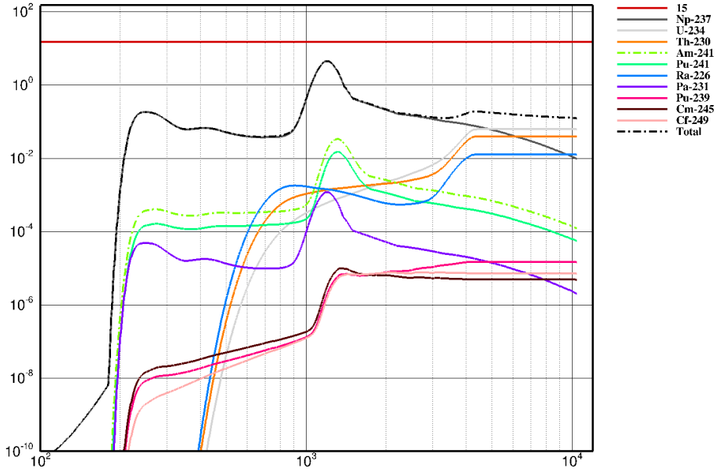
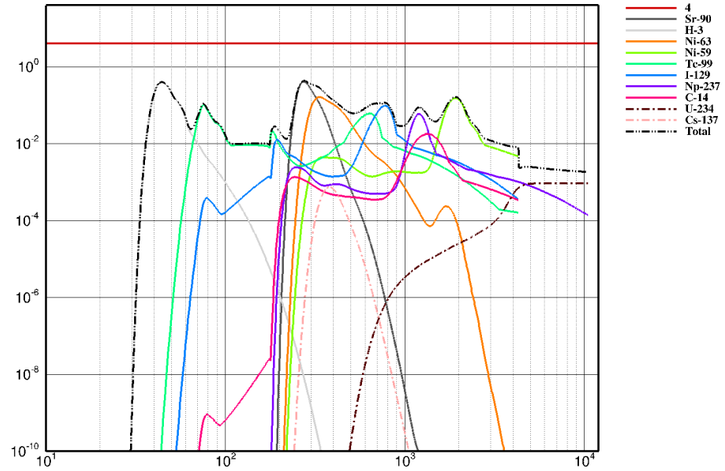
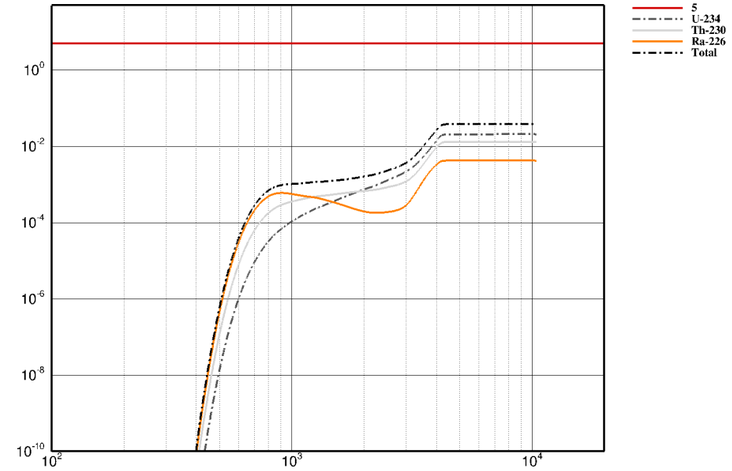
Figure I-56. Doses and Concentrations for Groundwater Pathways for ET08 and Top Contributing Radionuclides During Post-Compliance Period



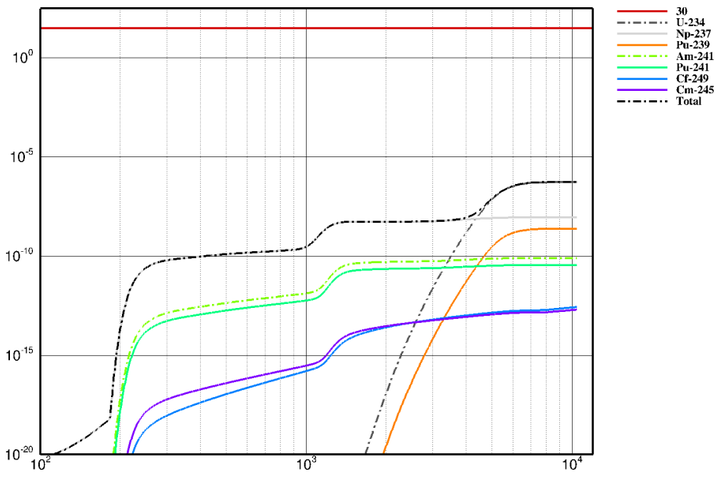
ET09 Gross-Alpha (pCi L^{-1})



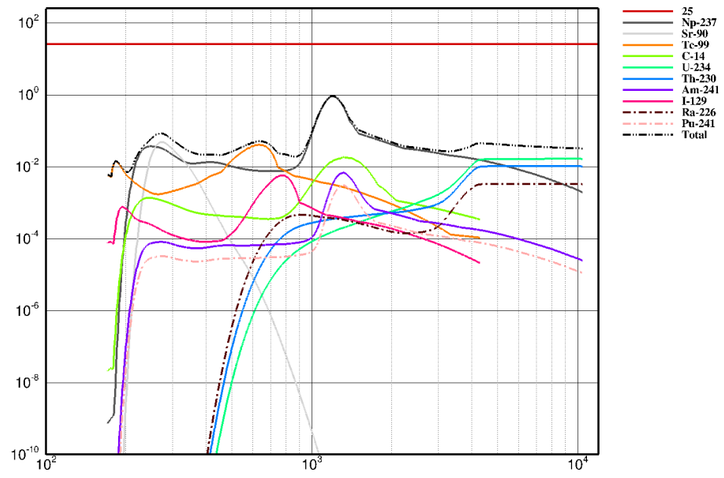
ET09 Beta-Gamma (mrem yr^{-1})



ET09 Radium (pCi L^{-1})



ET09 Uranium (µg L^{-1})



ET09 All-Pathways (mrem yr^{-1})

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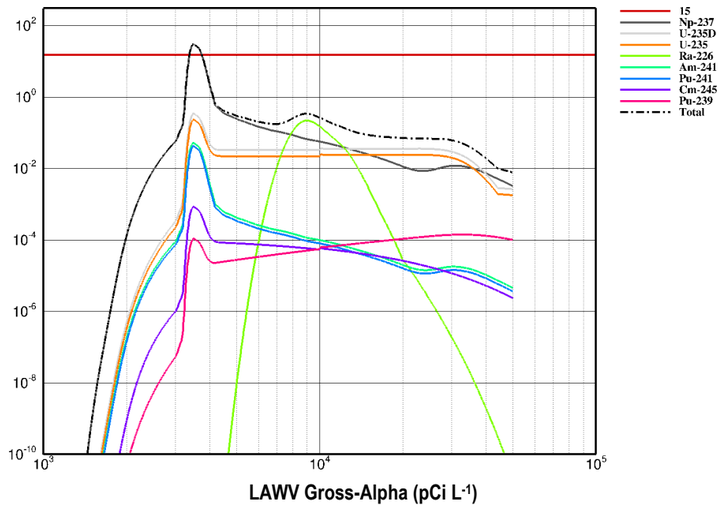
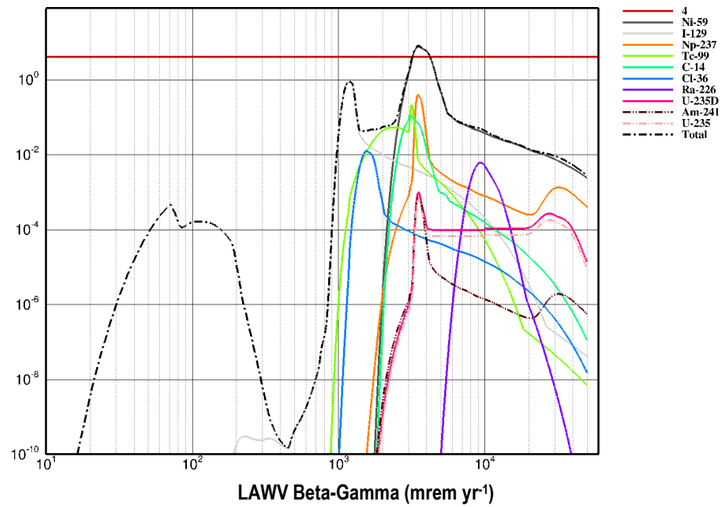
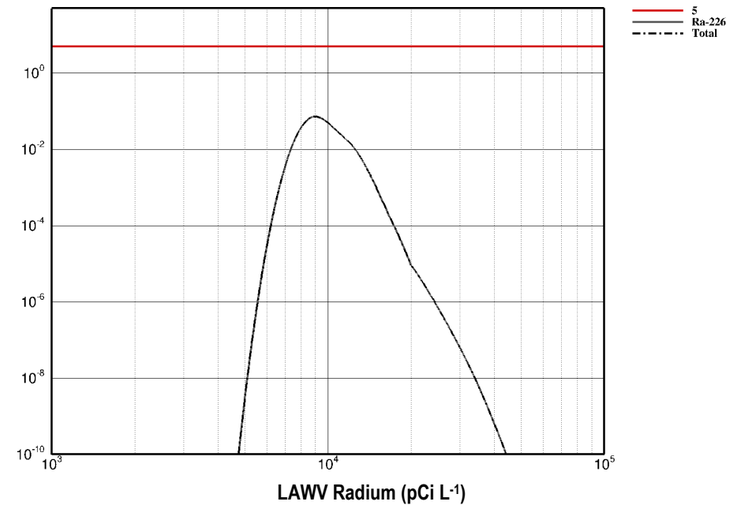
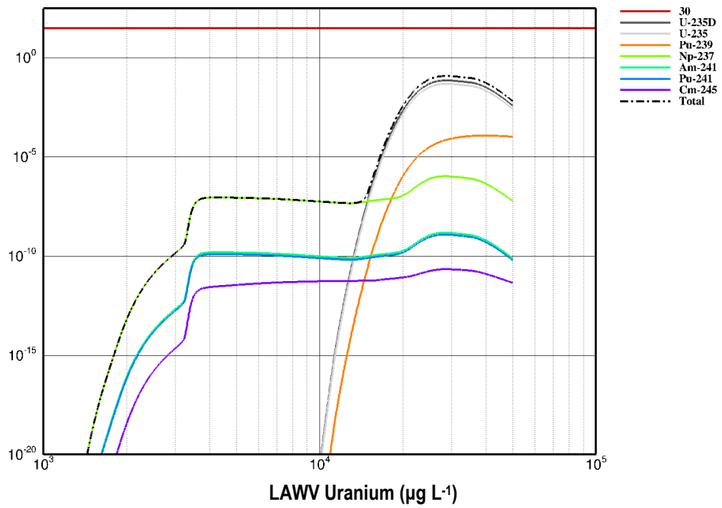
Figure I-57. Doses and Concentrations for Groundwater Pathways for ET09 and Top Contributing Radionuclides During Post-Compliance Period









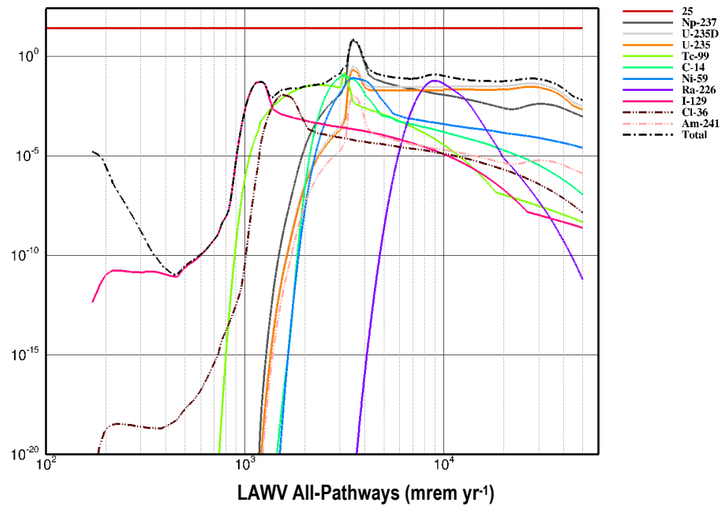


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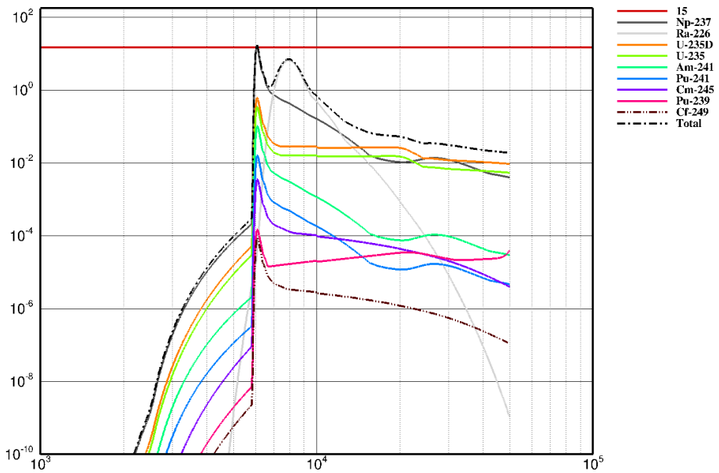
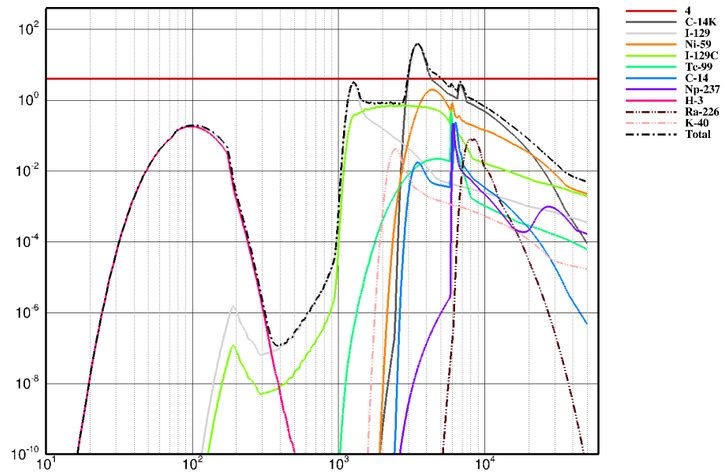
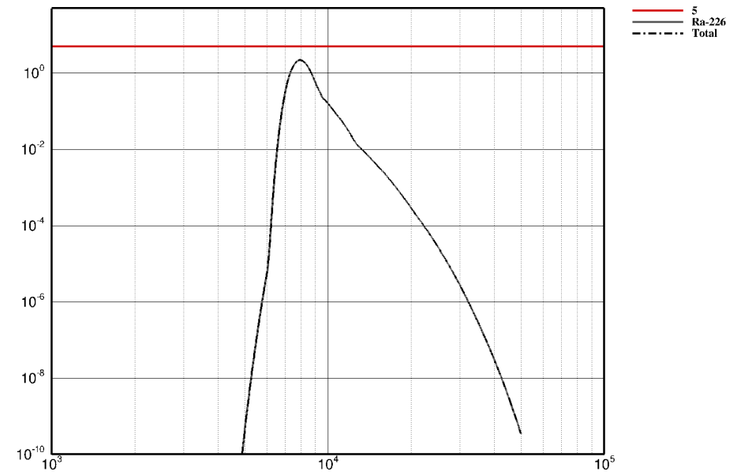
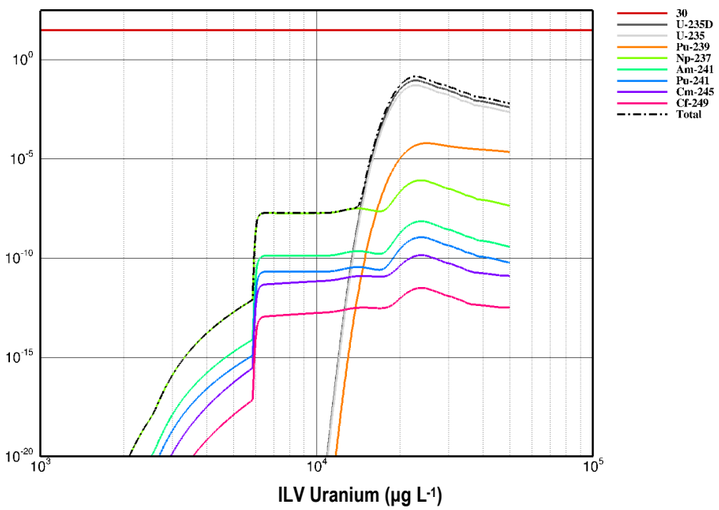
Figure I-58. Doses and Concentrations for Groundwater Pathways for LAWV and Top Contributing Radionuclides During Post-Compliance Period









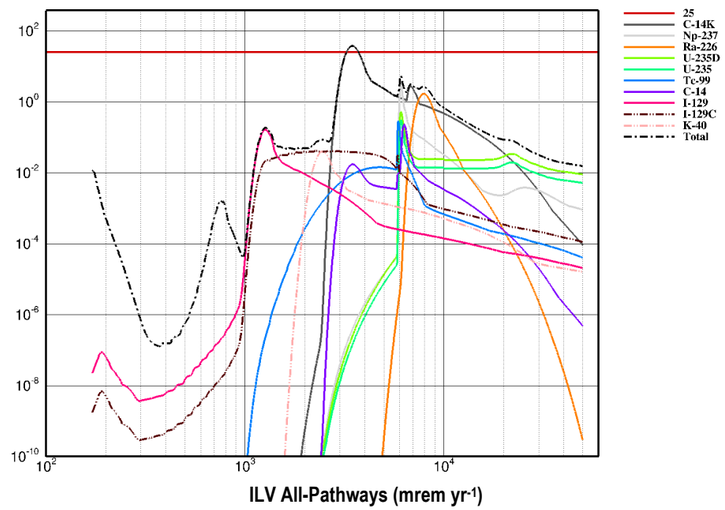


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Figure I-59. Doses and Concentrations for Groundwater Pathways for ILV and Top Contributing Radionuclides During Post-Compliance Period

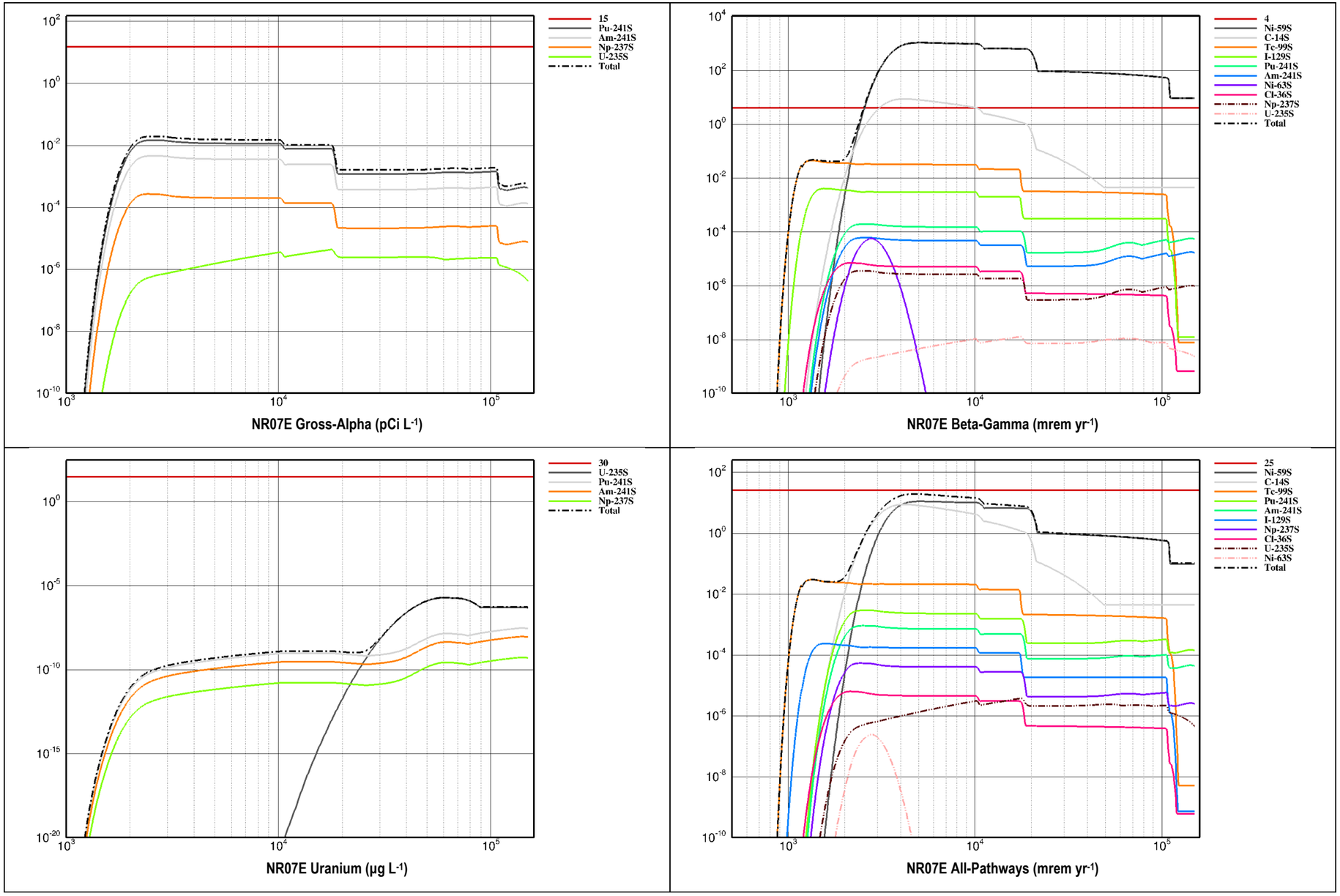


Figure I-60. Doses and Concentrations for Groundwater Pathways for NR07E and Top Contributing Radionuclides During Post-Compliance Period

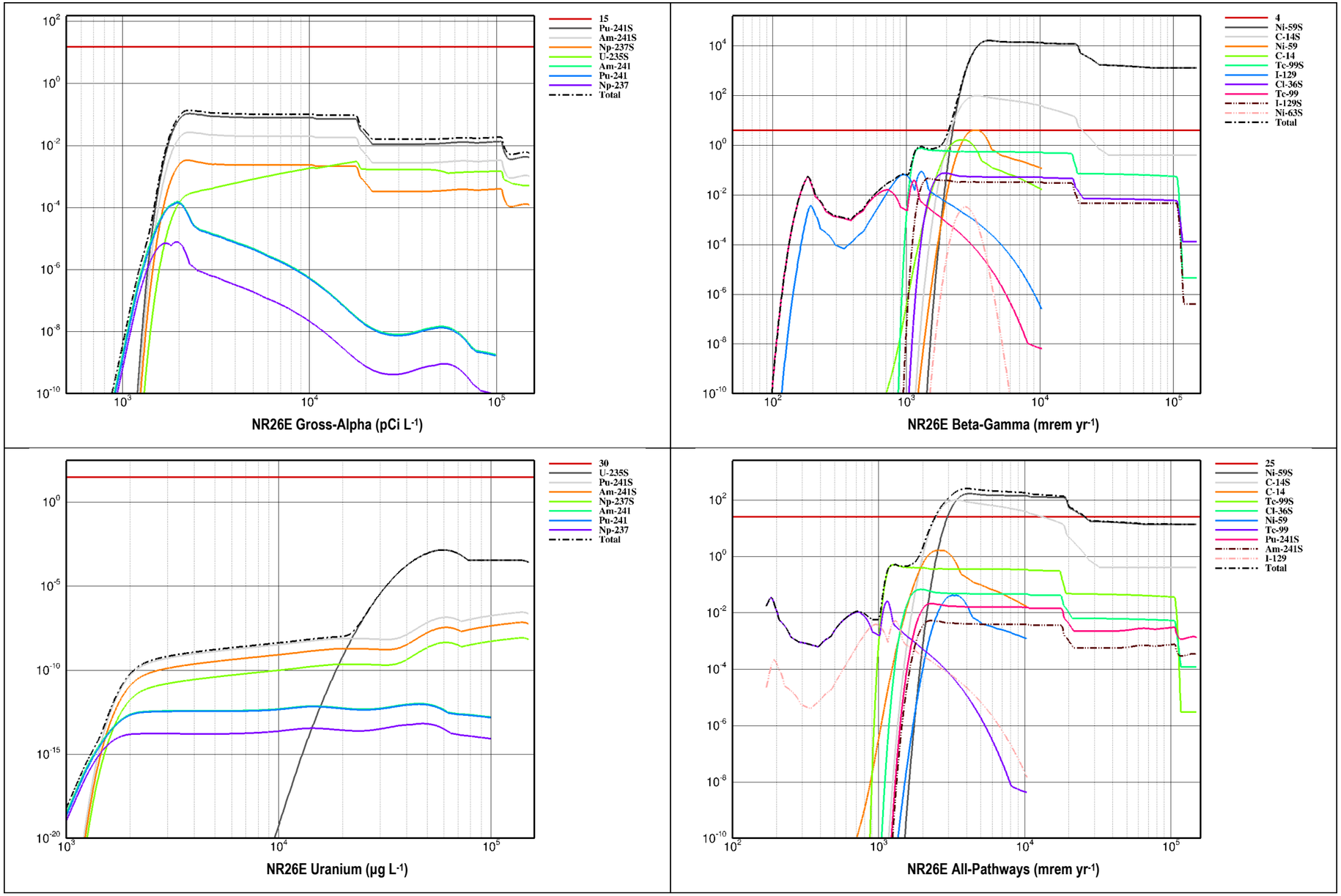


Figure I-61. Doses and Concentrations for Groundwater Pathways for NR26E and Top Contributing Radionuclides During Post-Compliance Period

I.4.2 Stochastic Results

The Closure Analysis Toolkit computes stochastic concentrations and doses at POAs using existing plus CWTS projected inventories with or without CWTS inventory biases and uncertainties. The stochastic results are based on a MC simulation of 10,000 realizations for (1) a closed DU with CWTS inventory biases and uncertainties applied to existing inventories to generate stochastic closure inventories; (2) an open or future DU with CWTS inventory biases and uncertainties applied to CWTS projected total inventories. Results are presented for all exposure pathways in the following subsections:

- Section I.4.2.1 presents concentrations and doses along the North curtain of the 100-meter POA for the GW pathways at the time of peak dose within the compliance period at r_{max}. The top-ten DU contributors to dose or concentration are also identified for each GW pathway as a function of time at r_{max}. The ELLWF and ST24 exceed the gross-alpha PO (15 pCi L^{-1}) with peak concentrations of 29.38 and 29.35 pCi L^{-1}, respectively, at the end of the compliance period (Year 1,171).
- Section I.4.2.2 reports maximum and total transient concentrations and doses, including the top-ten ranked radionuclides, for each DU and exposure pathway during the compliance period at r_{max}. ST24 exceeds the gross-alpha PO (15 pCi L^{-1}) with a peak concentration of 29.35 pCi L^{-1} at the end of the compliance period (Year 1,171). Np-237 within ST24 is the main contributor to gross-alpha with a peak concentration of 29.12 pCi L^{-1}.
- Section I.4.2.3 displays stochastic maximum SOF graphs for the ELLWF and PA2022 DUs for each exposure pathway over the final 1,000 realizations of the 10,000-realization MC simulation. Stochastic total SOF within each CWTS pathway time window for all DUs are also provided.
- Section I.4.2.4 display the stochastic maximum SOF histograms for the ELLWF and PA2022 DUs for each exposure pathway as well as the maximum SOF histograms for all 10,000 MC realizations. Histograms are generated for only those exposure pathways where the mean of the maximum SOFs exceeds 0.1. This exclusion eliminates histograms for the radium, uranium, all-pathways, IHI, air, and radon exposure pathways.
- Section I.4.2.5 summarizes the stochastic maximum SOF statistics for the ELLWF and PA2022 DUs for each exposure pathway as well as the maximum SOF for all 10,000 MC realizations. The statistics include the arithmetic mean, standard deviation, and coefficient of variation (standard deviation divided by mean) of the maximum SOF values.

I.4.2.1. Doses and Concentrations for ELLWF and Top-Ten Disposal Units Along North Curtain During Compliance Period

Concentrations and doses along the North curtain of the 100-meter POA for the GW pathways at the time of peak dose are shown in the left image of Figure I-62 through Figure I-66 for beta-gamma, gross-alpha, radium, uranium, and the all-pathways exposure pathways, respectively, at r_{max}. The right image of Figure I-62 through Figure I-66 presents transient concentrations and doses for the top-ten ranked DUs at the element along the North curtain where the peak for each DU occurs during the compliance period at r_{max}. The Limit curve (solid red) in each GW plot is

the PO of 4 mrem yr^{-1}, 15 pCi L^{-1}, 5 pCi L^{-1}, 30 µg L^{-1} and 25 mrem yr^{-1}, respectively, for each GW pathway. The max curve (solid black) in each figure is the maximum curtain dose at each point in time for the GW pathway. The peak of the max curve and timing corresponds to the peak concentration/dose on the curtain plot to the left for each GW pathway. The top contributing DUs for beta-gamma, gross-alpha, radium, uranium, and all-pathways exposure scenarios are ST01, ST24, ET09, ST24, and ST24, respectively.

Transient doses of the top-ten ranked DUs for the acute and chronic IHI pathway are shown in Figure I-67 at r_{max}. The Limit curve (solid red) in each plot is the PO of 500 mrem and 100 mrem yr^{-1}, respectively, for each pathway. The top contributing DUs for acute and chronic IHI exposure scenarios are ST23 and NR26E, respectively.

Transient doses/fluxes of the top-ten ranked DUs for the air and radon pathways are shown in Figure I-68 at r_{max}. The solid-red Limit curve in each plot marks the PO of 10 mrem yr^{-1} and 20 pCi m^{-2} s^{-1}, respectively, for each pathway. The solid-black ELLWF curve in the air pathway plot represents the sum of doses from all 27 DUs at each point in time. This curve is compared to the PO to confirm compliance within the PA compliance period. The top-contributing DUs for the air and radon exposure pathways are NR26E and ST23, respectively.

Table I-66 summarizes the stochastic peak concentrations and doses for each exposure pathway as derived from Figure I-62 through Figure I-68. The gross-alpha, IHI-Chronic, beta-gamma and all-pathways exposure scenarios have the top-four highest SOFs, ranging from 195.90% to 23.62%.

Table I-66. Summary of Stochastic Exposure Scenario Peak Concentration/Dose

Exposure Scenario	Performance Objective	Time of Peak (Year)	Peak Concentration or Dose	SOF (%)
Air Pathway	10 mrem yr^{-1}	1,171	2.68E-02	0.27%
Radon Flux Pathway	20 pCi m^{-2} s^{-1}	72	1.22E-02	0.06%
All-Pathways	25 mrem yr^{-1}	1,171	5.90E+00	23.62%
Water Resources:				
Beta-Gamma	4 mrem yr^{-1}	21	1.99E+00	49.72%
Gross-Alpha	15 pCi L^{-1}	1,171	2.94E+01	195.90%
Ra-226+Ra-228	5 pCi L^{-1}	944	9.46E-04	0.02%
Uranium (total)	30 µg L^{-1}	1,171	1.50E-08	0.00%
Inadvertent Human Intruder				
Chronic exposure	100 mrem yr^{-1}	171	6.86E+01	68.55%
Acute exposure	500 mrem	171	3.39E+00	0.68%

Table I-67 through Table I-70 summarize the top-ten ranked DUs with the greatest SOF impacts (> 1%) for each exposure pathway. The peak dose in each table is highlighted in orange.

Figure I-63 displays stochastic gross-alpha transient concentrations for the ELLWF and top-ten DU contributors, while Table I-67 lists peak concentrations and times of peak concentration. Compared to the deterministic case (Figure I-2), the ELLWF peak concentration of 29.384 pCi L^{-1} for the stochastic case has shifted from the western sector (ET07, ET08, ET09) to the center sector (ST24) of the North curtain (Figure I-63). Peak concentrations of 29.352, 5.800, 4.504, and

3.521 pCi L^{-1} for ST24, ET08, ET07, and ET09, respectively, represent 99.9%, 19.7%, 15.3%, and 12.0% of the ELLWF peak concentration, respectively.

Table I-67. Stochastic Peak Concentrations for ELLWF and Top-Ten Disposal Units for Gross-Alpha Groundwater Pathway

DU	Gross-Alpha Concentration (pCi L^{-1})	SOF (-)	Time of Peak Concentration (Year)
ELLWF	29.384	1.959	1,171
ST24	29.352	1.957	
ET08	5.800	0.387	
ET07	4.504	0.300	
ET09	3.521	0.235	
ST06	3.330	0.222	
ST07	1.598	0.107	
ET03	1.575	0.105	
ET02	1.447	0.096	
ET05	0.842	0.056	
ST18	0.801	0.053	

Notes:
The peak dose for the ELLWF is highlighted in orange.

Figure I-67 displays stochastic IHI-Chronic transient doses for the ELLWF and top-ten DU contributors, while Table I-68 lists peak doses and times of peak dose. The peak dose for NR26E (68.55 mrem yr^{-1}) is 15 times higher than for the LAWV (4.43 mrem yr^{-1}). The peak doses for all top-ten DUs occur at the end of IC in Year 171.

Table I-68. Stochastic Peak Doses for Top-Ten Disposal Units for IHI-Chronic Exposure Scenario

DU	IHI-Chronic Dose (mrem yr^{-1})	SOF (-)	Time of Peak Dose (Year)
NR26E	68.55	0.6855	171
LAWV	4.43	0.0443	
ST23	1.91	0.0191	
NR07E	1.83	0.0183	
ILV	0.52	0.0052	
ST24	0.35	0.0035	
ST18	0.09	0.0009	
ET04	0.06	0.0006	
ET09	0.04	0.0004	
ET08			

Notes:
The peak DU dose is highlighted in orange.

Figure I-62 shows stochastic beta-gamma transient doses for the ELLWF and top-ten DU contributors; Table I-69 lists peak doses and times of peak dose. A peak dose of 1.989 mrem yr^{-1} at Year 21 for ST01 represents 99.95% of the total dose for the ELLWF. The locations of the peak dose for ST01 and ELLWF along the North curtain appear to lie in close proximity in the center sector of Figure I-62.

Table I-69. Stochastic Peak Doses for ELLWF and Top-Ten Disposal Units for Beta-Gamma Groundwater Pathway

DU	Beta-Gamma Dose (mrem yr^{-1})	SOF (-)	Time of Peak Dose (Year)
ELLWF	1.989	0.497	21
ST01	1.988	0.497	
ST09	1.631	0.408	37
ST24	1.335	0.334	864
ILV	1.055	0.264	1,171
LAWV	0.836	0.209	1,166
ST23	0.800	0.200	42
NR26E	0.614	0.154	1,171
ET01	0.508	0.127	25
ST18	0.501	0.125	44
ET09	0.479	0.120	276

Notes:
The peak dose for the ELLWF is highlighted in orange.

Figure I-66 displays stochastic all-pathways transient doses for the ELLWF and top-ten DU contributors, while Table I-70 reports the peak doses and times of peak dose. Compared to the deterministic case (Figure I-5), the peak dose of 5.904 mrem yr^{-1} for the ELLWF stochastic case has shifted from the western sector (ET07, ET08, ET09) to the center sector (ST24) of the North curtain (Figure I-66). Peak doses of 5.895, 1.180, 0.916, and 0.727 mrem yr^{-1} for ST24, ET08, ET07, and ET09, respectively, represent 99.8%, 20.0%, 15.5%, and 12.3%, respectively, of the ELLWF peak dose. The identity and ranked order of the top-four DUs dominating total all-pathways dose (Table I-70) are the same as for the gross-alpha pathway (Table I-67).

Table I-70. Stochastic Peak Doses for ELLWF and Top-Ten Disposal Units for All-Pathways Groundwater Exposure Scenario

DU	All-Pathways Dose (mrem yr^{-1})	SOF (-)	Time of Peak Dose (Year)
ELLWF	5.904	0.236	1,171
ST24	5.895	0.236	
ET08	1.180	0.047	
ET07	0.916	0.037	
ET09	0.727	0.029	
ST06	0.668	0.027	
ST09	0.572	0.023	184
ST23	0.452	0.018	845
NR26E	0.392	0.016	1,171
ET03	0.324	0.013	
ST07	0.322		

Notes:
The peak dose for the ELLWF is highlighted in orange.

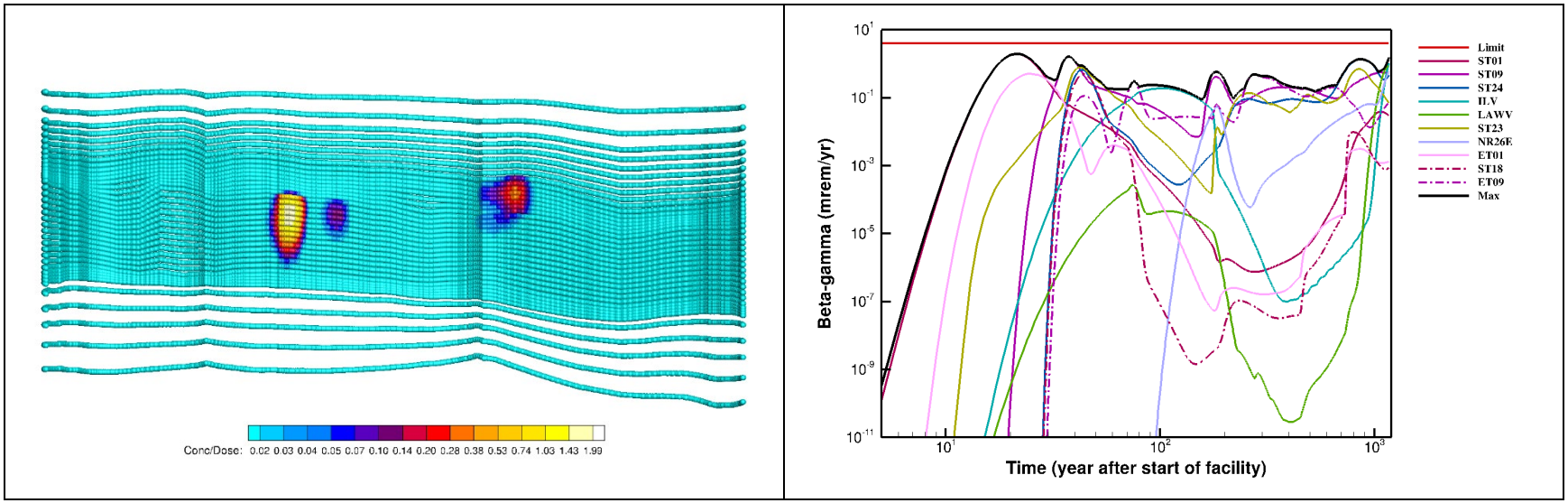


Figure I-62. Beta-Gamma Doses for (left) ELLWF at Year 21 and (right) Top-Ten Disposal Units Over Compliance Period

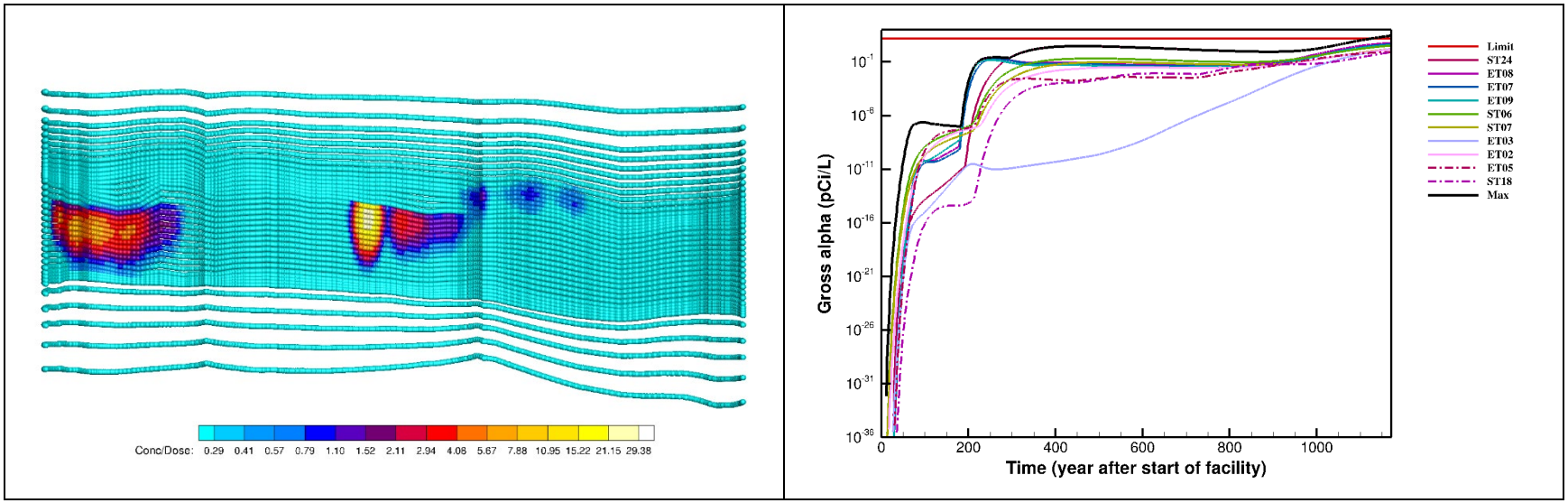


Figure I-63. Gross-Alpha Doses for (left) ELLWF at Year 1,171 and (right) Top-Ten Disposal Units Over Compliance Period

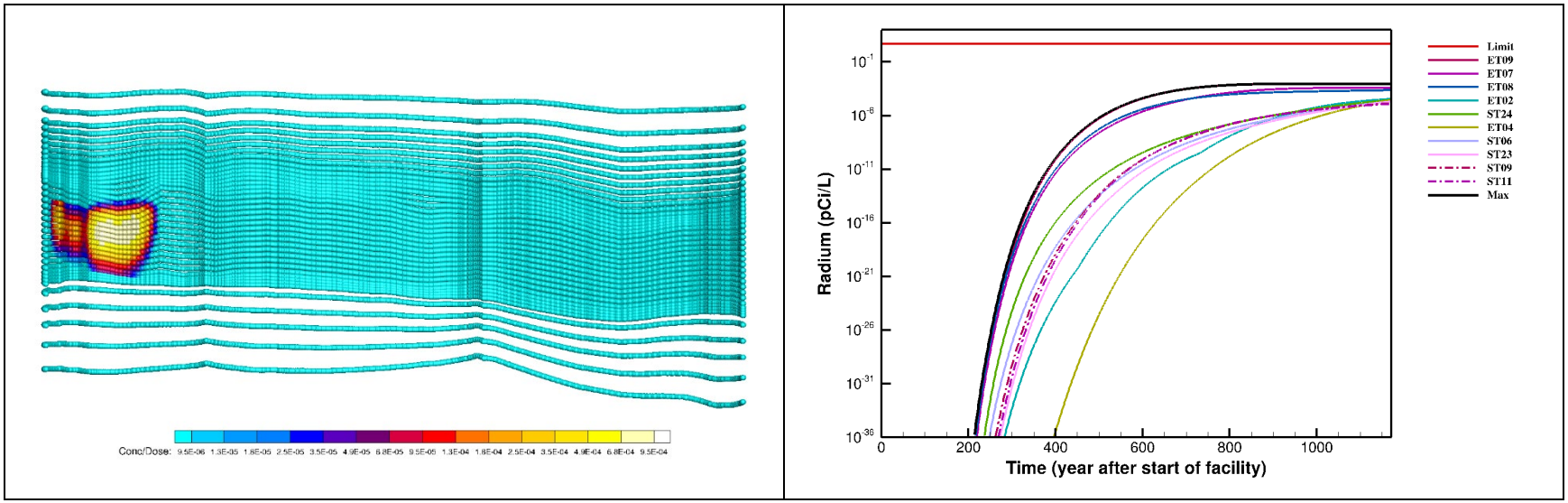


Figure I-64. Radium Concentrations for (left) ELLWF at Year 944 and (right) Top-Ten Disposal Units Over Compliance Period

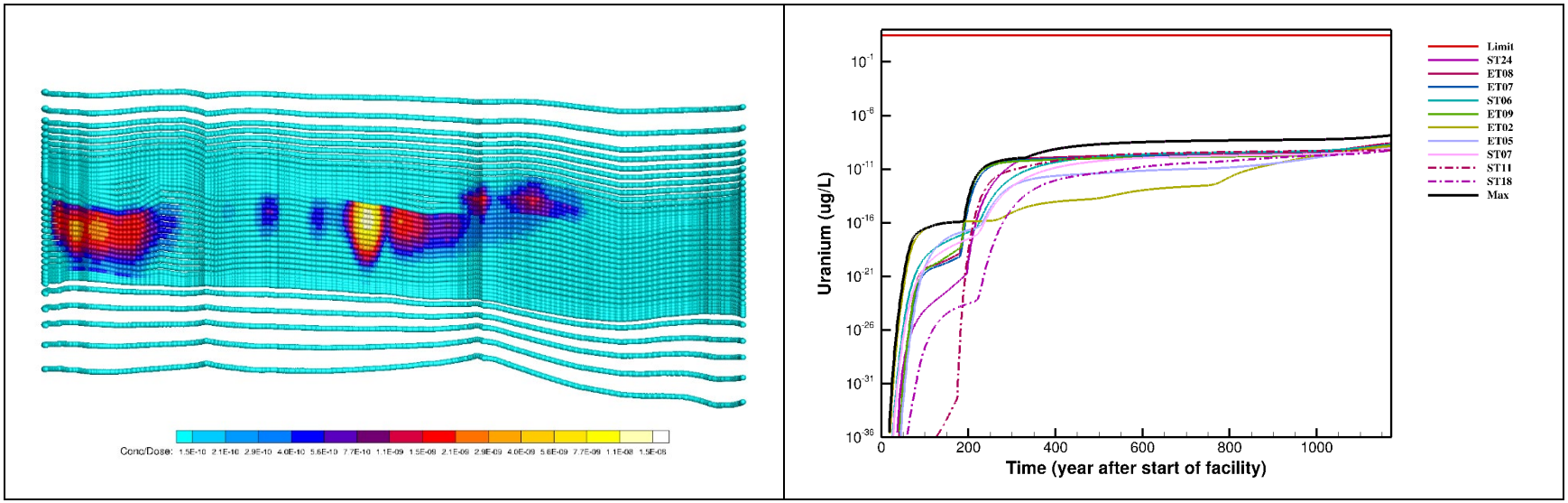


Figure I-65. Uranium Concentrations for (left) ELLWF at Year 1,171 and (right) Top-Ten Disposal Units Over Compliance Period

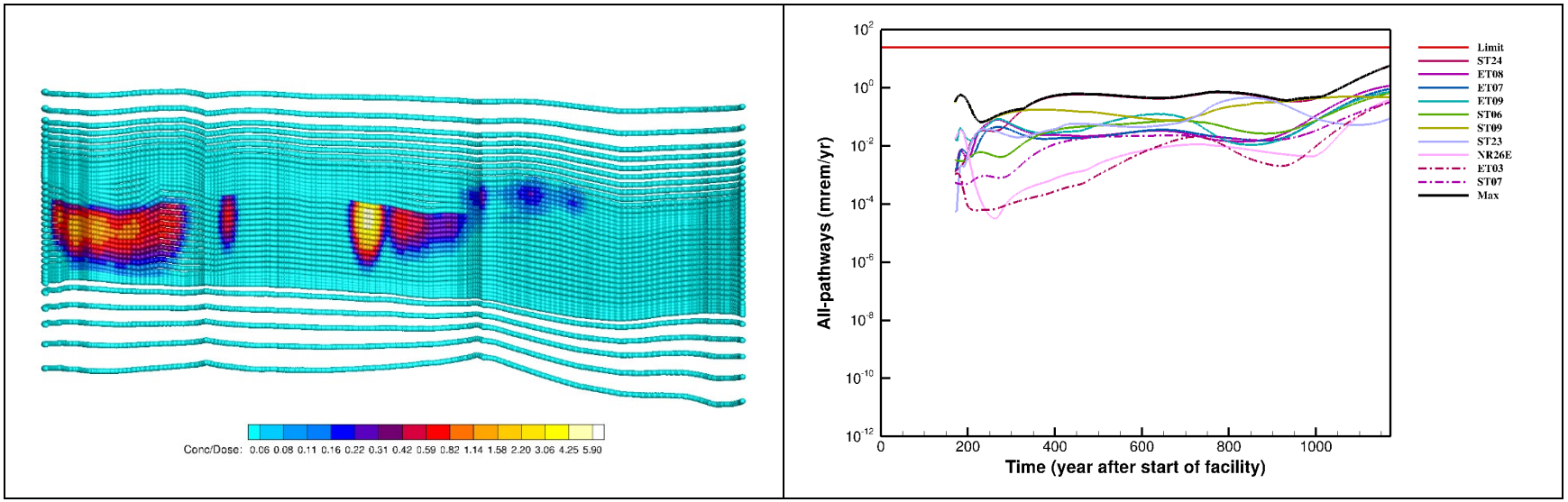


Figure I-66. All-Pathways Dose for (left) ELLWF at Year 1,171 and (right) Top-Ten Disposal Units Over Compliance Period

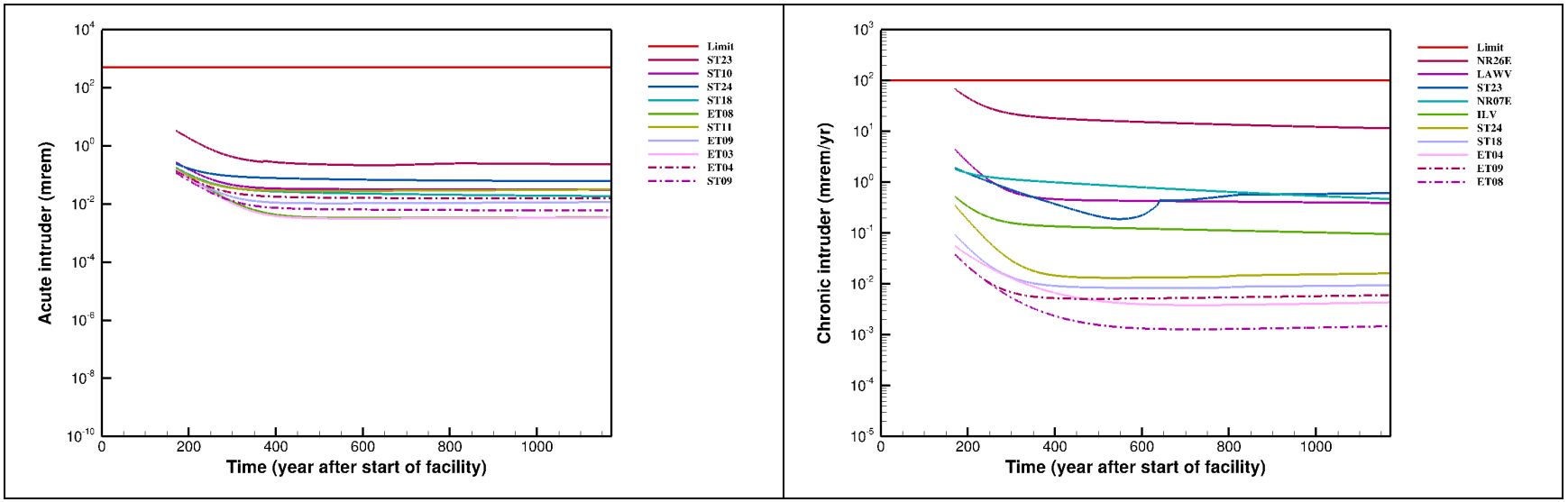


Figure I-67. Acute (left) and Chronic (right) Inadvertent Human Intruder Doses for Top-Ten Disposal Units During Compliance Period

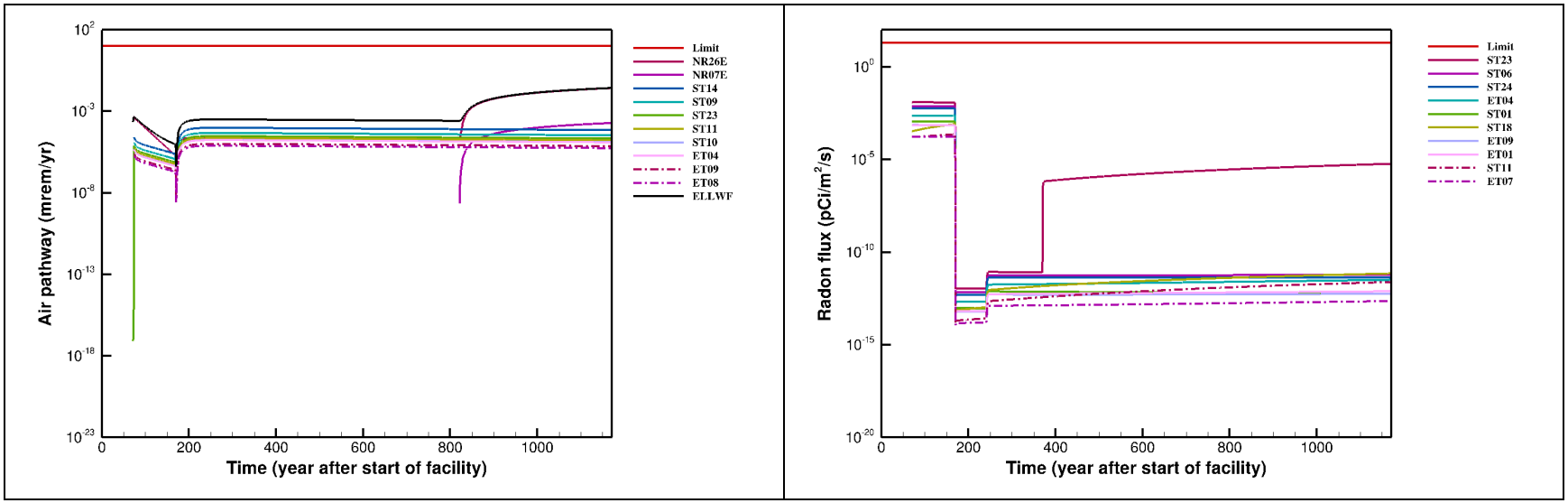


Figure I-68. Air Pathway Dose (left) and Radon Flux (right) for ELLWF and Top-Ten Disposal Units During Compliance Period

I.4.2.2. Doses and Concentrations by Exposure Pathway for Individual Disposal Units and Top Contributing Radionuclides

Figure I-69 through Figure I-95 present transient doses and concentrations of the top-ten ranked radionuclides during the compliance period for each DU and exposure pathway. Each figure comprises up to 9 graphs representing the exposure scenarios within a given DU. The solid-red Limit curve in each graph is the PO for each exposure pathway. The solid-black Max curve in each GW pathway figure represents the maximum curtain dose at each point in time. The peak of the Max curve and its timing corresponds to the peak concentration or dose on the curtain plot for each GW pathway. The DU curve in each GW pathway plot represents the transient concentrations or doses at the element on the North curtain where the peak value for the DU occurs during the compliance period. The DU curve in each non-GW pathway graph represents the summation of radionuclide concentrations or doses within the DU.

Table I-71 through Table I-75 summarize the doses/concentrations of the top-ten contributing radionuclides and corresponding times of peak dose/concentration for the four DU/exposure-pathway scenarios with the greatest impact on total SOF.

Figure I-83 displays stochastic transient concentrations for ST24 and its top-ten radionuclide contributors for the gross-alpha GW pathway. Table I-71 lists the gross-alpha peak concentrations and times of peak concentration for ST24 and its top-ten radionuclide contributors. Np-237 accounts for 99.21% of the gross-alpha dose concentration in ST24 at the end of the compliance period. All radionuclides peak at the end of the compliance period in Year 1,171.

Table I-71. Stochastic Gross-Alpha Peak Concentrations for ST24 and Top-Ten Contributing Radionuclides

DU/Radionuclide	Gross-Alpha (pCi L^{-1})	SOF (-)	% of ST24	Time of Peak Concentration (Year)
ST24	29.352	1.9568	100.00%	1,171
Np-237	29.120	1.9414	99.21%	
Am-241	0.208	0.0139	0.71%	
Pu-241	0.023	0.0015	0.08%	
Pa-231	0.001	0.0000	0.00%	
Cm-245	0.000			
Ra-226				
Th-230				
Cf-249				
Pu-239				
U-234				

Figure I-95 displays stochastic transient doses for NR26E and its top-ten radionuclide contributors for the IHI-Chronic exposure pathway. Table I-72 lists the IHI-Chronic peak doses and times of peak dose for NR26E and its top-ten radionuclide contributors. Sr-90S, Sn-121mS, Am-241S, and Am-243S account for 95% of the IHI-Chronic dose in NR26E. The time of peak dose for all top-ten radionuclides is Year 171 at the end of IC.

Table I-72. Stochastic IHI-Chronic Peak Doses for NR26E and Top-Ten Contributing Radionuclides

DU/Radionuclide	IHI-Chronic Dose (mrem yr^{-1})	SOF (-)	% of NR26E	Time of Peak Dose (Year)
NR26E	68.5532	0.6855	100.00%	171
Sr-90S	33.3556	0.3336	48.66%	
Sn-121mS	13.7098	0.1371	20.00%	
Am-241S	11.4128	0.1141	16.65%	
Am-243S	6.4474	0.0645	9.40%	
Sn-126S	2.4715	0.0247	3.61%	
Mo-93S	0.7924	0.0079	1.16%	
Nb-93mS	0.2160	0.0022	0.32%	
Nb-94S	0.1046	0.0010	0.15%	
Co-60S	0.0401	0.0004	0.06%	
Cs-137S	0.0030	0.0000	0.00%	

Figure I-69 displays stochastic transient doses for ST01 and its top-ten radionuclide contributors for the beta-gamma GW pathway. Table I-73 lists the beta-gamma peak doses and times of peak dose for ST01 and its top-ten radionuclide contributors. H-3F and H-3 account for 85.55% and 14.45% of the beta-gamma dose in ST01 at Year 21. The peak doses of the top-ten radionuclides occur at different times within the compliance period primarily because of differences in half-lives and radionuclide transport properties (i.e., K_d values in sand and clay regions of the aquifer).

Table I-73. Stochastic Beta-Gamma Peak Doses for ST01 and Top-Ten Contributing Radionuclides

DU/Radionuclide	Beta-Gamma Dose (mrem yr^{-1})	SOF (-)	% of ST01	Time of Peak Dose (Year)
ST01	1.988	0.4969	100.00%	21
H-3F	1.700	0.4251	85.55%	
H-3	0.287	0.0718	14.45%	
I-129	0.023	0.0057	1.14%	1,057
I-129J	0.019	0.0048	0.97%	1,171
Tc-99	0.010	0.0024	0.49%	885
I-129F	0.000	0.0000	0.00%	1,171
Np-237				
C-14N				
C-14				
Am-241				

Figure I-83 displays stochastic transient doses for ST24 and its top-ten radionuclide contributors for the all-pathways exposure scenario. Table I-74 lists the all-pathways peak doses and times of peak dose for ST24 and its top-ten radionuclide contributors. Np-237 (99.05%), Am-241 (0.71%), Pu-241 (0.08%), C-14 (0.05%), and Pa-231 (0.01%) account for 99.90% of the all-pathways dose in ST24 at the end of the compliance period.

Table I-74. Stochastic All-Pathways Peak Doses for ST24 and Top-Ten Contributing Radionuclides

DU/Radionuclide	All-Pathways Dose (mrem yr^{-1})	SOF (-)	% of ST24	Time of Peak Dose (Year)
ST24	5.8951	0.2358	100.00%	1,171
Np-237	5.8388	0.2336	99.05%	
Tc-99	0.4525	0.0181	7.68%	776
I-129	0.0603	0.0024	1.02%	922
Am-241	0.0417	0.0017	0.71%	1,171
Pu-241	0.0046	0.0002	0.08%	
Sr-90	0.0038		0.06%	410
C-14	0.0030	0.0001	0.05%	1,171
Pa-231	0.0005	0.0000	0.01%	
K-40	0.0001		0.00%	834
Ni-63				659

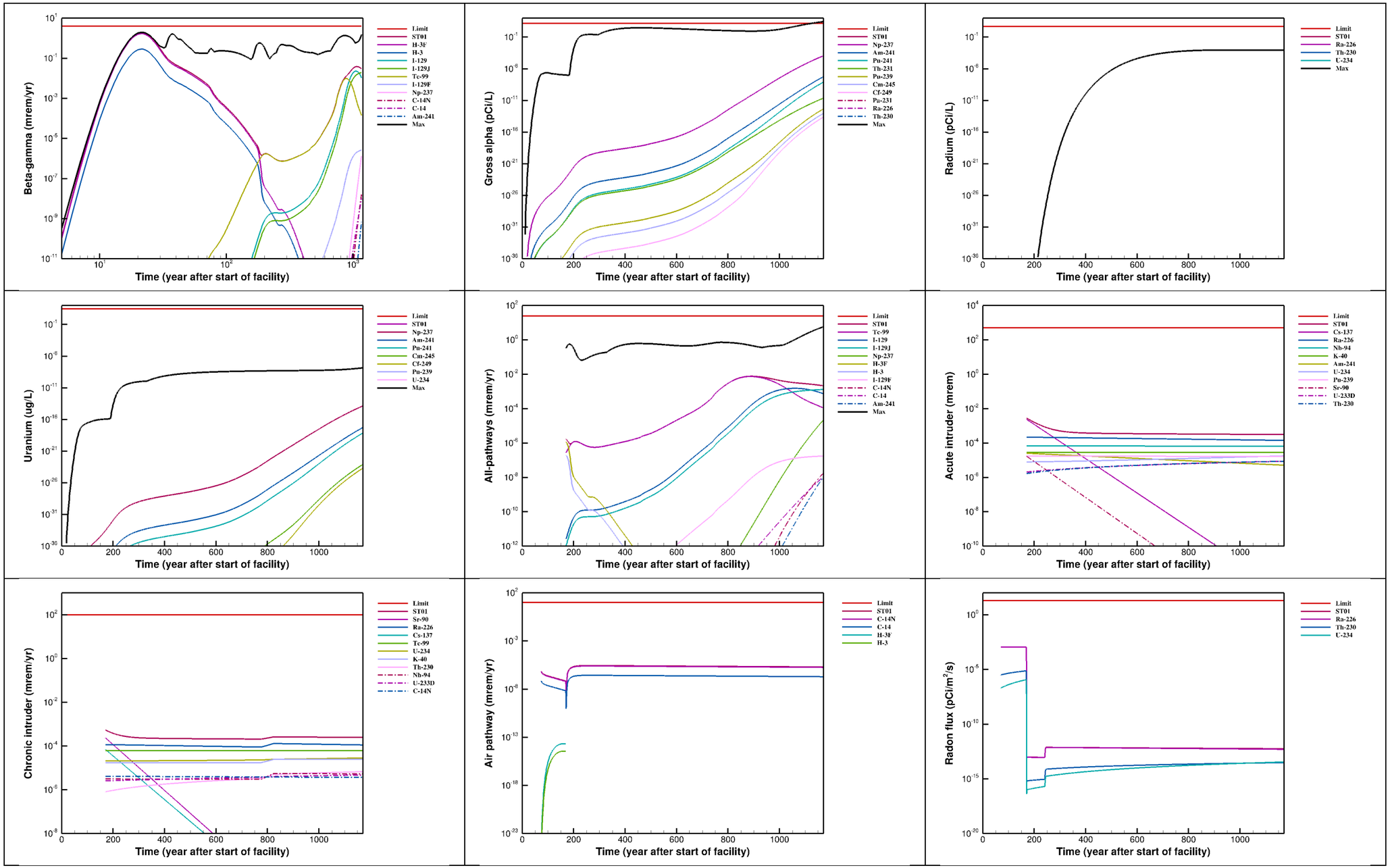


Figure I-69. Doses and Concentrations for ST01 and Top Contributing Radionuclides

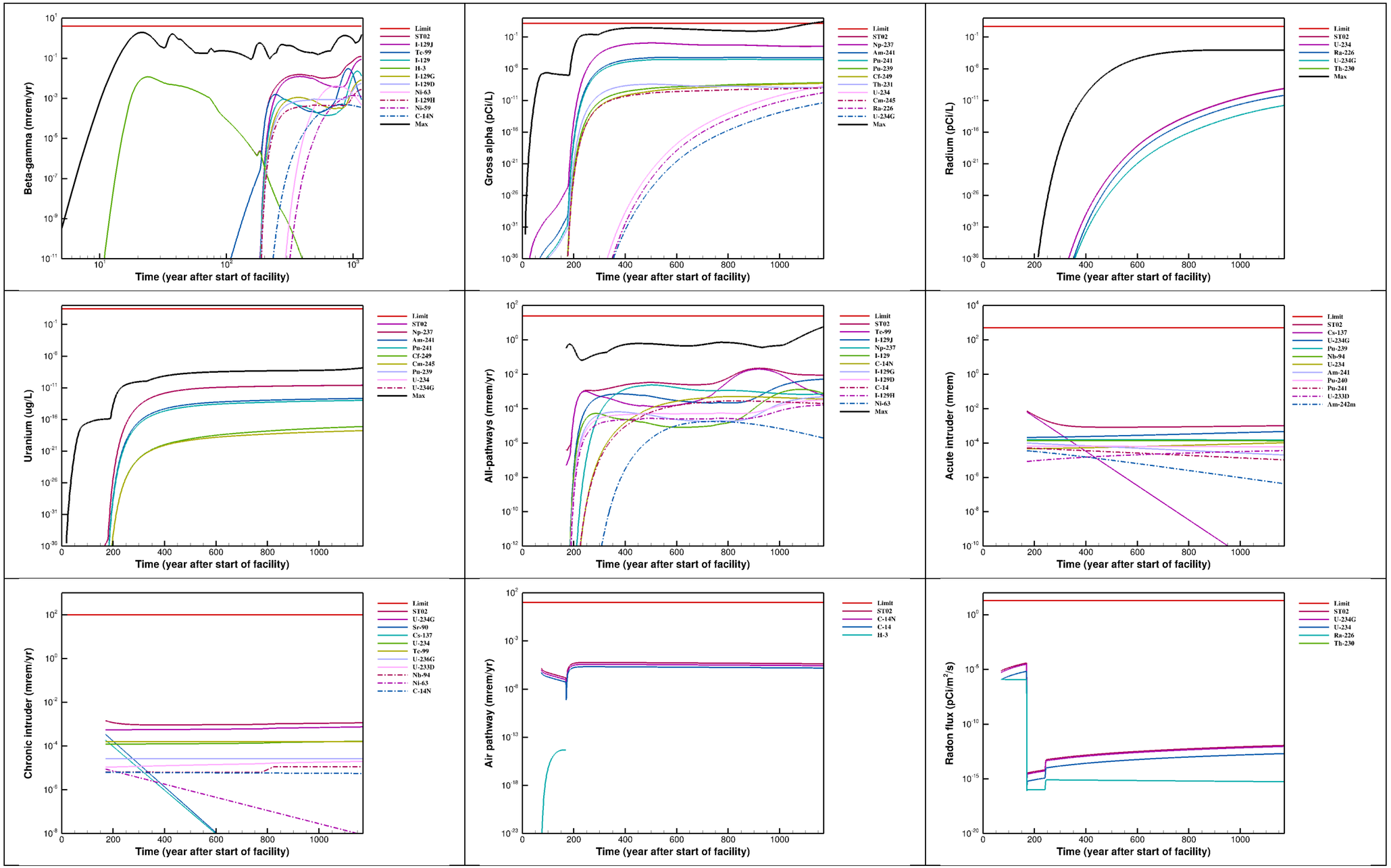


Figure I-70. Doses and Concentrations for ST02 and Top Contributing Radionuclides

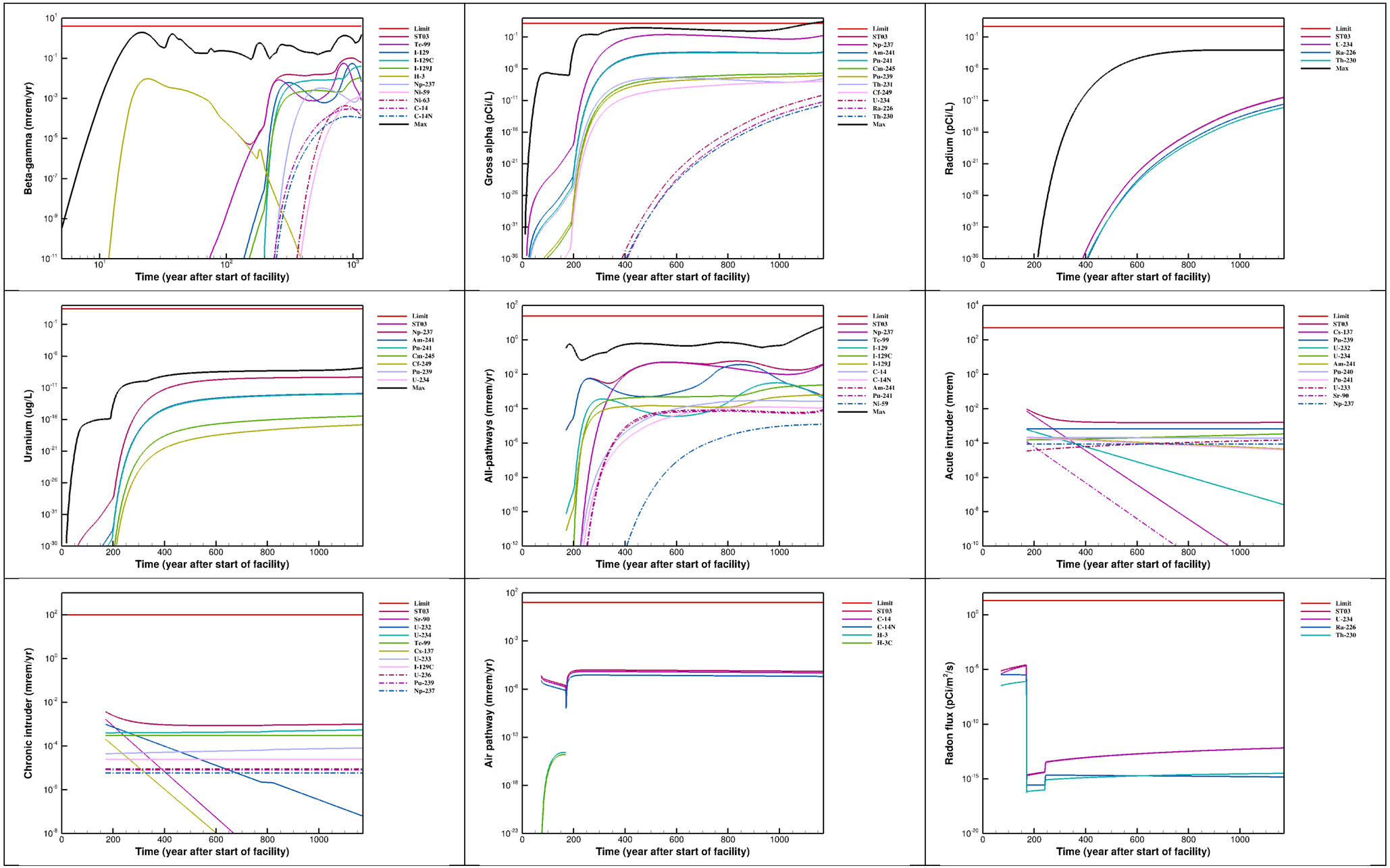


Figure I-71. Doses and Concentrations for ST03 and Top Contributing Radionuclides

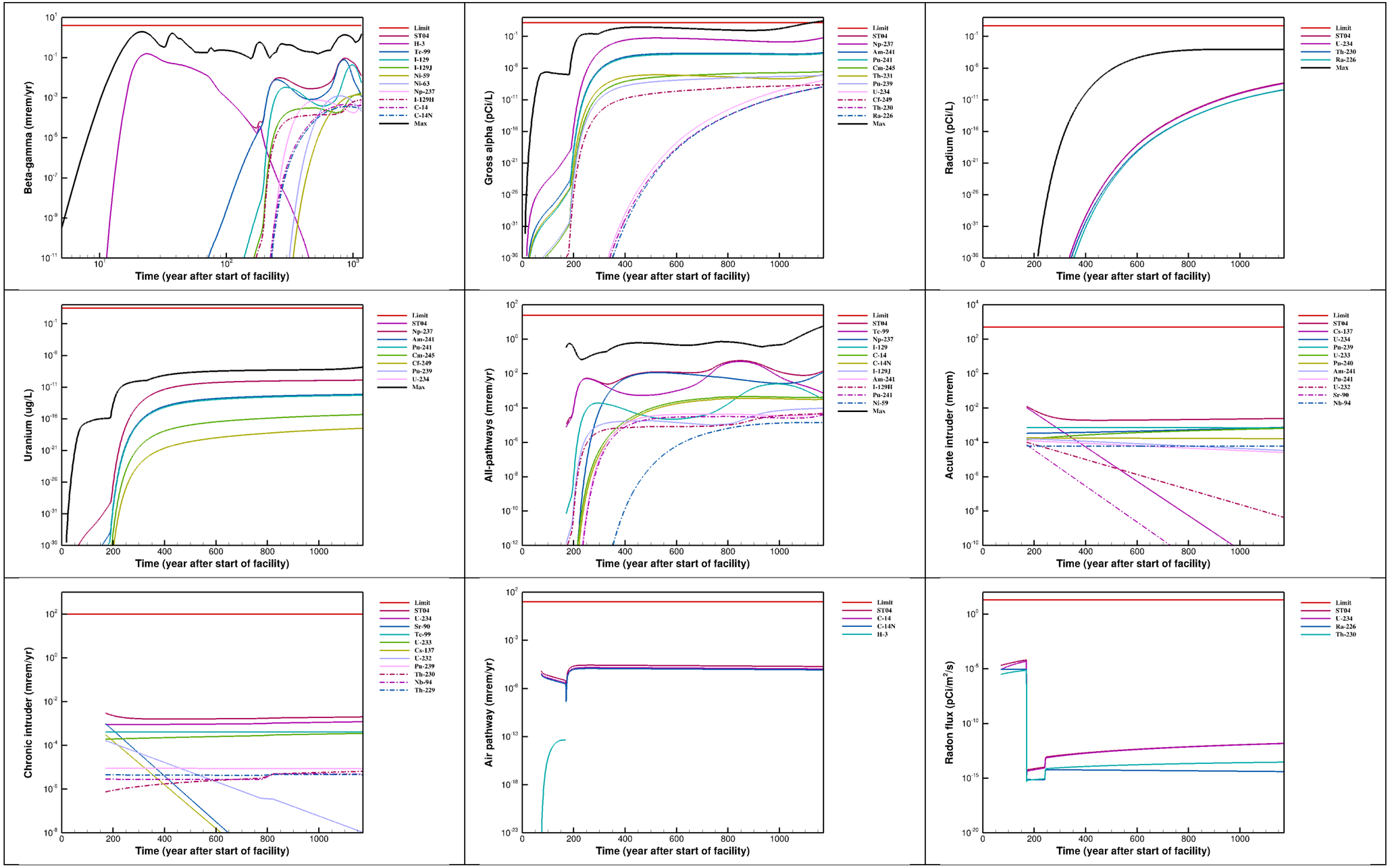


Figure I-72. Doses and Concentrations for ST04 and Top Contributing Radionuclides

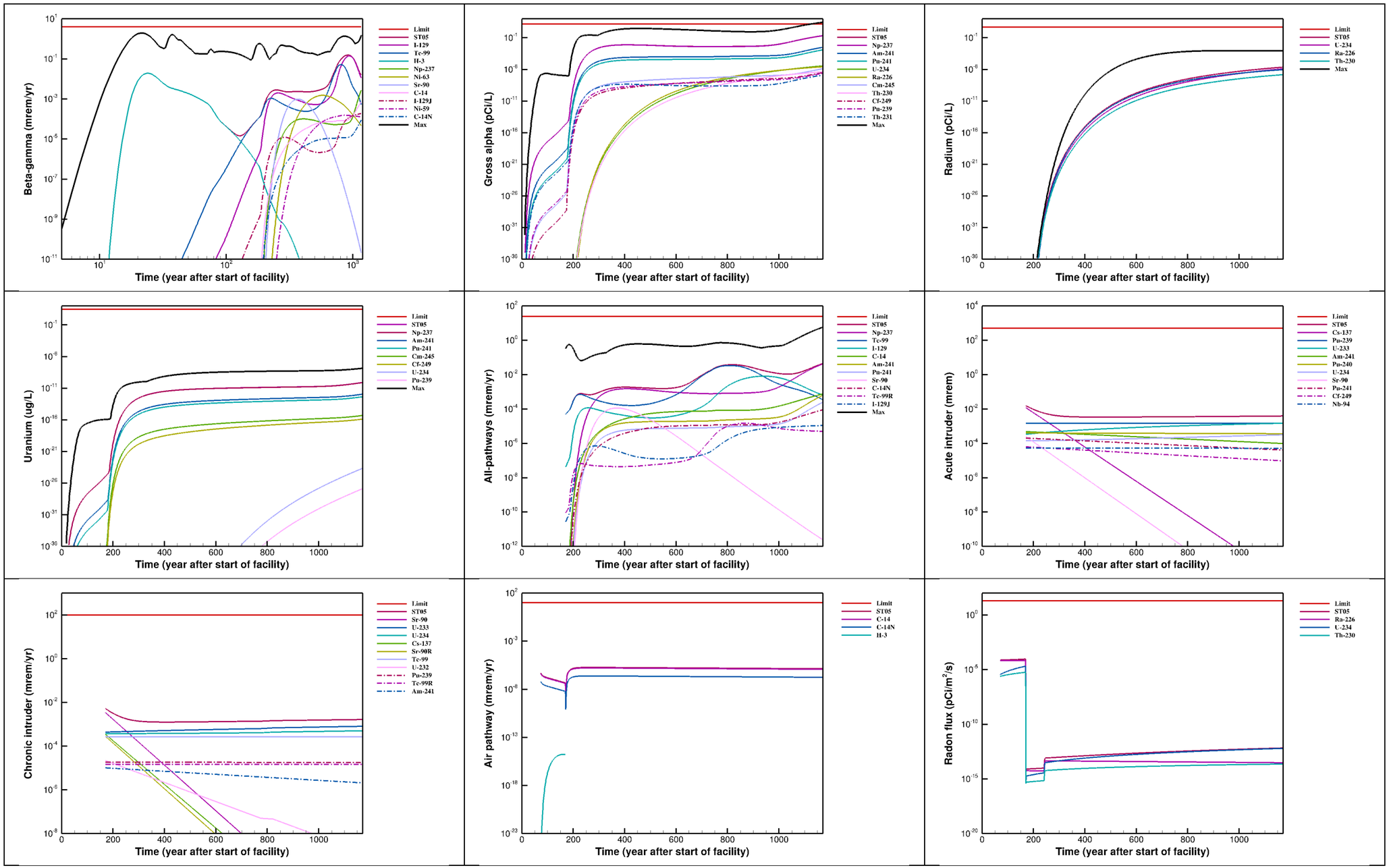


Figure I-73. Doses and Concentrations for ST05 and Top Contributing Radionuclides

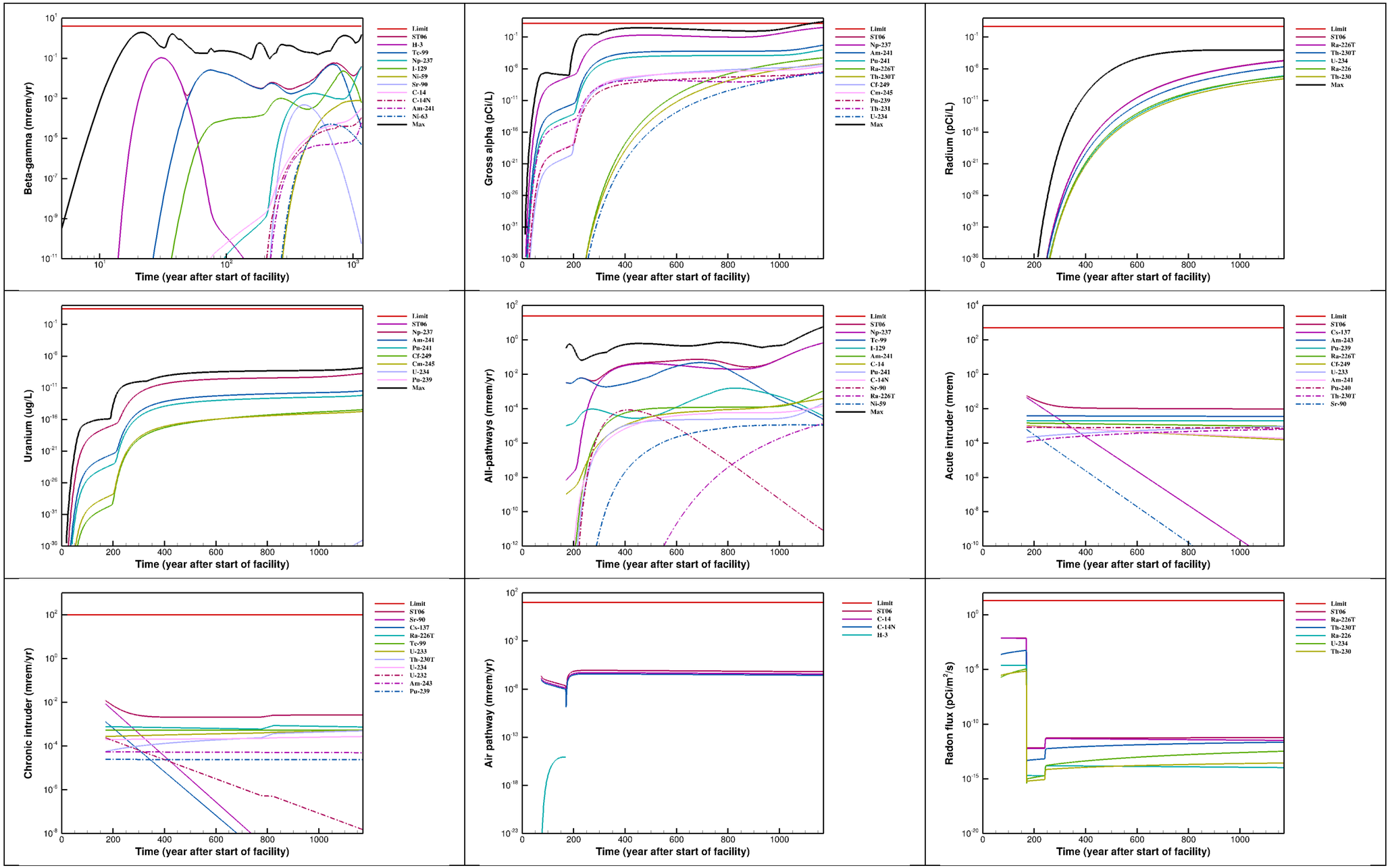


Figure I-74. Doses and Concentrations for ST06 and Top Contributing Radionuclides

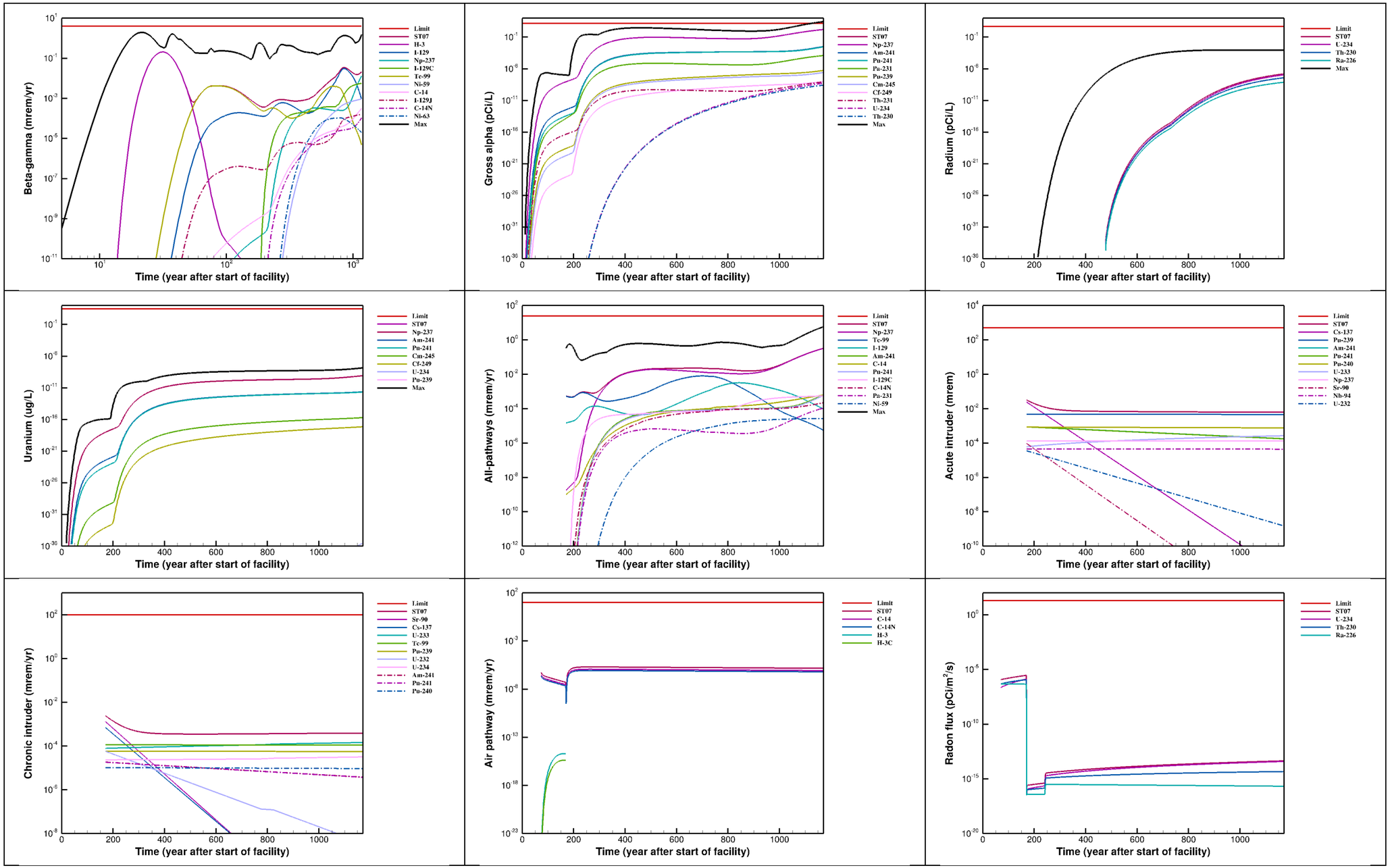


Figure I-75. Doses and Concentrations for ST07 and Top Contributing Radionuclides

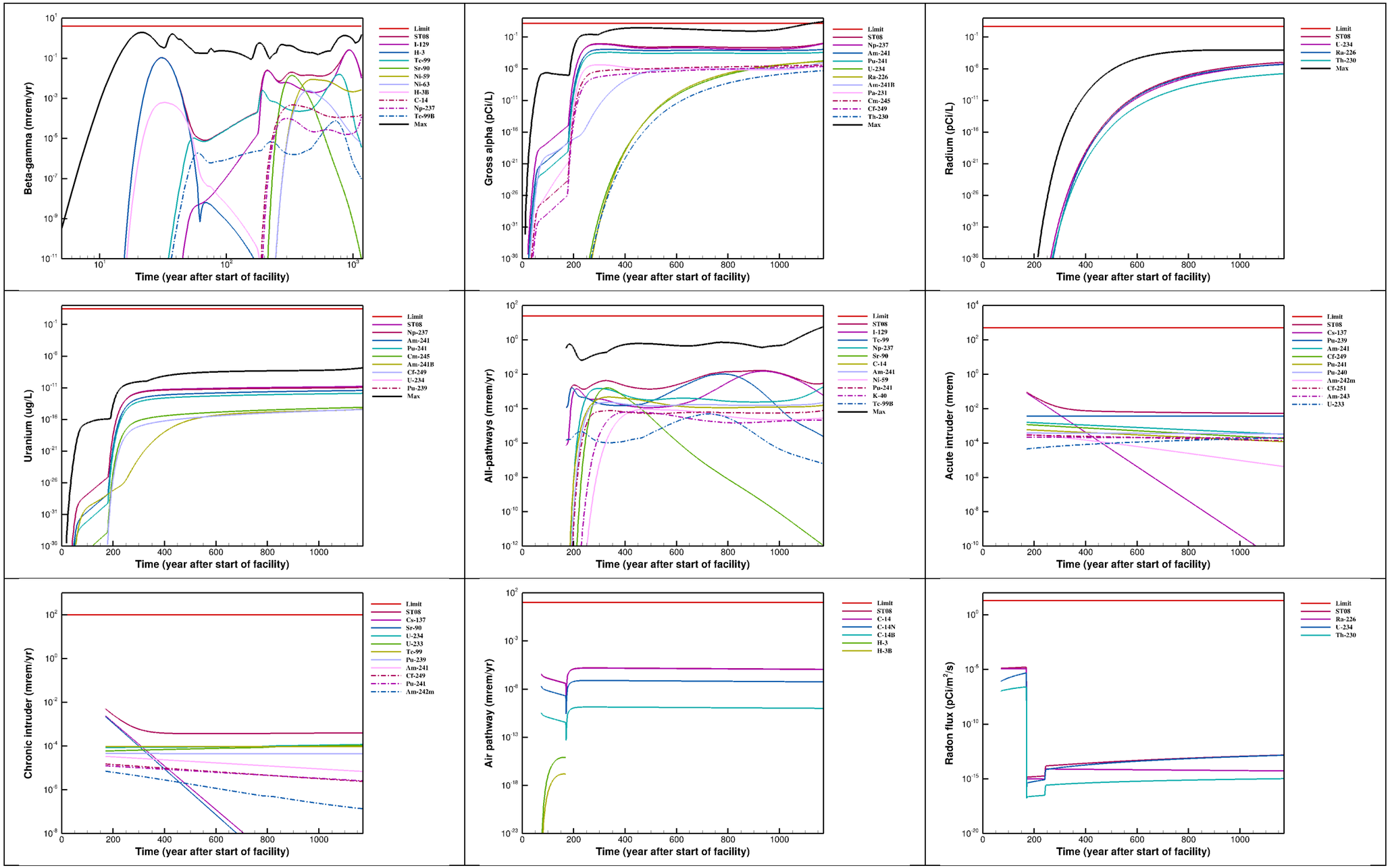


Figure I-76. Doses and Concentrations for ST08 and Top Contributing Radionuclides

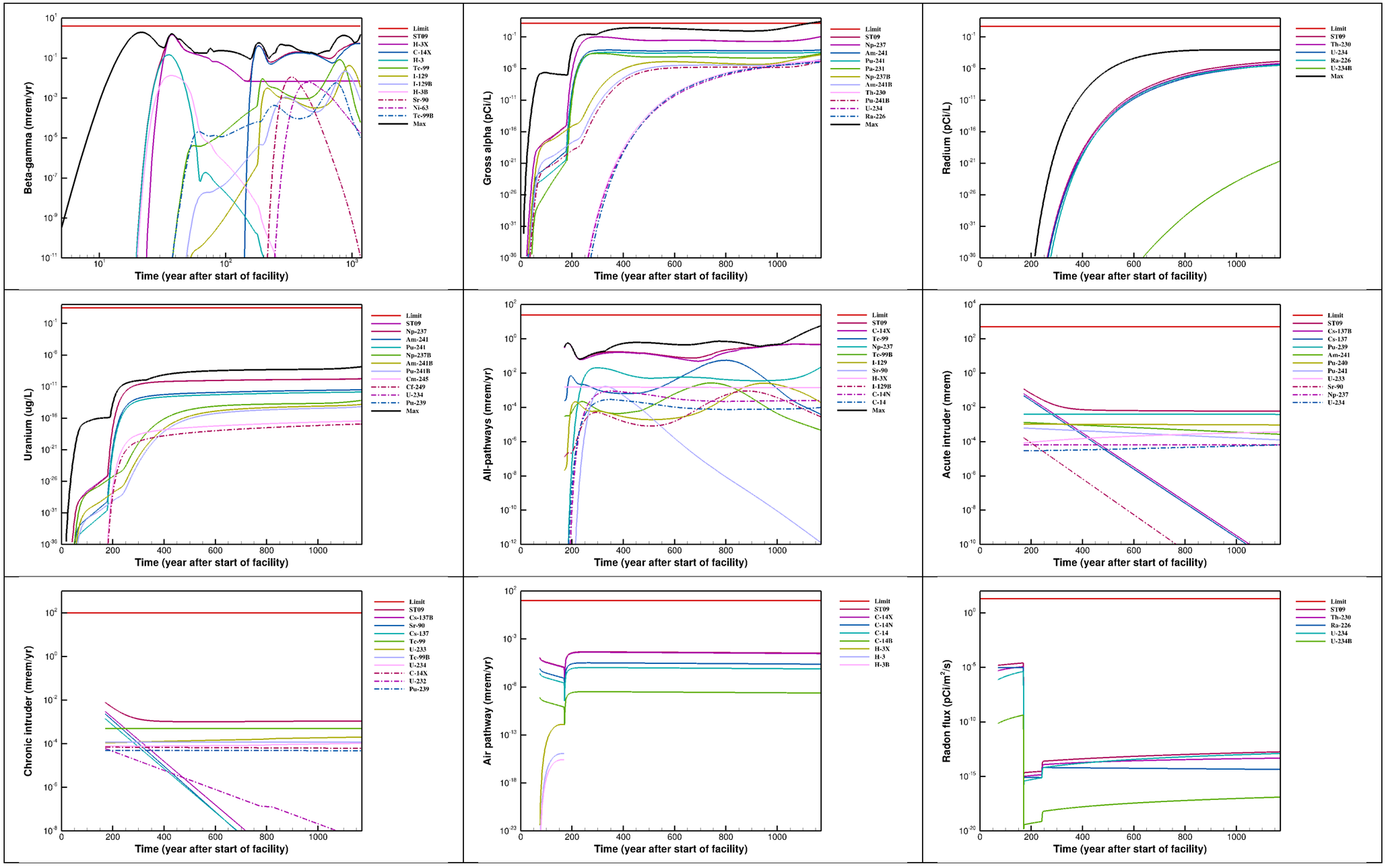


Figure I-77. Doses and Concentrations for ST09 and Top Contributing Radionuclides

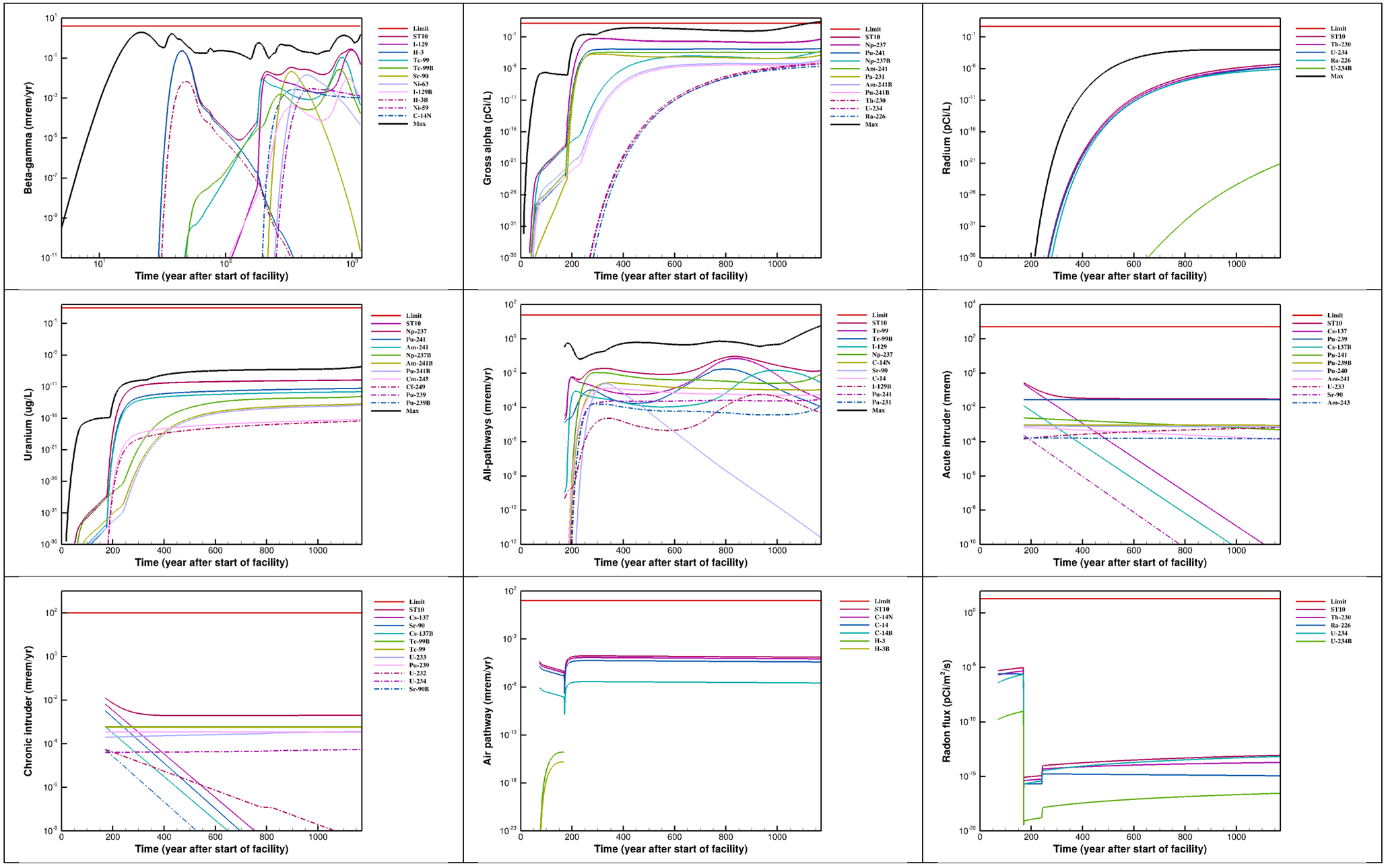


Figure I-78. Doses and Concentrations for ST10 and Top Contributing Radionuclides

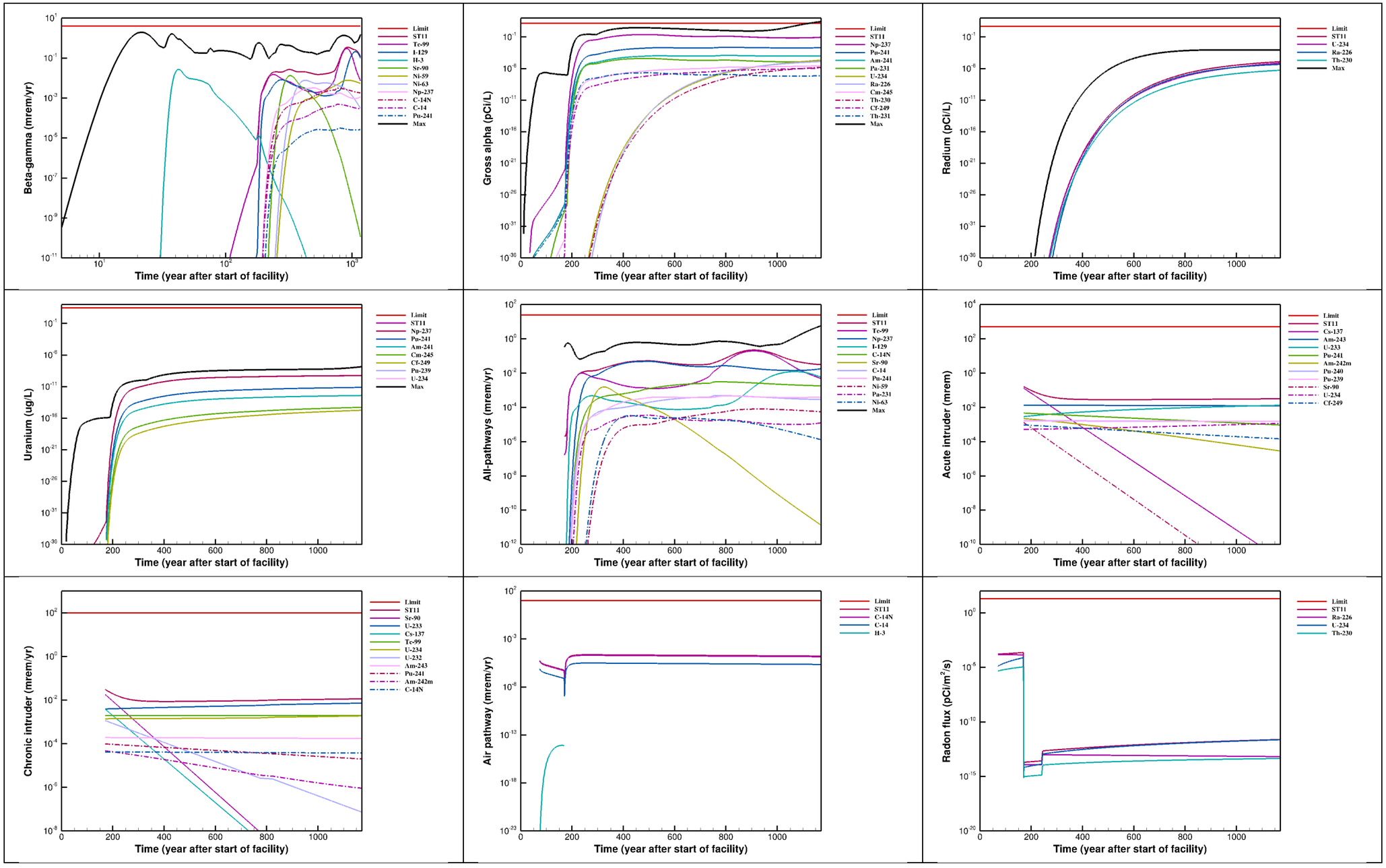


Figure I-79. Doses and Concentrations for ST11 and Top Contributing Radionuclides

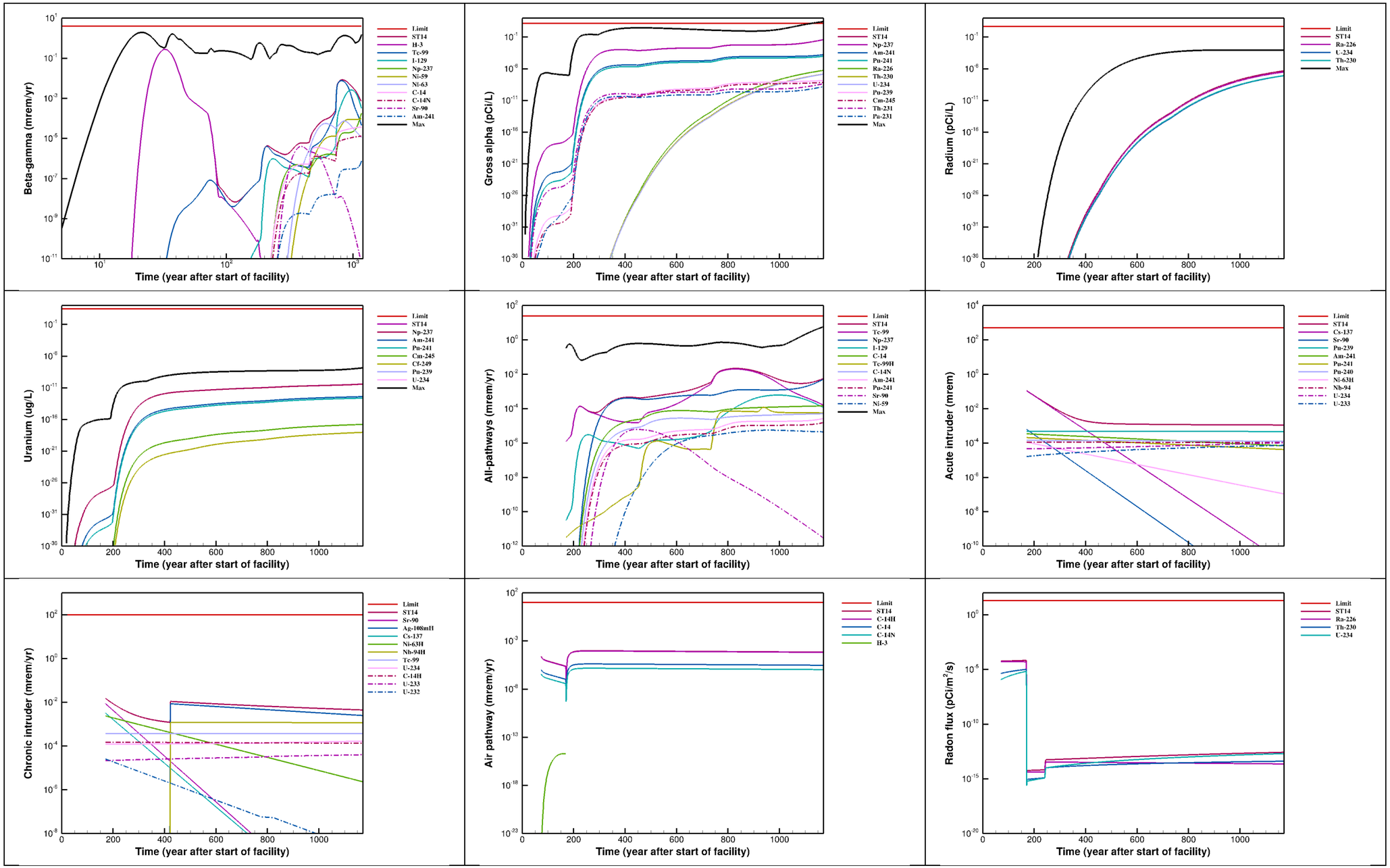


Figure I-80. Doses and Concentrations for ST14 and Top Contributing Radionuclides

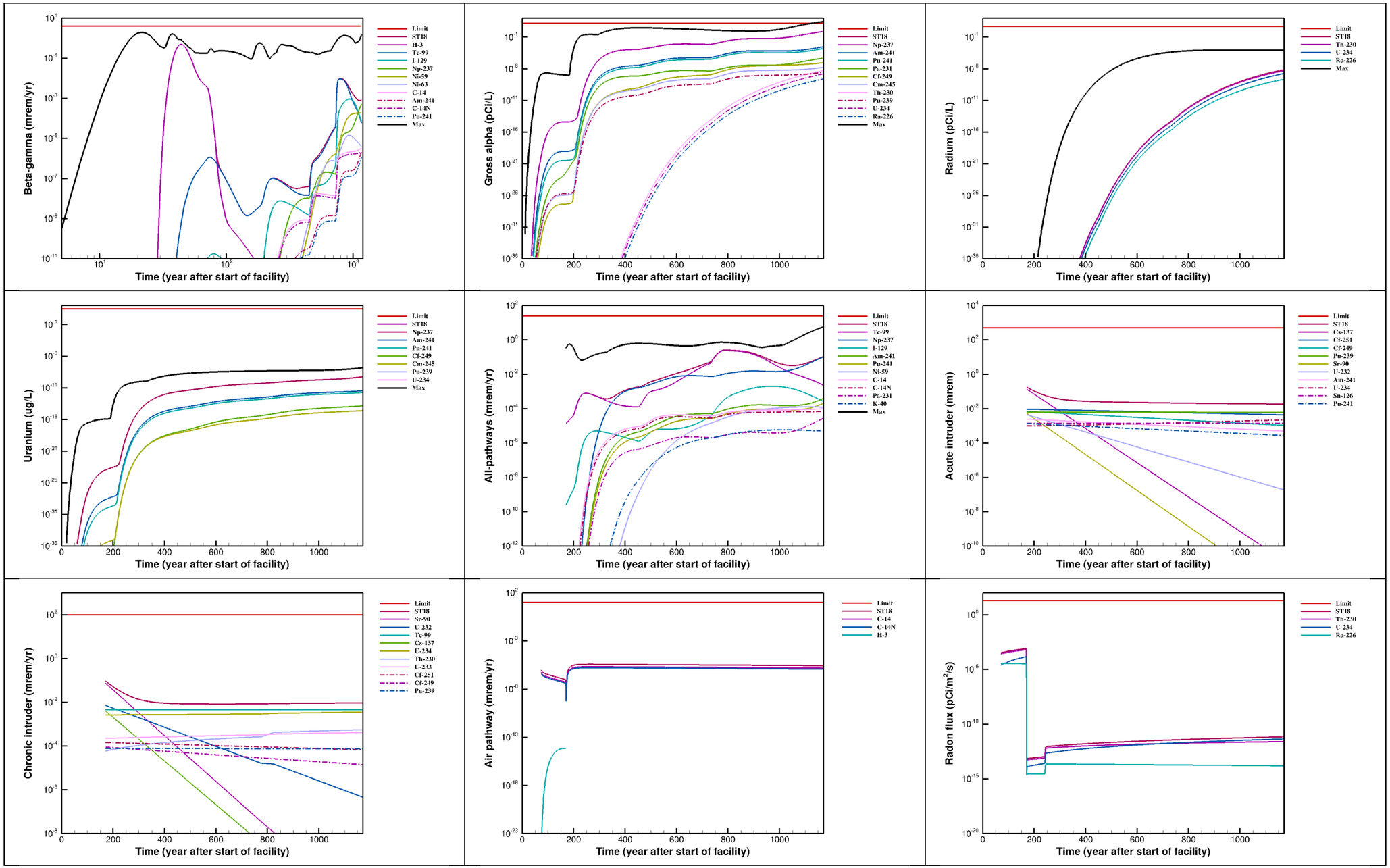


Figure I-81. Doses and Concentrations for ST18 and Top Contributing Radionuclides

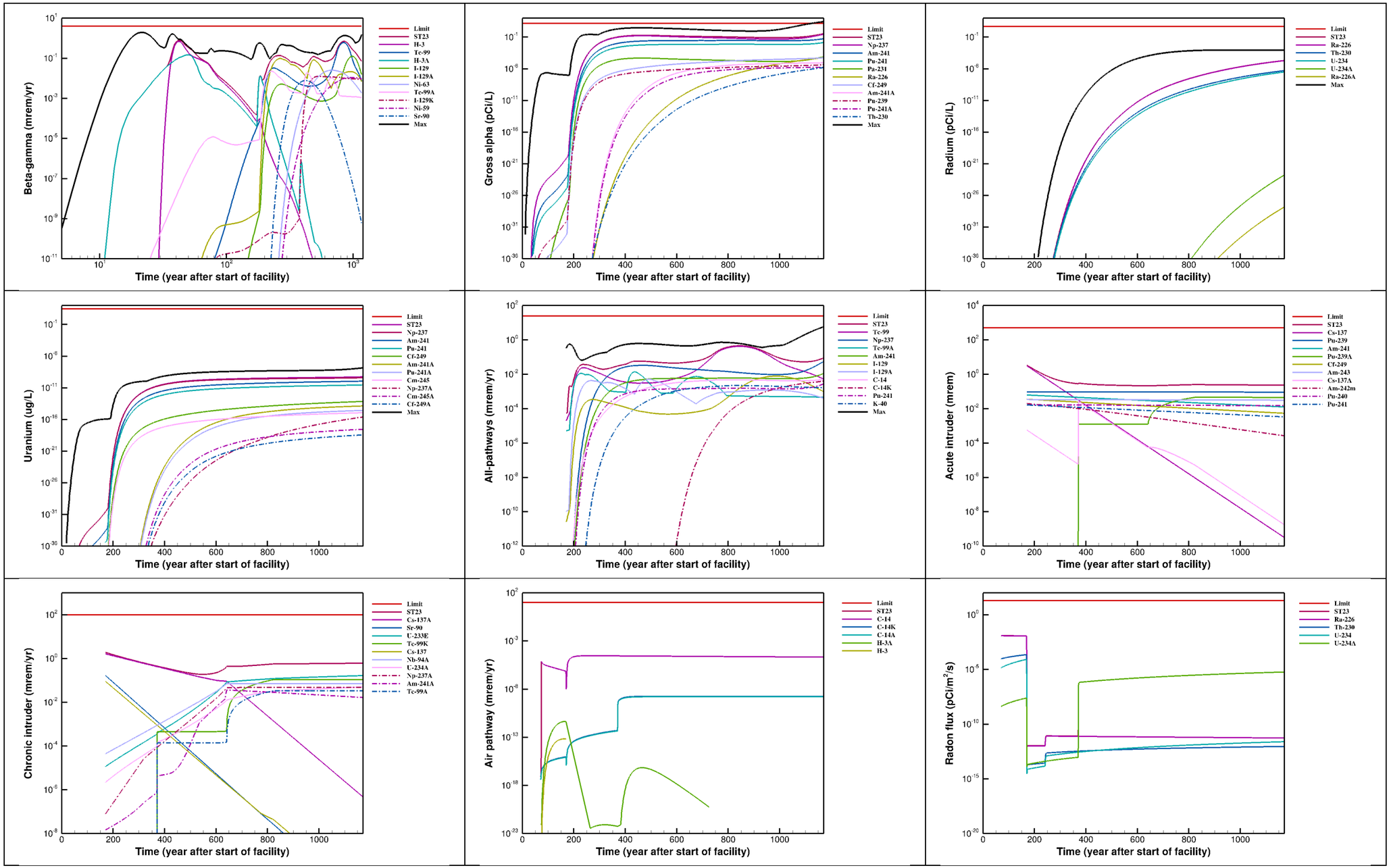


Figure I-82. Doses and Concentrations for ST23 and Top Contributing Radionuclides

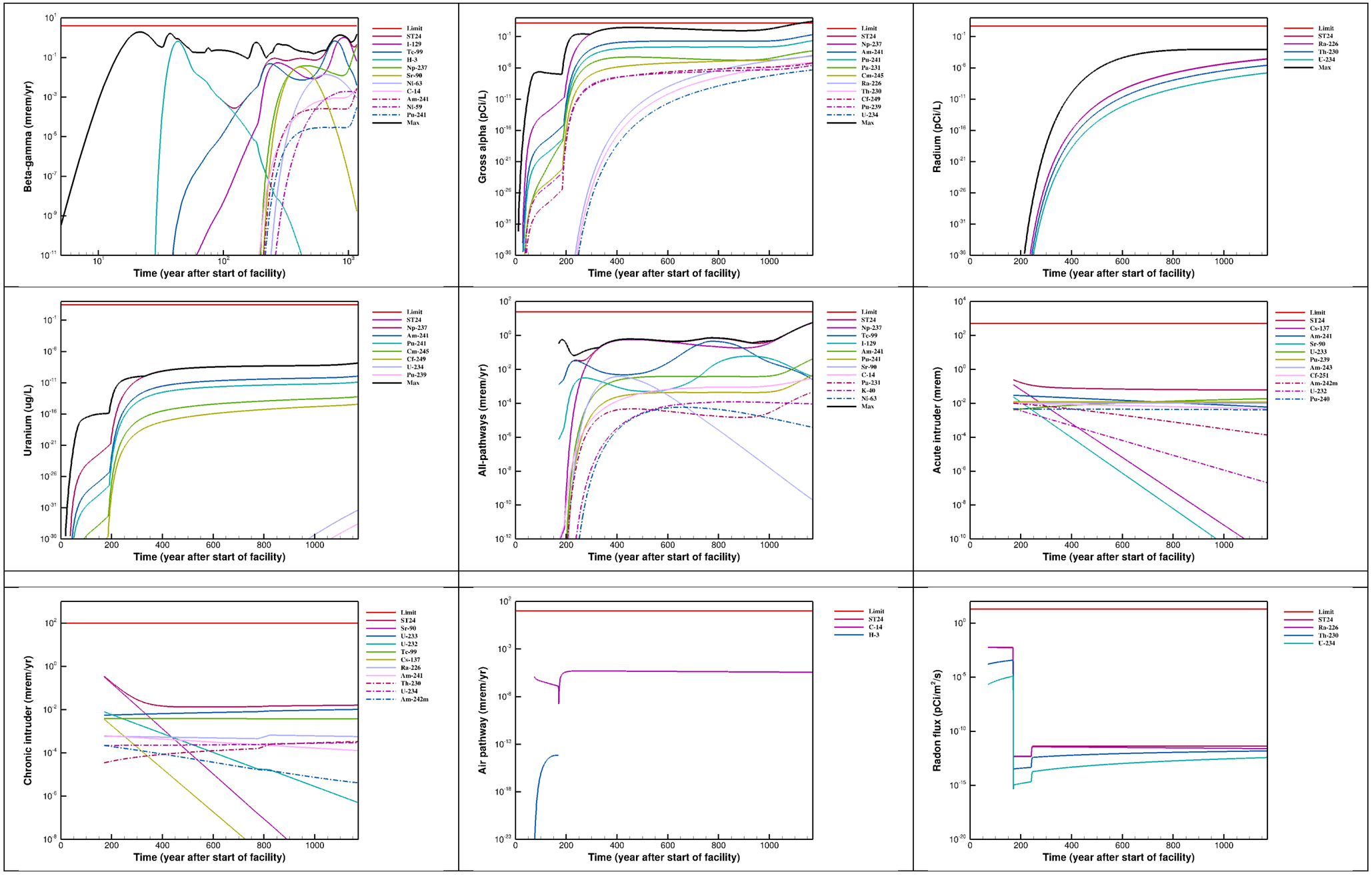


Figure I-83. Doses and Concentrations for ST24 and Top Contributing Radionuclides

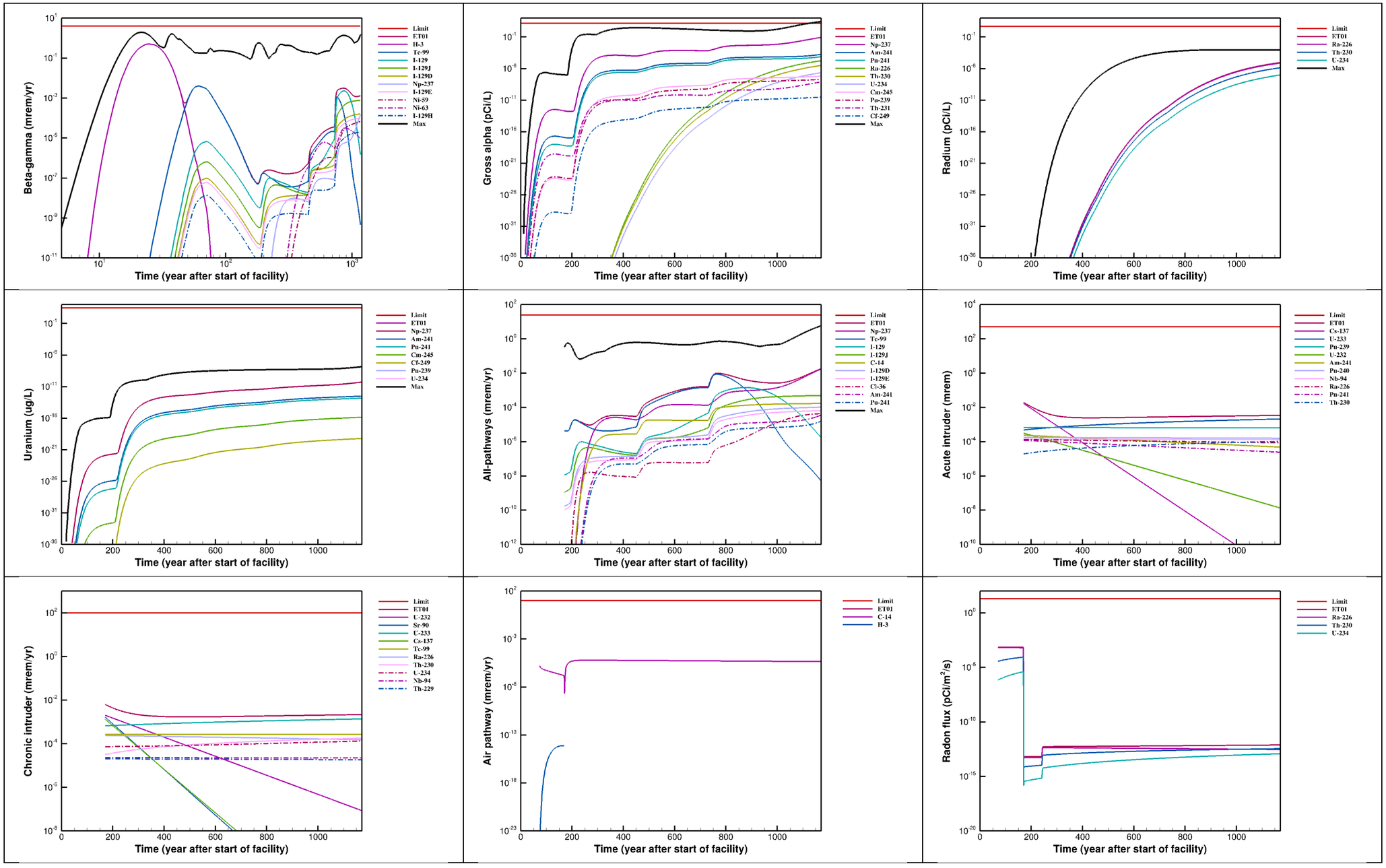


Figure I-84. Doses and Concentrations for ET01 and Top Contributing Radionuclides

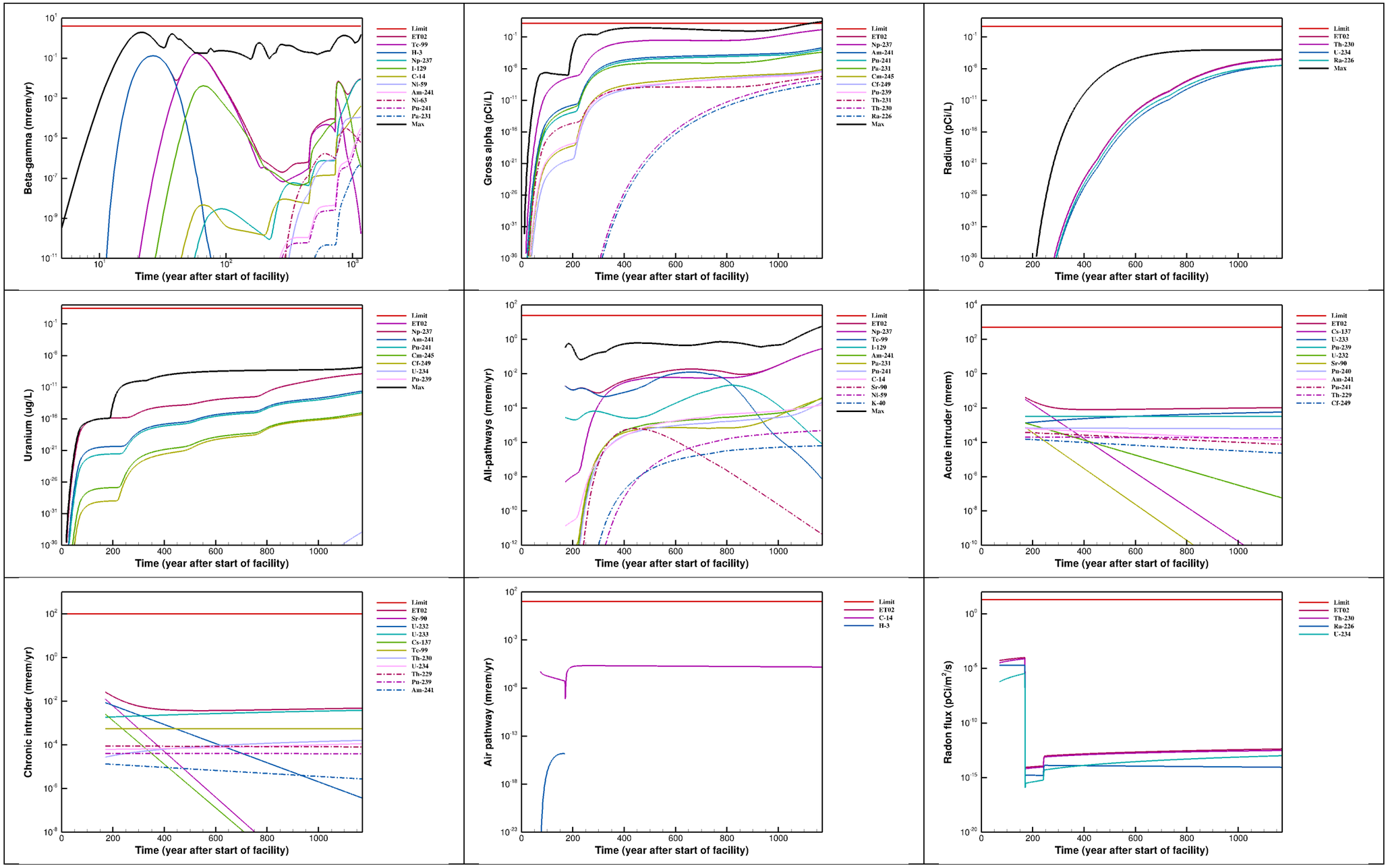


Figure I-85. Doses and Concentrations for ET02 and Top Contributing Radionuclides

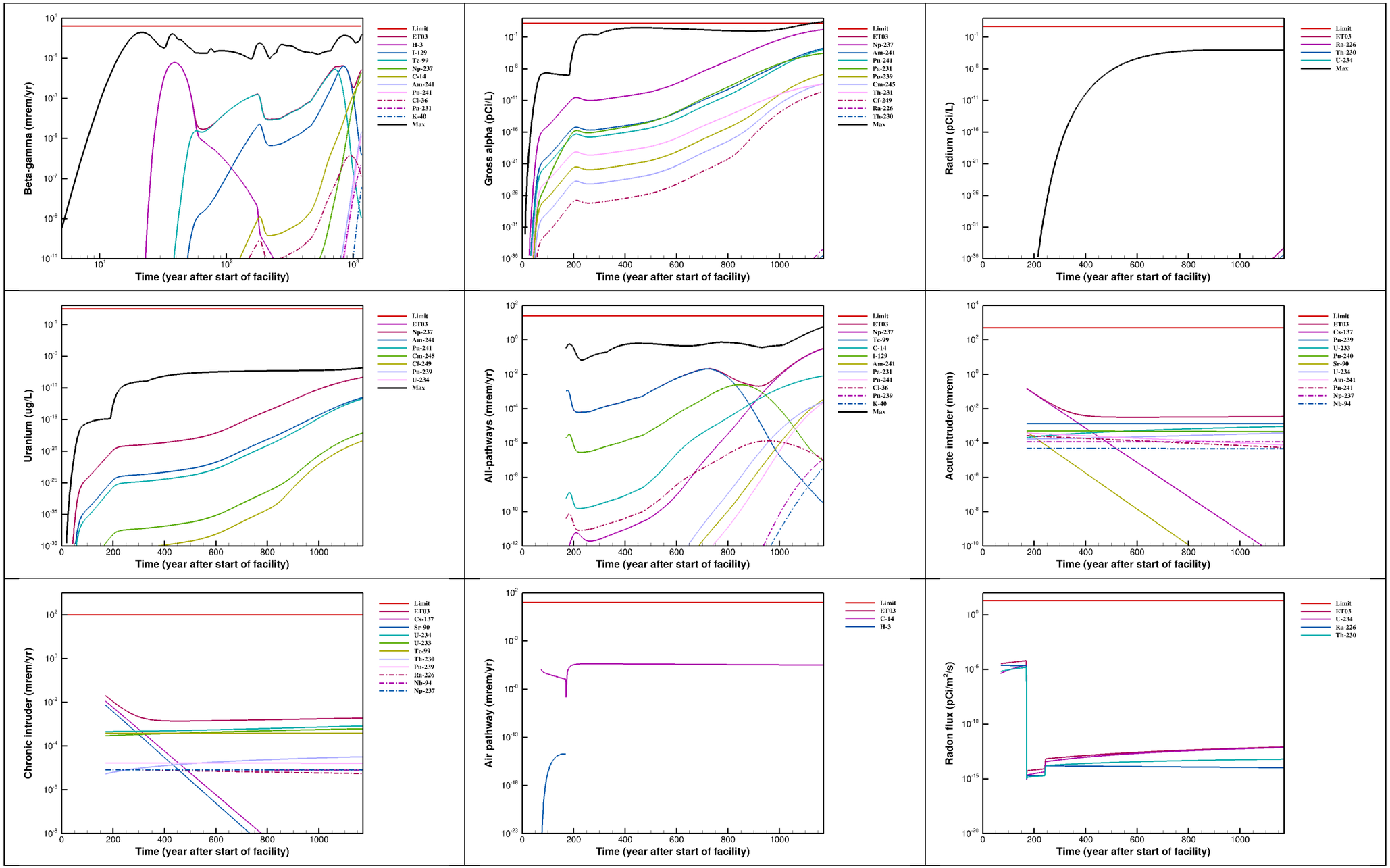


Figure I-86. Doses and Concentrations for ET03 and Top Contributing Radionuclides

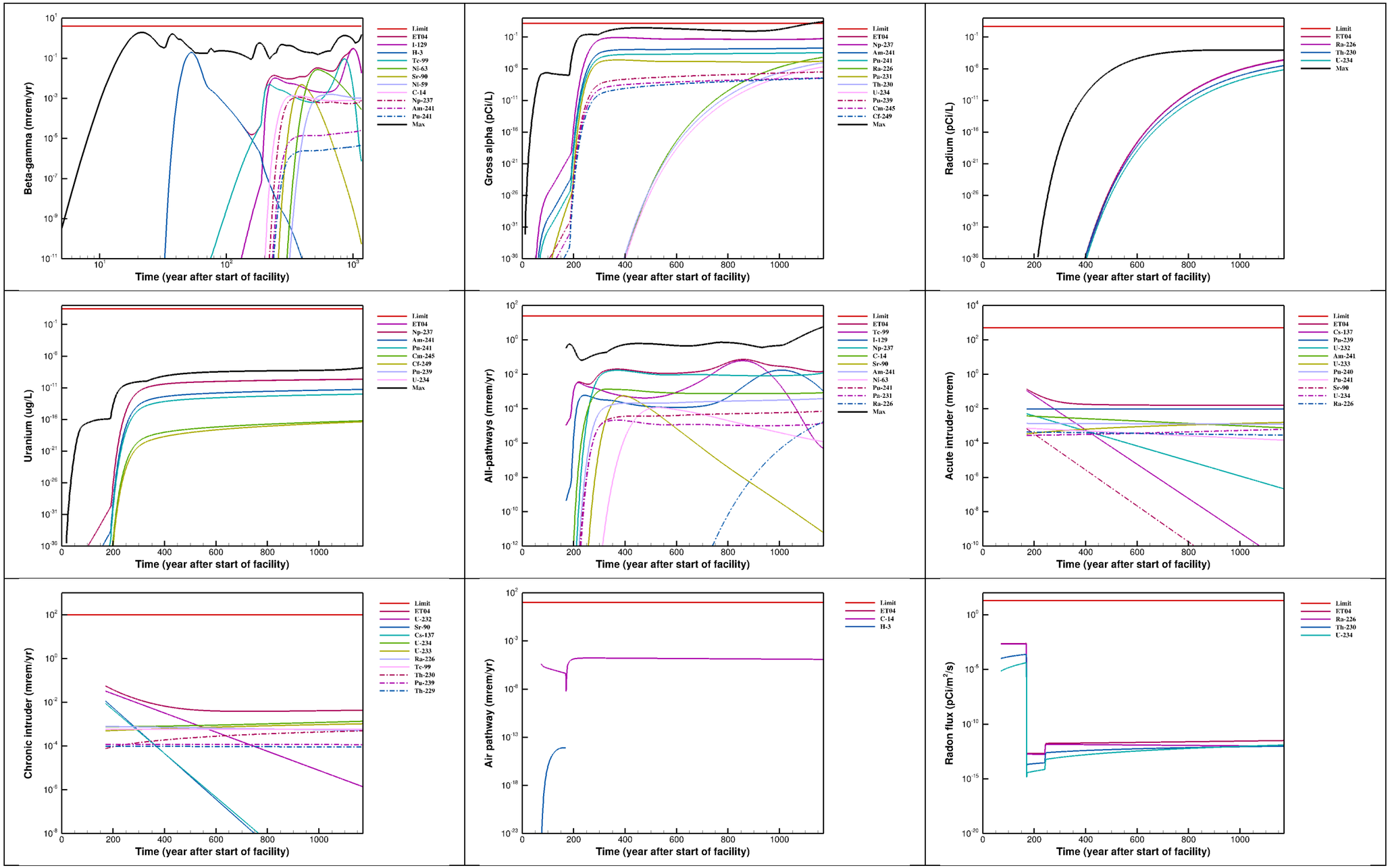


Figure I-87. Doses and Concentrations for ET04 and Top Contributing Radionuclides

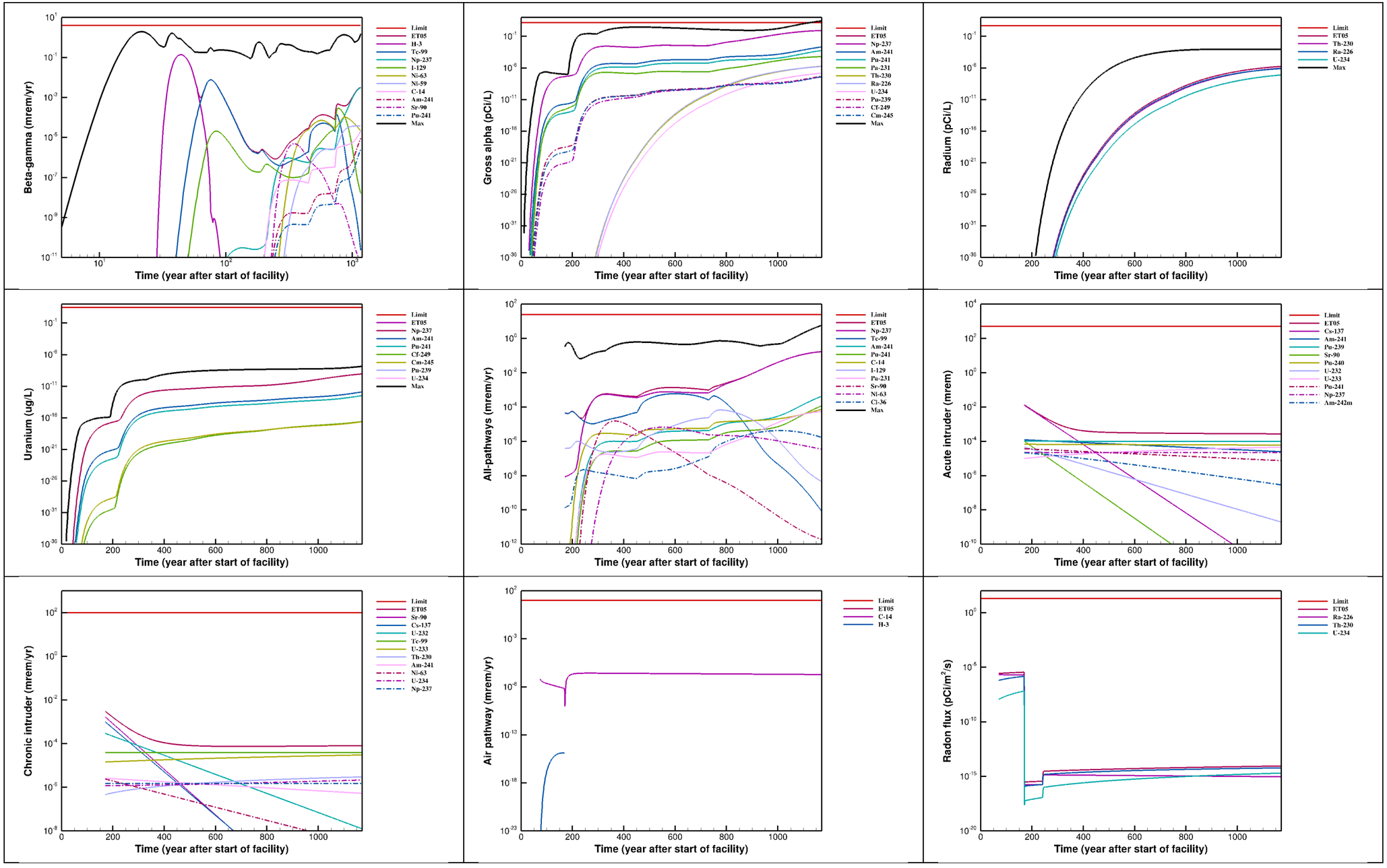


Figure I-88. Doses and Concentrations for ET05 and Top Contributing Radionuclides

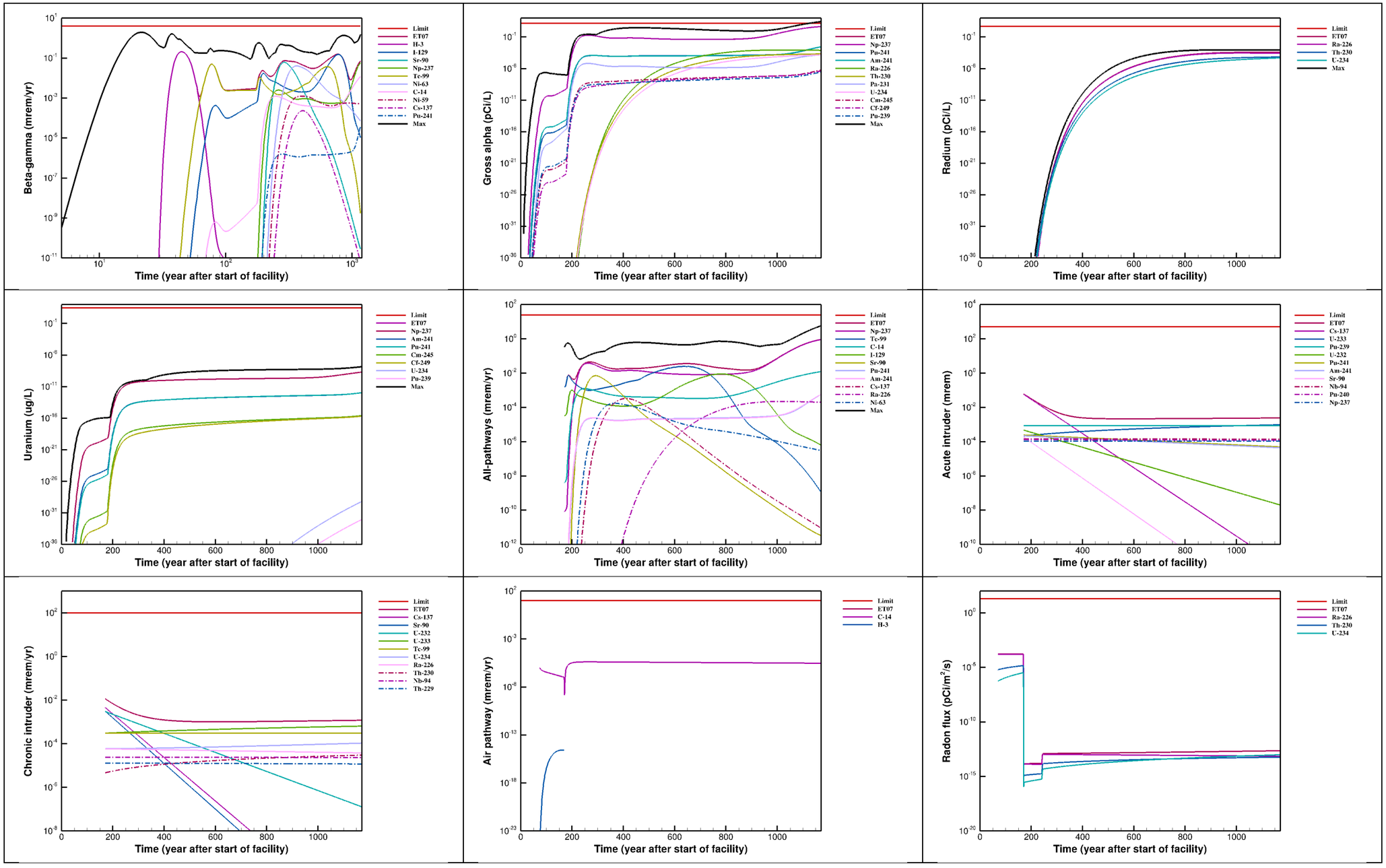


Figure I-89. Doses and Concentrations for ET07 and Top Contributing Radionuclides

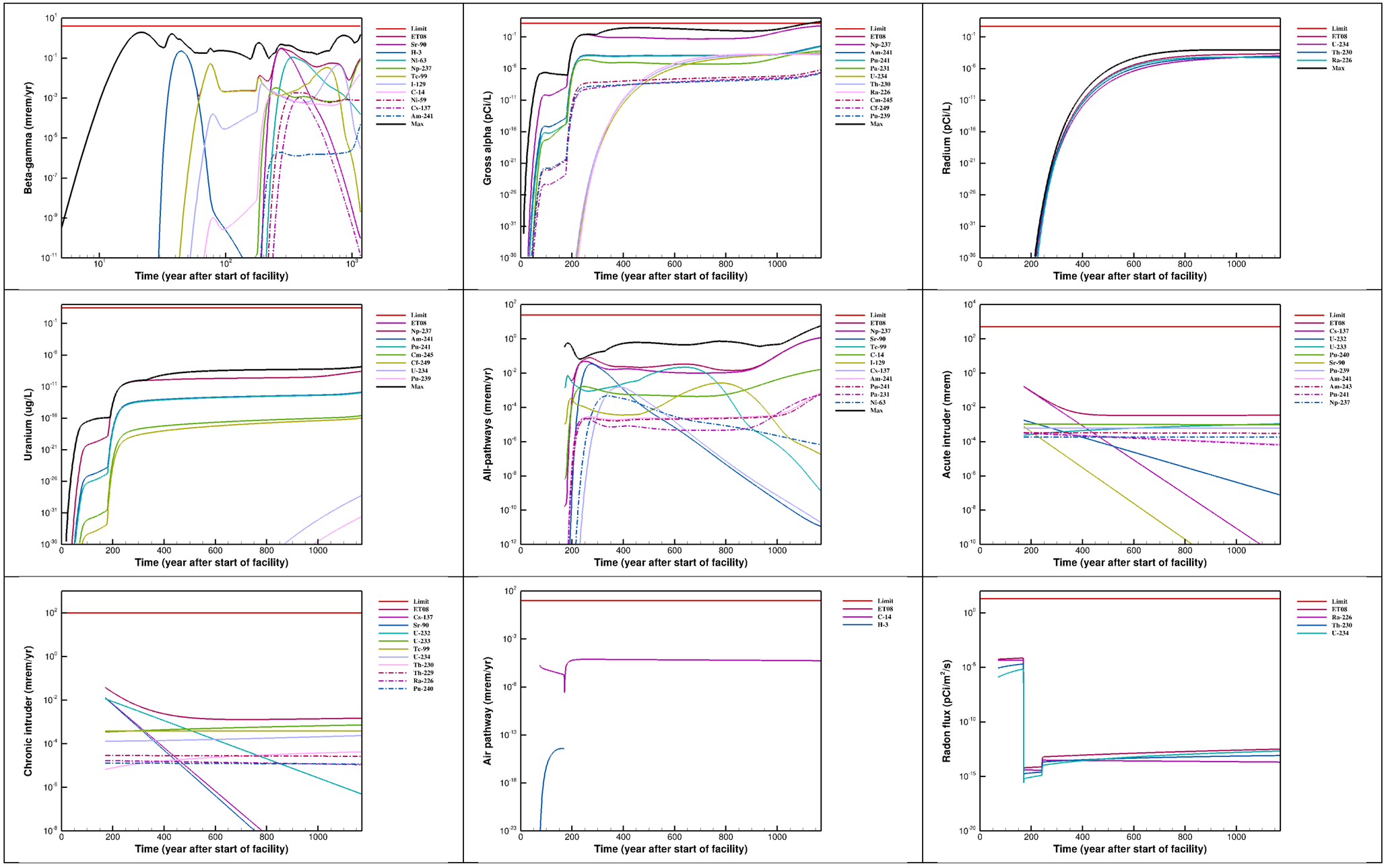


Figure I-90. Doses and Concentrations for ET08 and Top Contributing Radionuclides

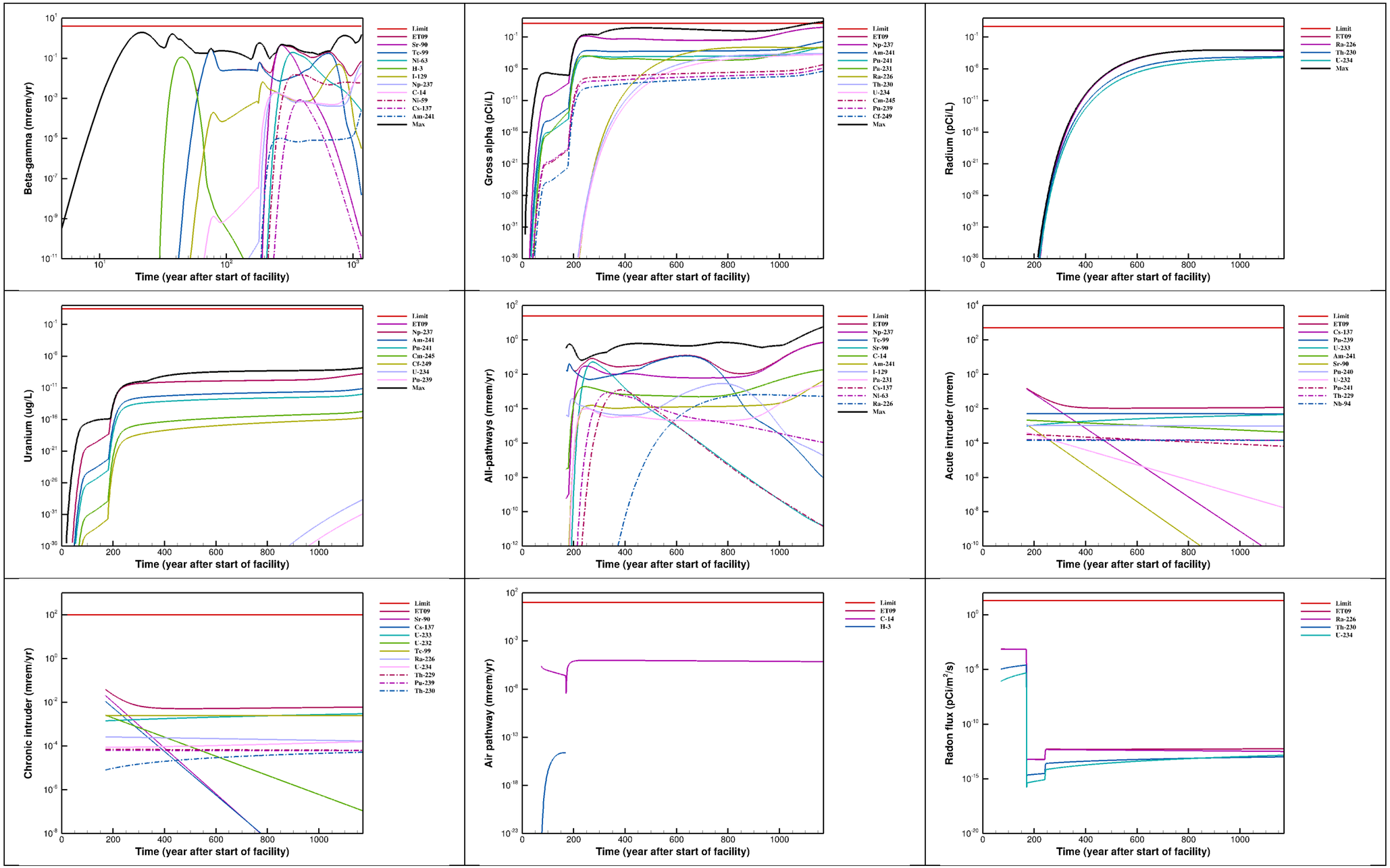


Figure I-91. Doses and Concentrations for ET09 and Top Contributing Radionuclides

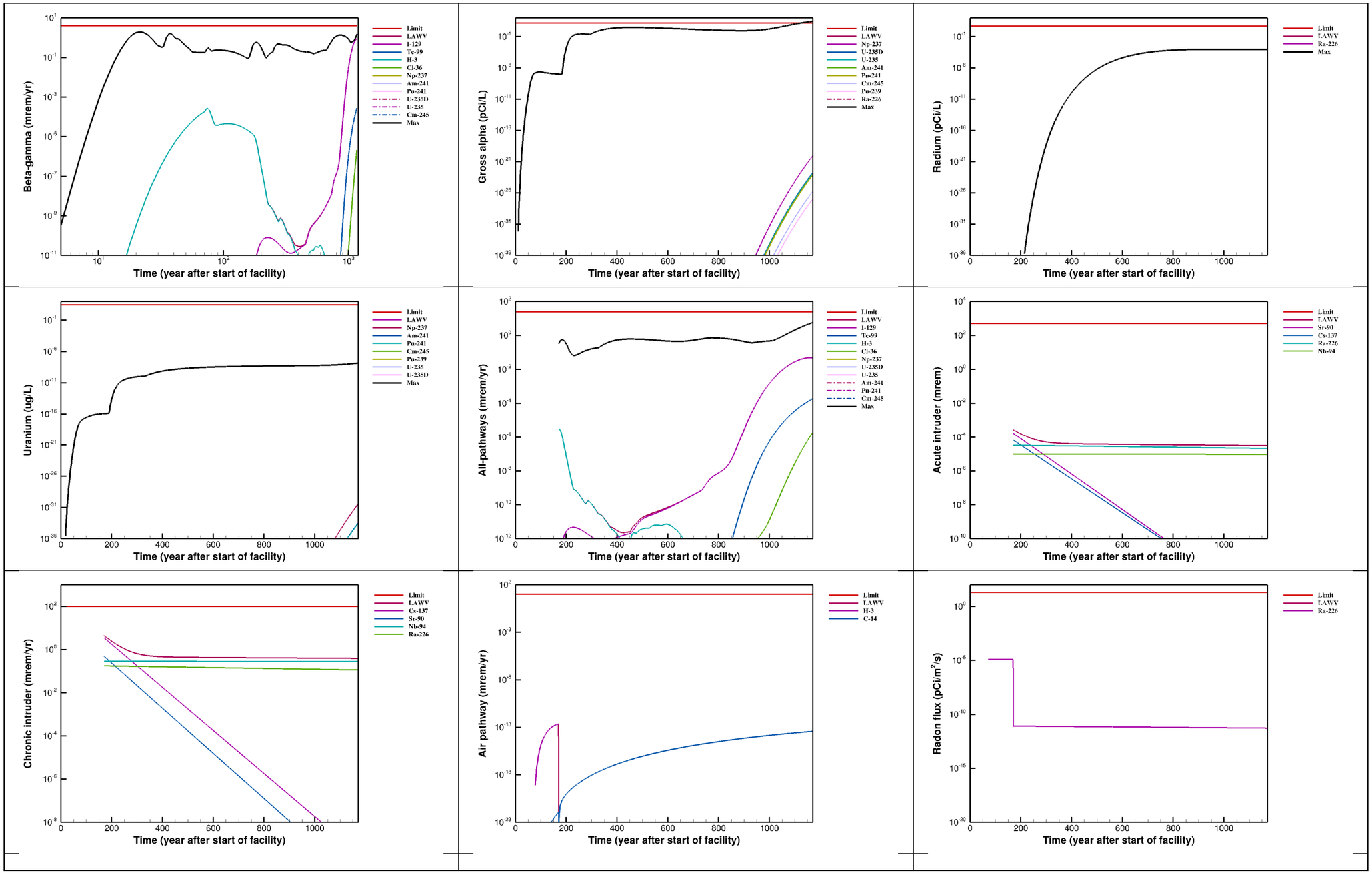


Figure I-92. Doses and Concentrations for LAWV and Top Contributing Radionuclides

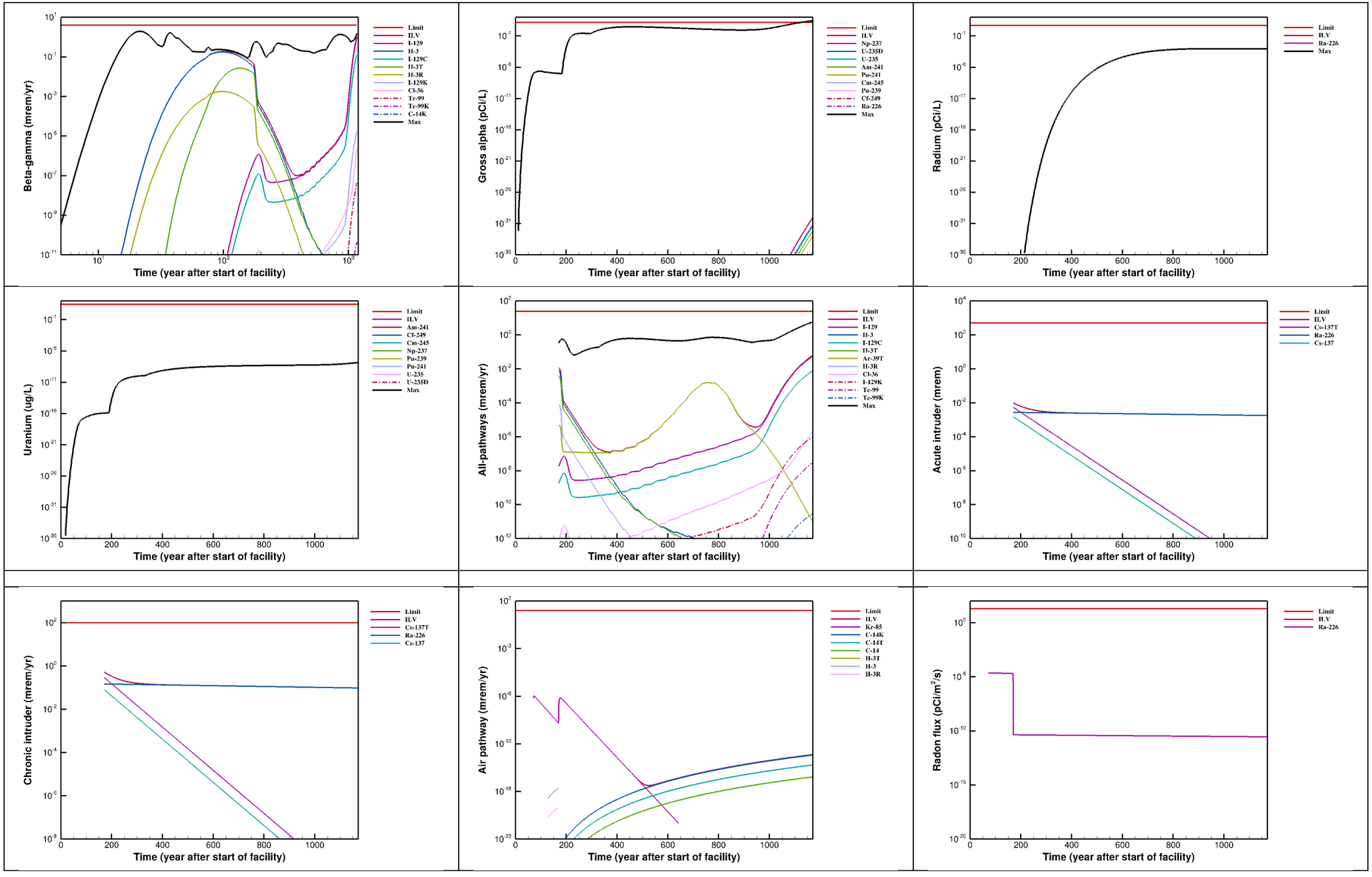


Figure I-93. Doses and Concentrations for ILV and Top Contributing Radionuclides

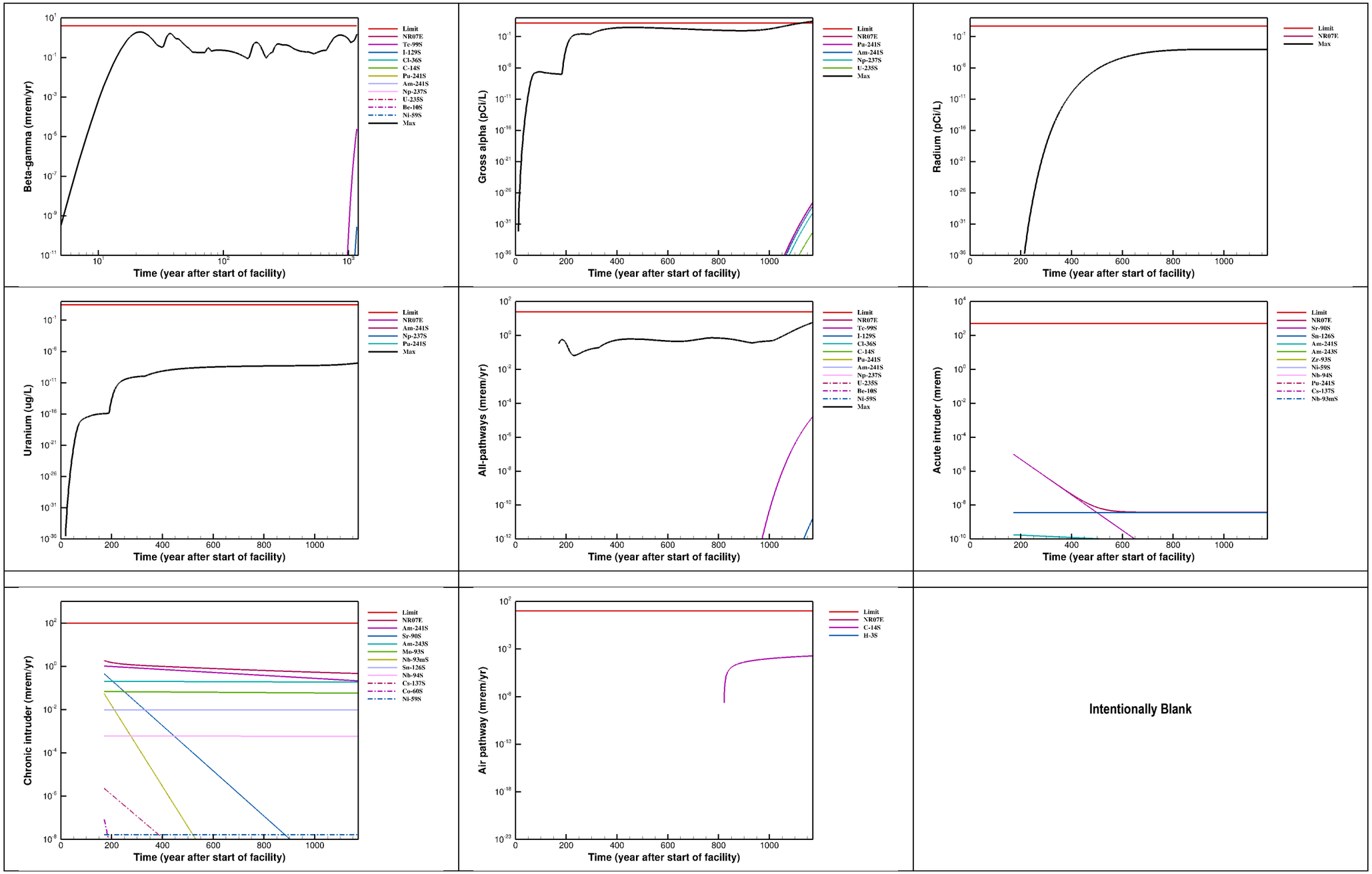


Figure I-94. Doses and Concentrations for NR07E and Top Contributing Radionuclides

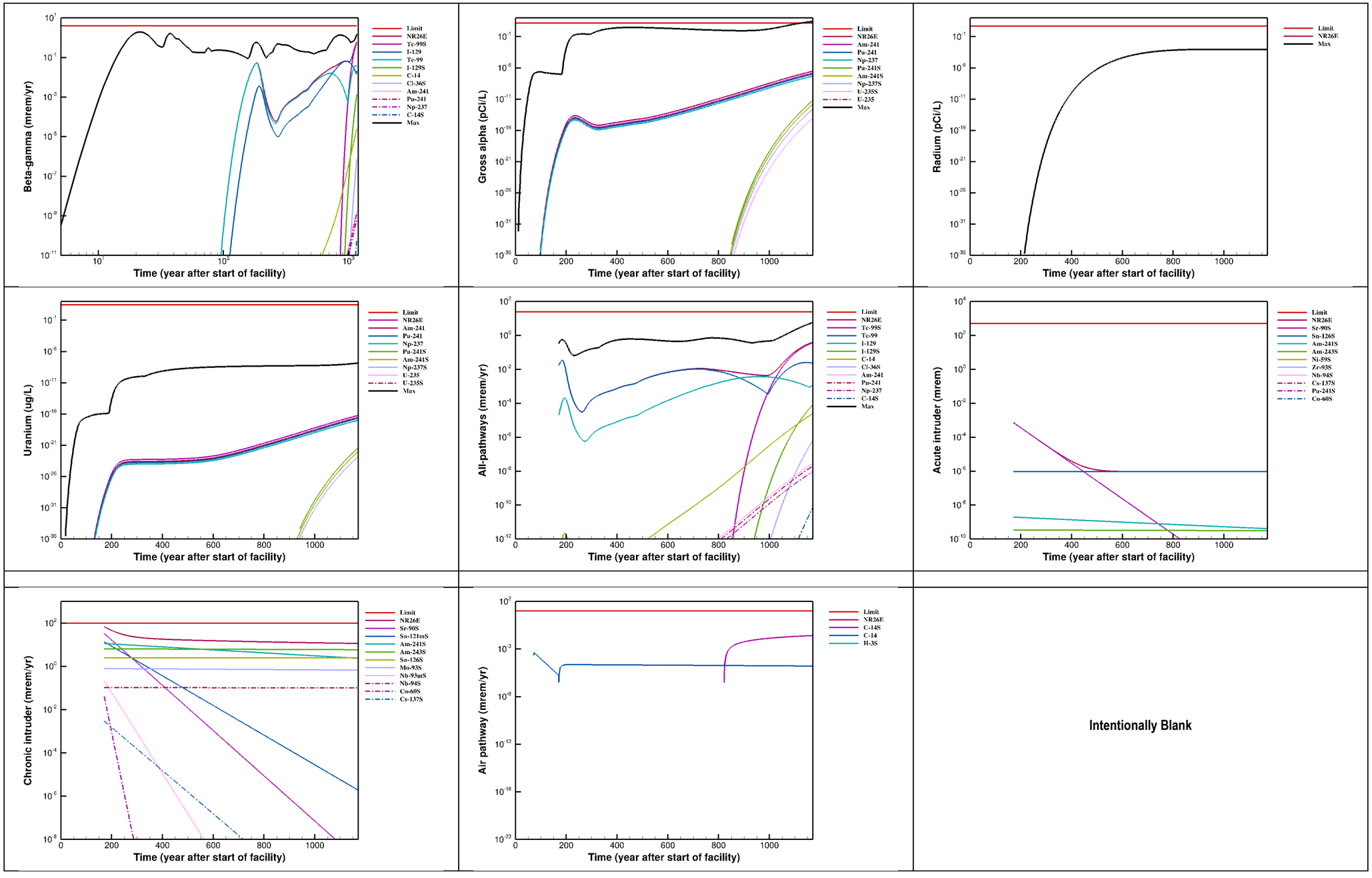


Figure I-95. Doses and Concentrations for NR26E and Top Contributing Radionuclides

I.4.2.3. Stochastic Maximum Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ELLWF and PA2022 Disposal Units

The SOF method is employed in this PA to compare differences among the various exposure pathways. For each realization within the MC simulation, the calculational aspects utilized in computing maximum total SOFs by pathway, in addition to an overall maximum SOF for the ELLWF, are consistent with those discussed in Appendix H, Section H.8. The SOFs per realization are tabulated and stored for the overall ELLWF and individual DUs. Additionally, total SOFs for CWTS exposure-pathway time windows are generated and stored for each DU. Figure I-97 through Figure I-123 display, in the form of sequential MC simulation results for the 27 PA2022 DUs, the maximum total SOFs and total SOFs by CWTS time window for each exposure pathway.

To illustrate typical sequential MC simulation results that are stored, the final 1,000 realizations of a 10,000-realization MC simulation are shown in Figure I-96 for the overall ELLWF for all nine exposure pathways. Graphically, the relative mean and spread in maximum total SOFs for each pathway is displayed. For this case, the spread in gross-alpha values exceeds the spread for beta-gamma. The highest maximum total SOF observed for the ELLWF across the 10,000 realizations is 1.959.

The total SOF by DU is computed using stochastic closure inventories and CWTS inventory limits for each CWTS exposure-pathway time window. For example, trench DUs utilize three time windows for beta-gamma, two for all-pathways, and one for the remaining pathways. The CWTS inventory limits include PIFs for the GW and air pathways. For closed DUs, CWTS inventories and biases are applied to existing CWTS inventories. For open and future DUs, projected CWTS inventories, after random sampling of log-normal distributions, are adjusted and added to existing inventories until a SOF of 1.0 is achieved within a CWTS exposure-pathway time window. The projected CWTS inventories are then adjusted by applying CWTS inventory biases and uncertainties to arrive at the stochastic closure inventories. The total SOFs in Figure I-97 through Figure I-123 are computed using these stochastic closure inventories.

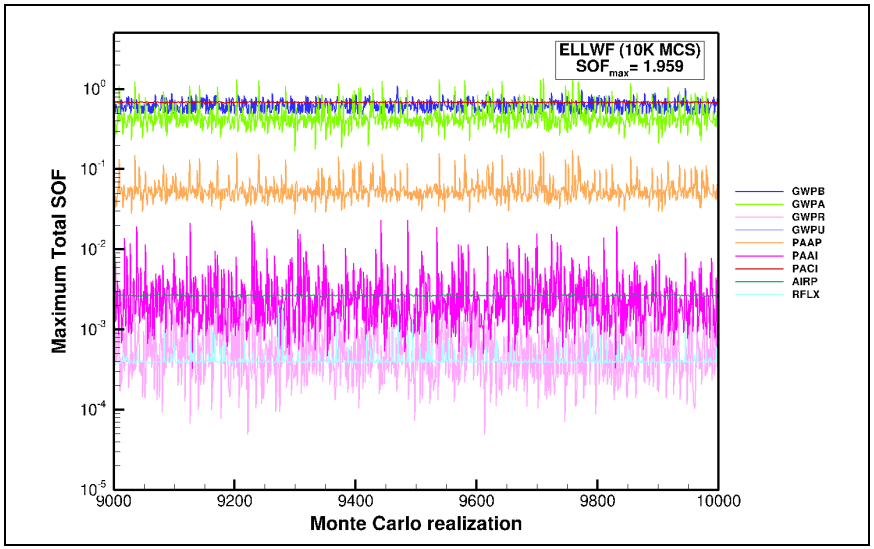


Figure I-96. Stochastic Maximum Total Sum-of-Fractions for ELLWF for Last 1,000 Realizations of 10,000-Realization MC Simulation

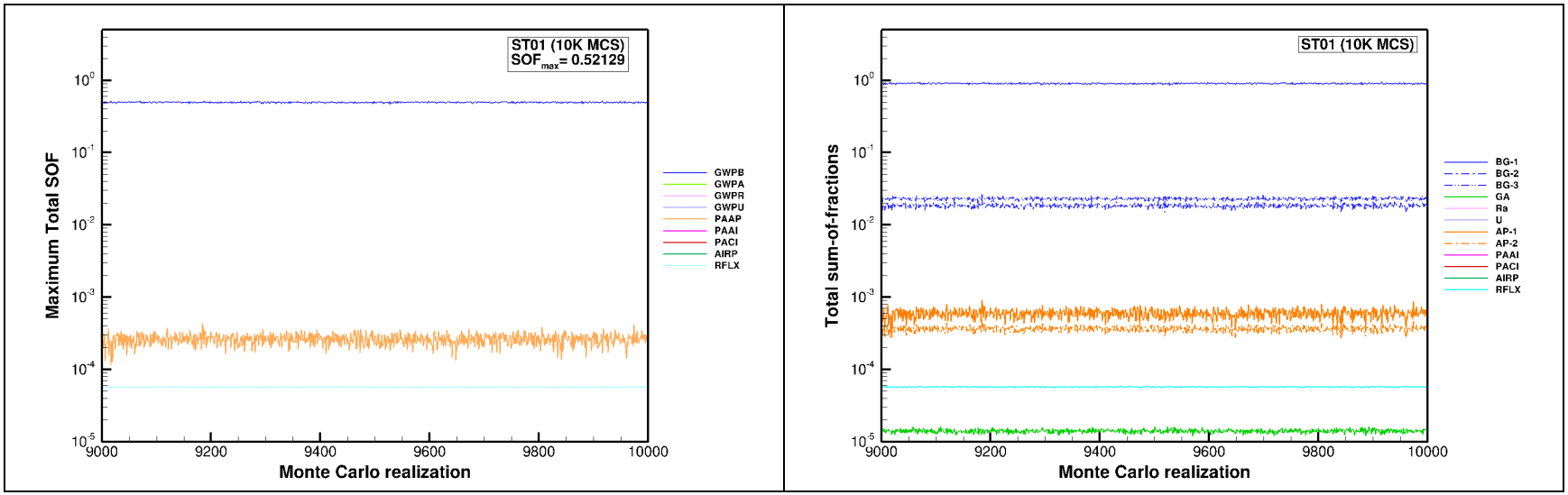


Figure I-97. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ST01

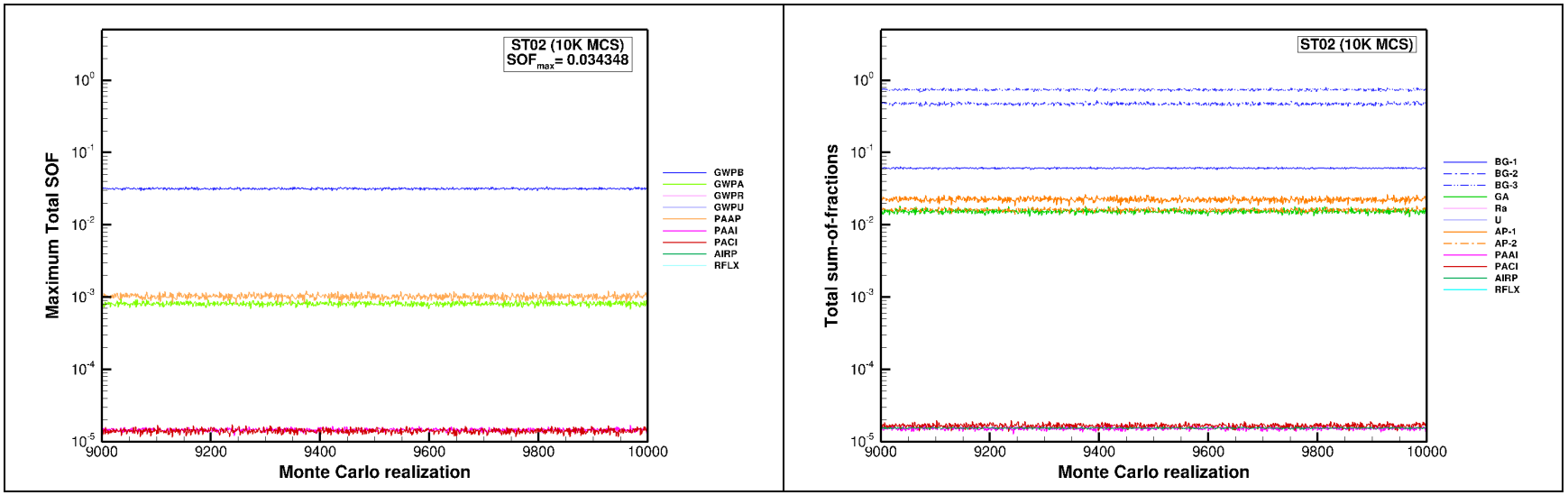


Figure I-98. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ST02

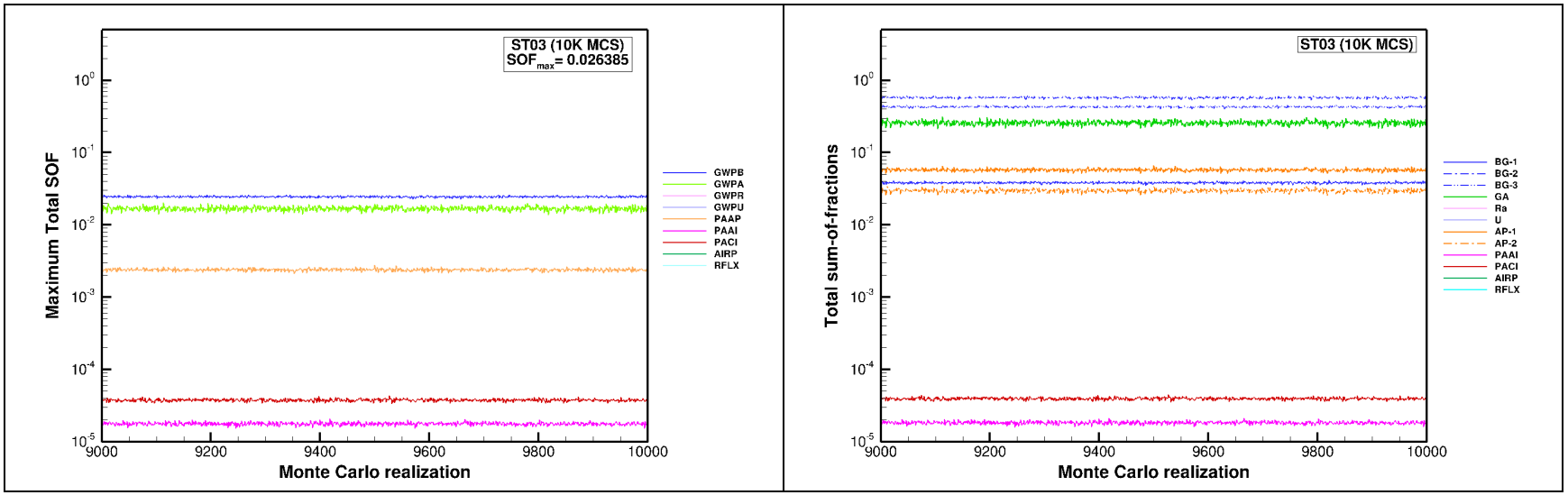


Figure I-99. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ST03

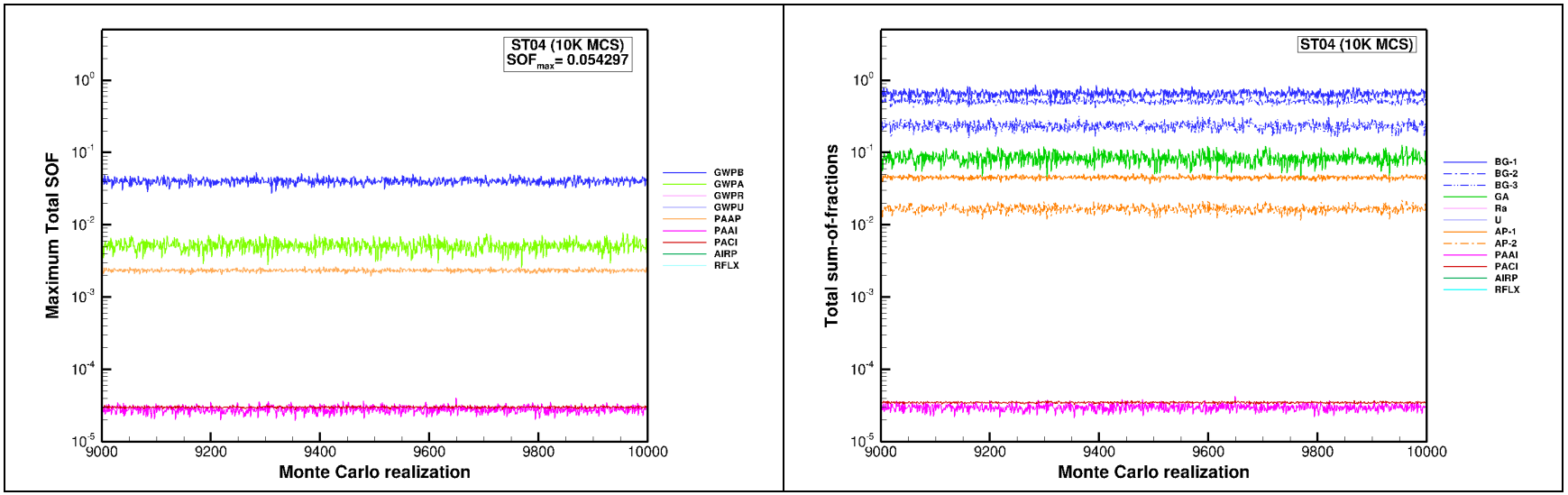


Figure I-100. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ST04

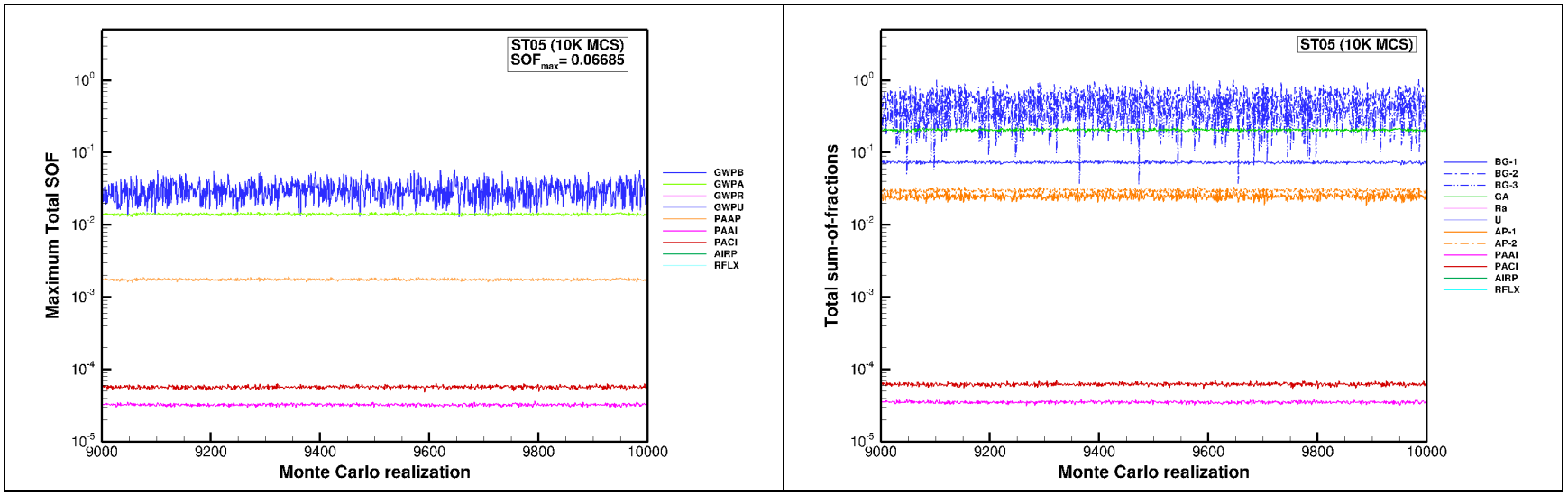


Figure I-101. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ST05

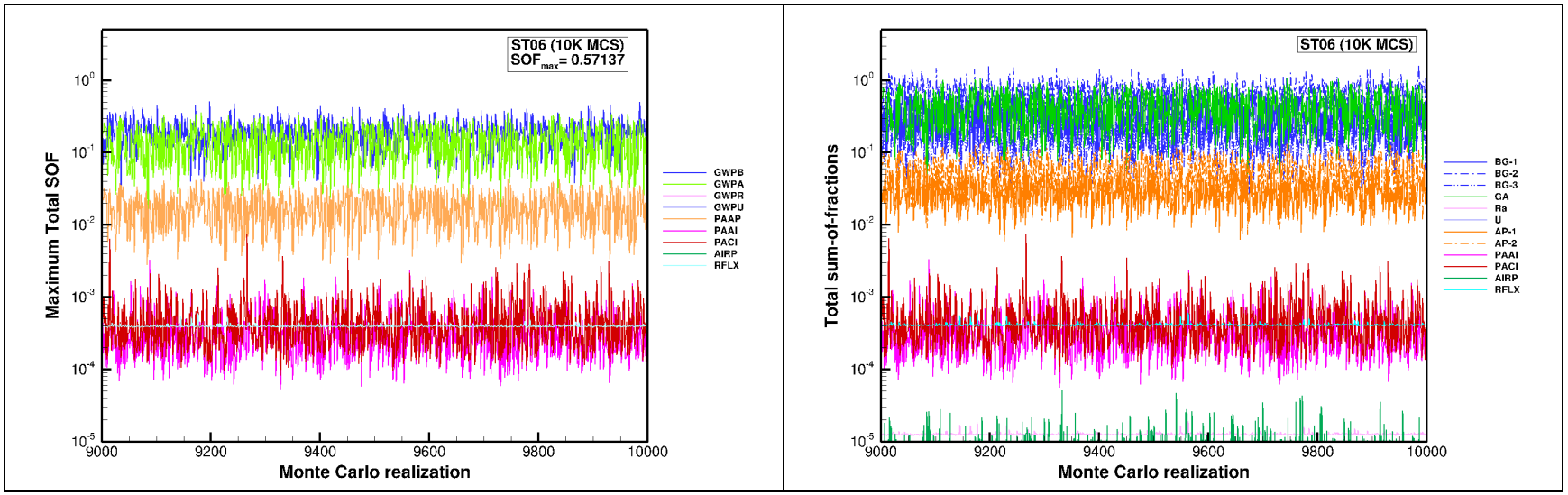


Figure I-102. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ST06

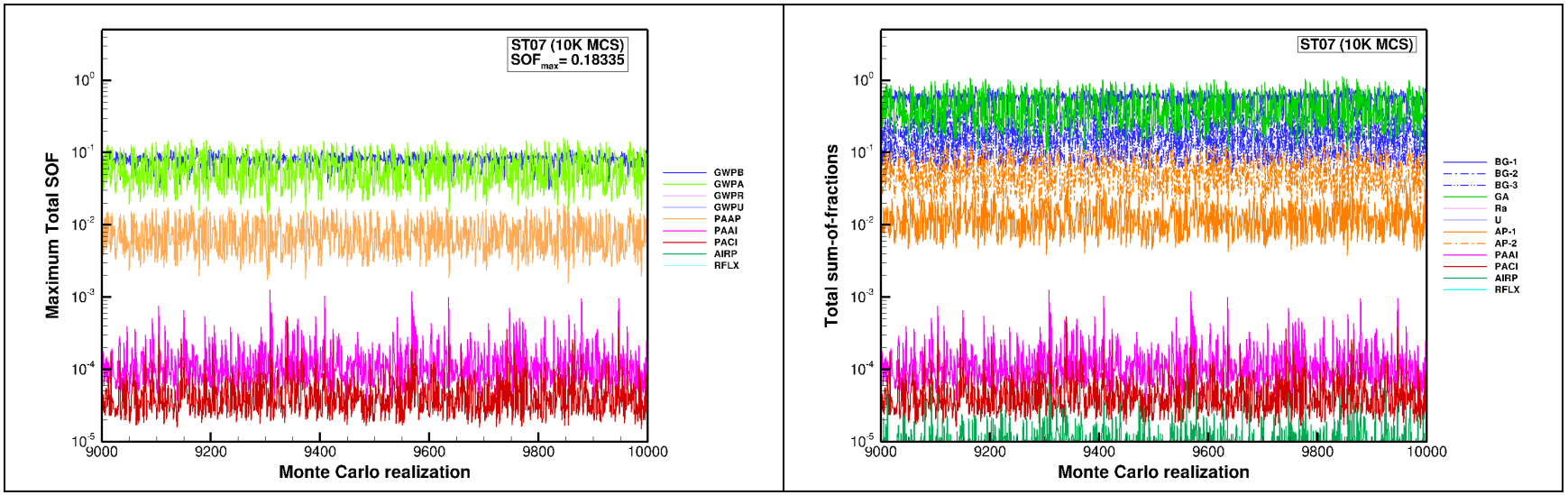


Figure I-103. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ST07

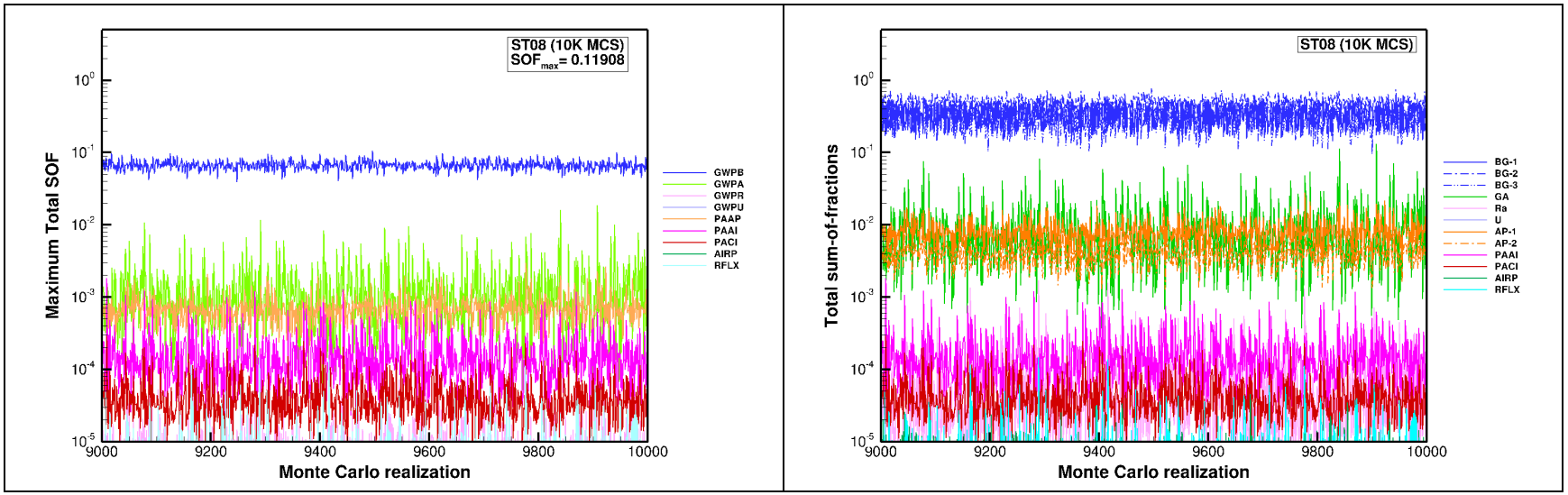


Figure I-104. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ST08

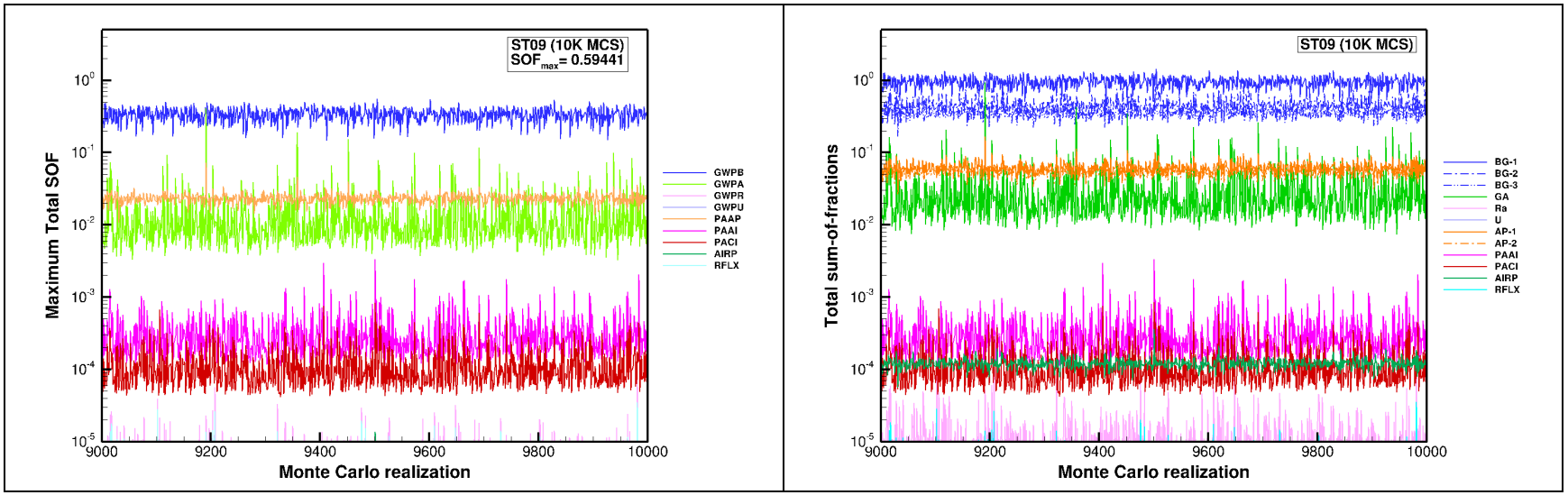


Figure I-105. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ST09

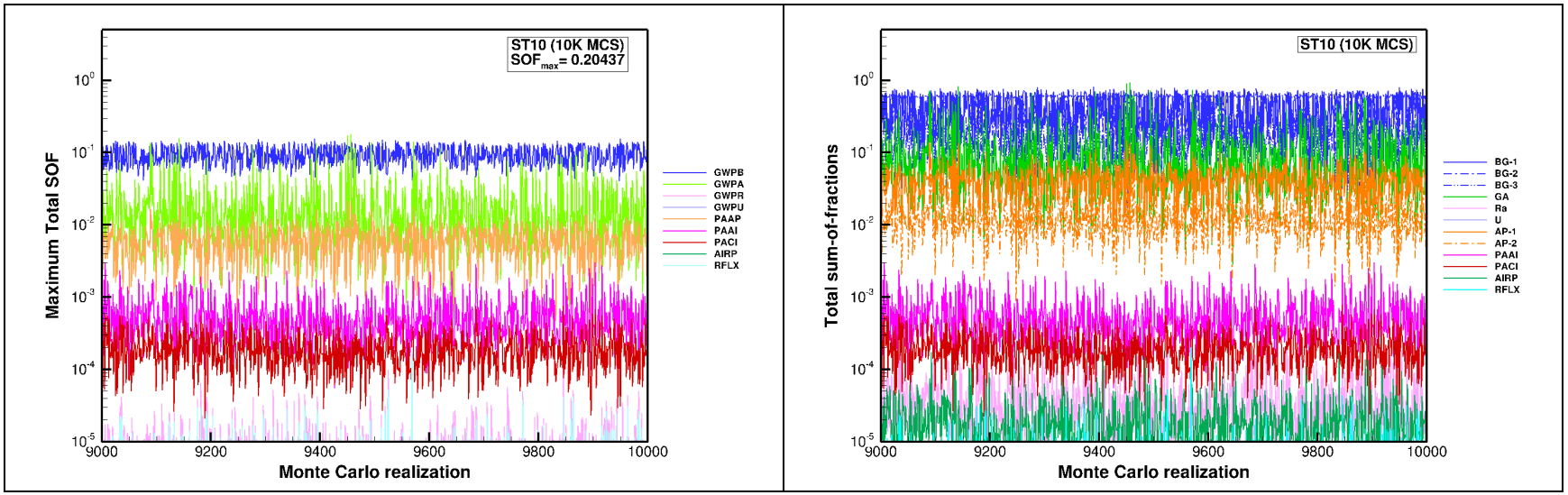


Figure I-106. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ST10

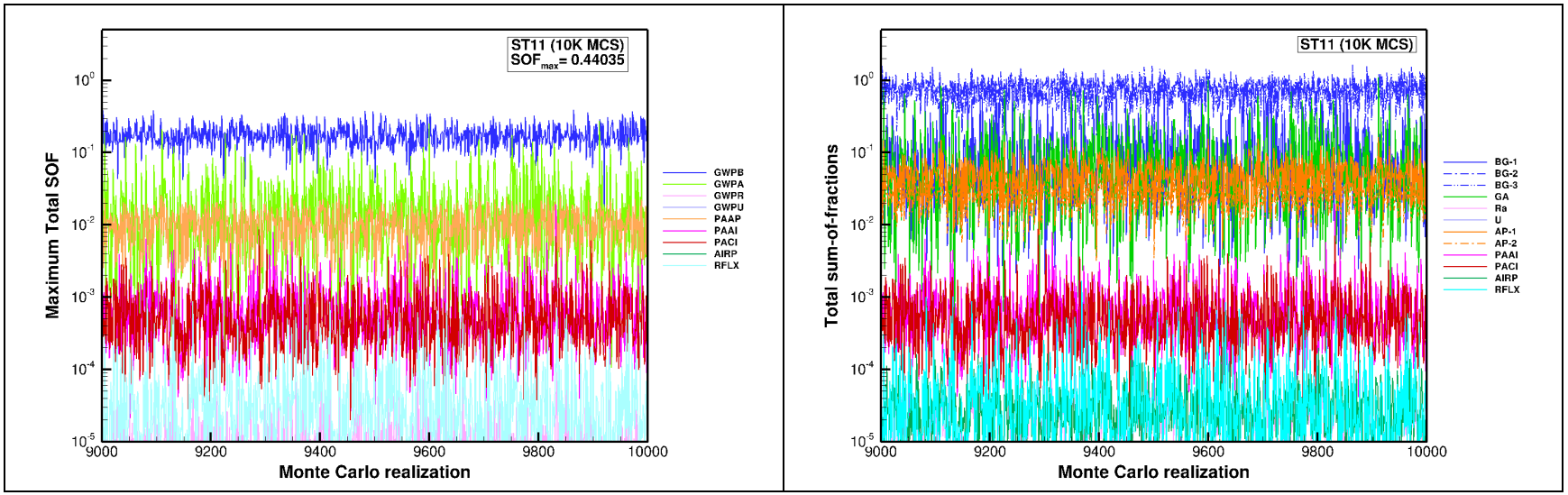


Figure I-107. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ST11

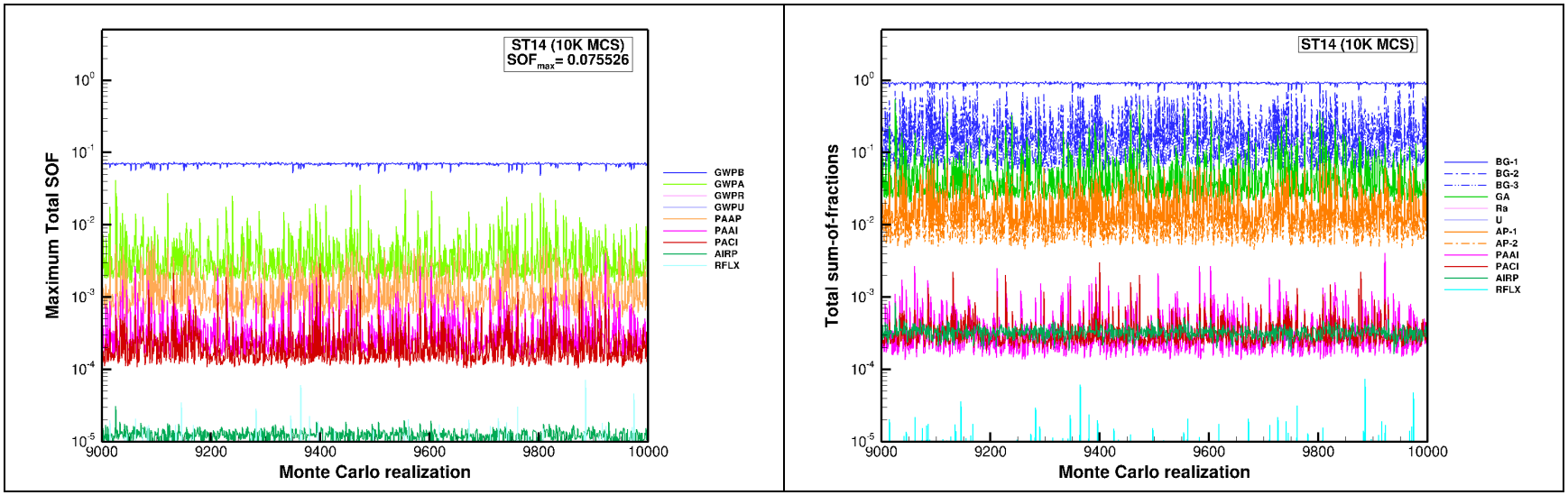


Figure I-108. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ST14

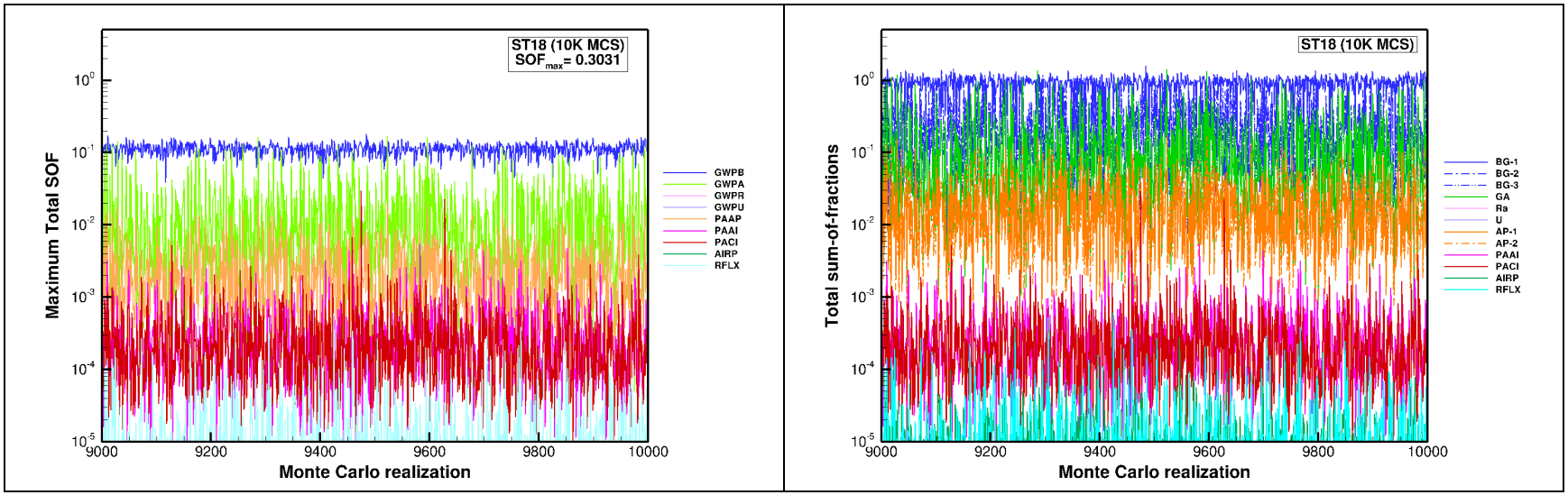


Figure I-109. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ST18

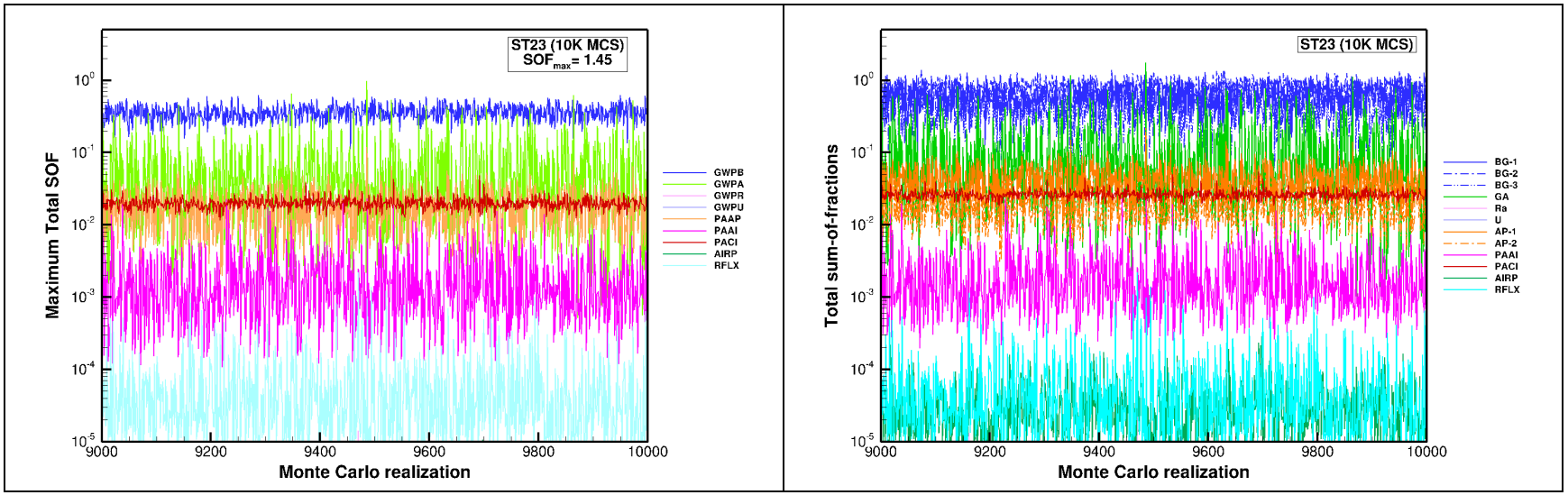


Figure I-110. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ST23

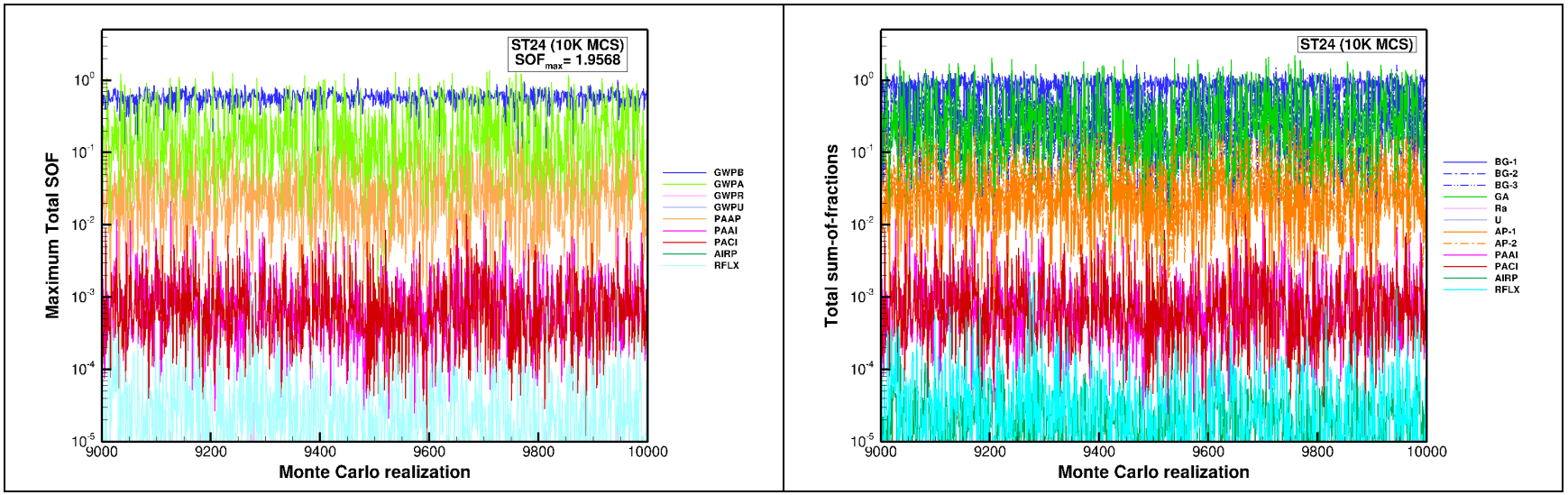


Figure I-111. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ST24

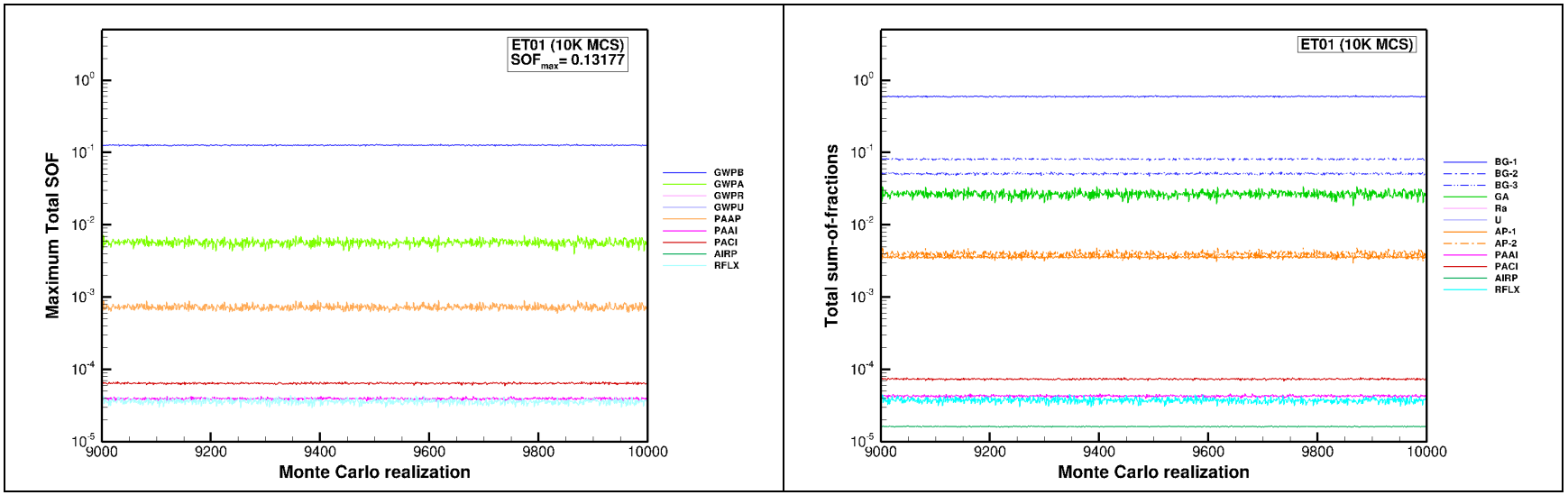


Figure I-112. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ET01

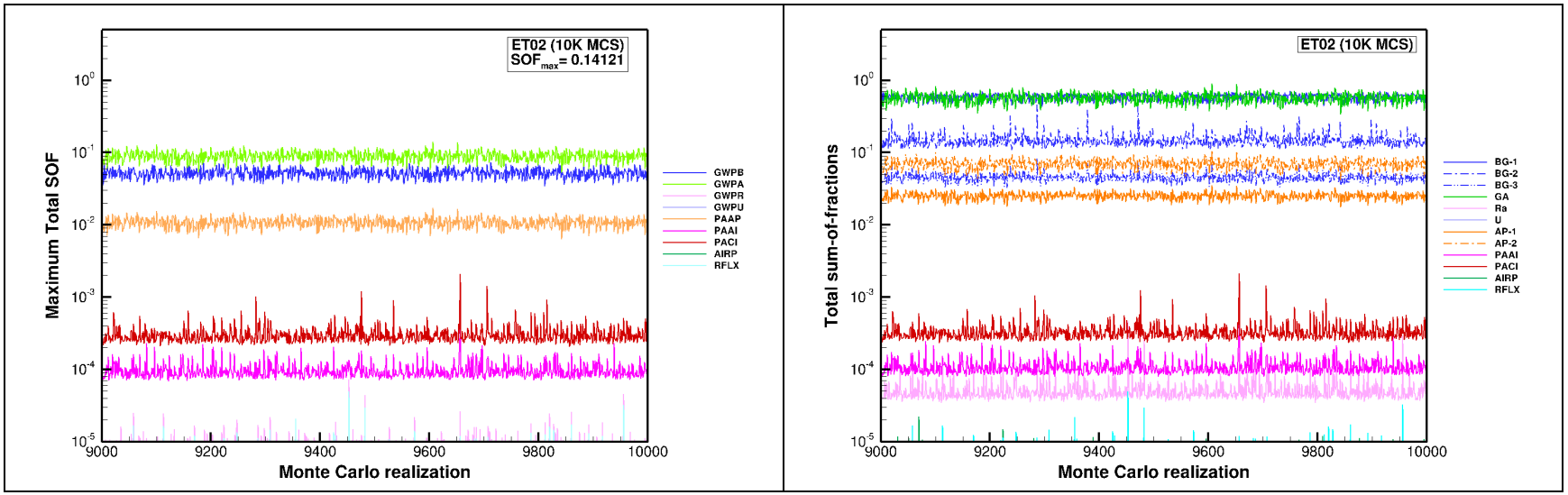


Figure I-113. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ET02

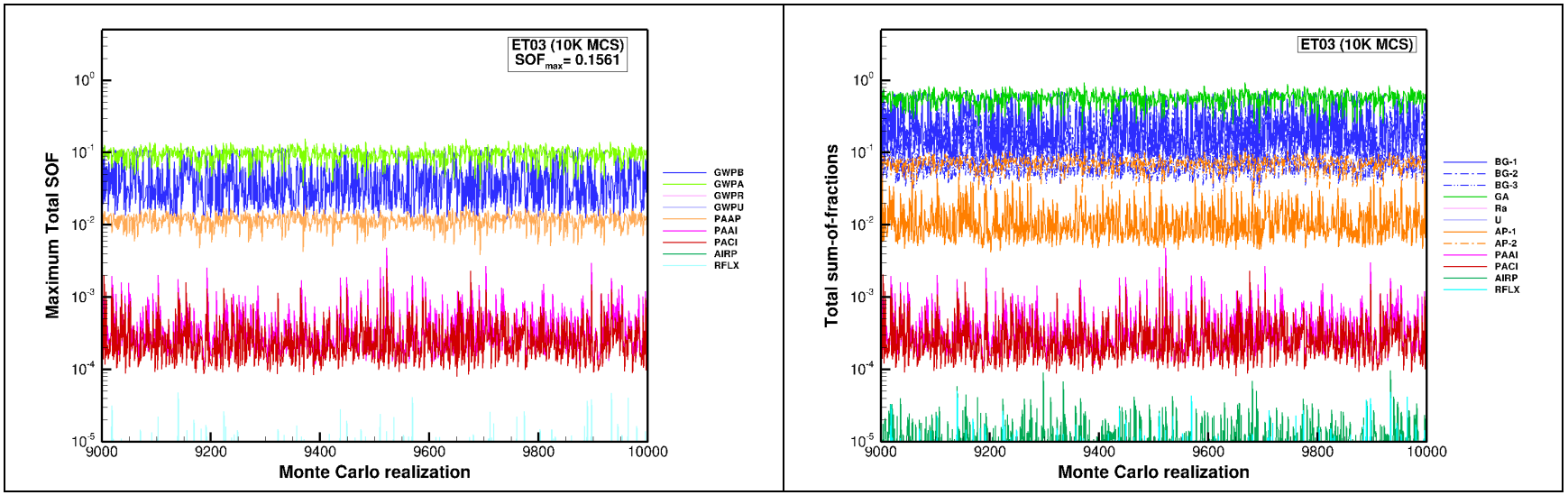


Figure I-114. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ET03

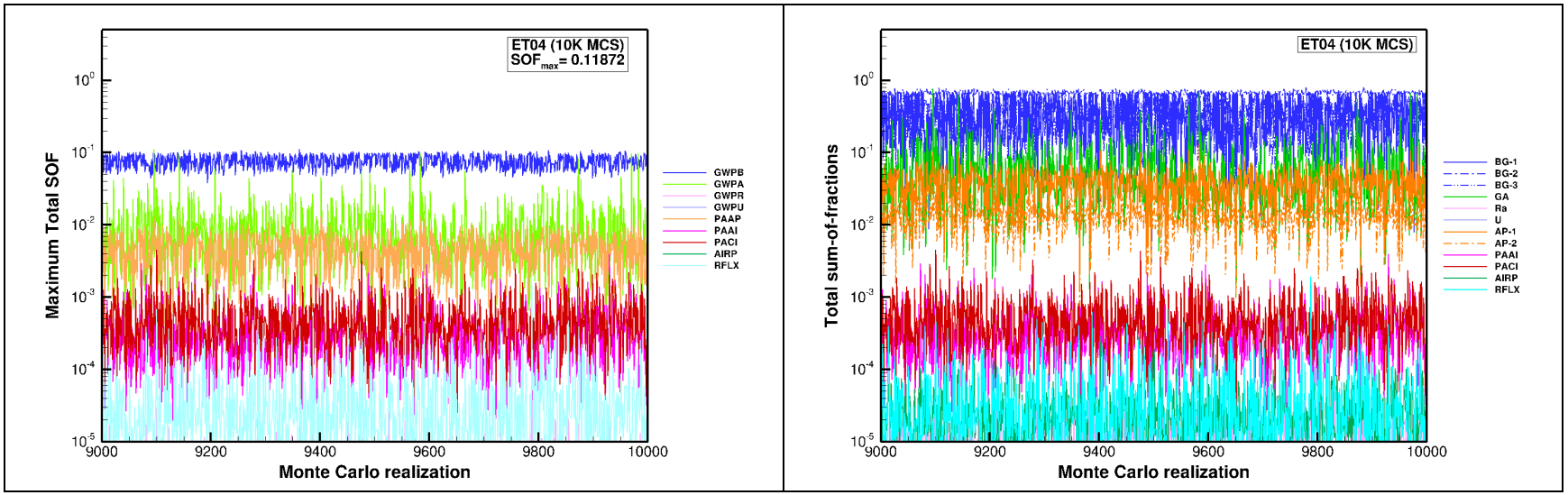


Figure I-115. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ET04

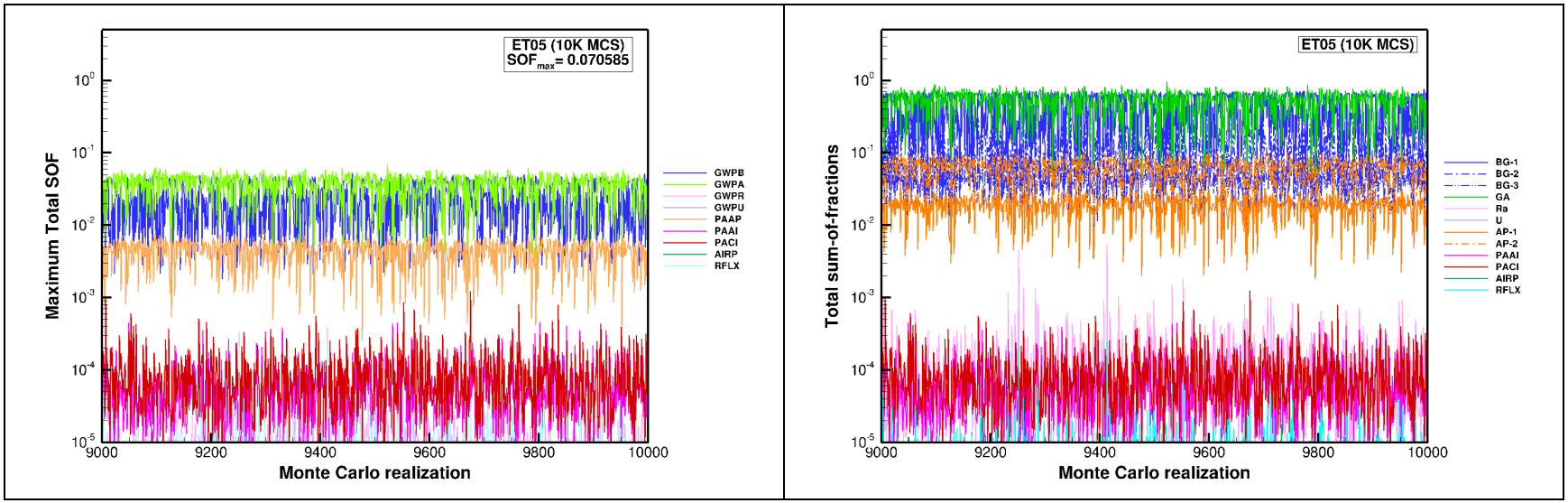


Figure I-116. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ET05

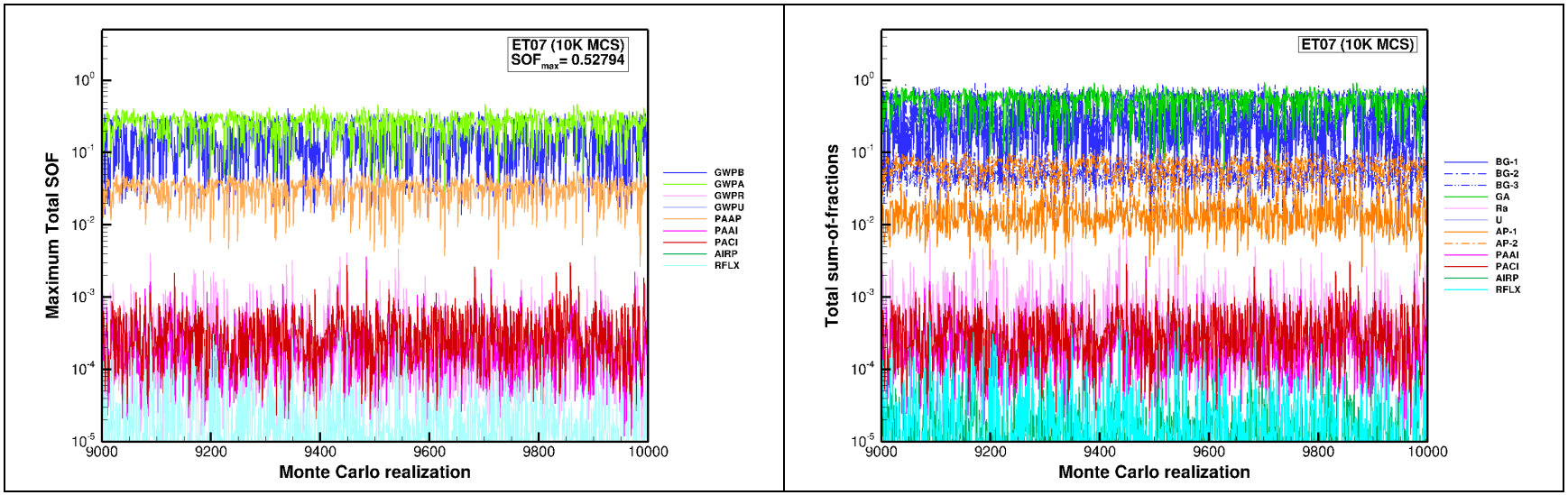


Figure I-117. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ET07

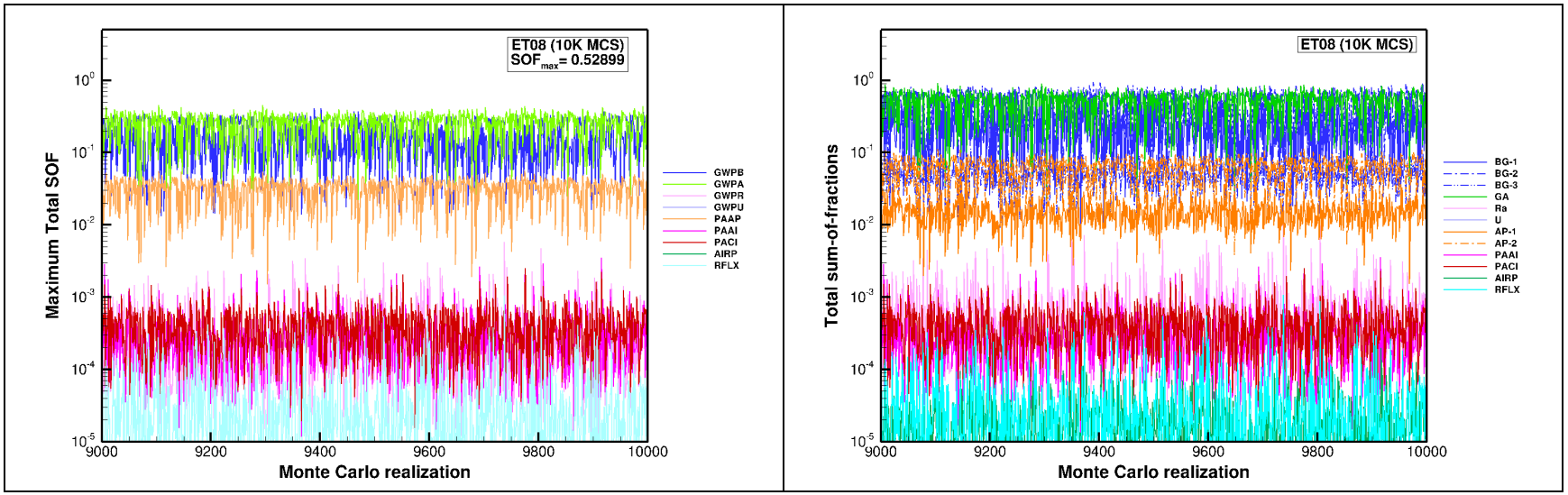


Figure I-118. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ET08

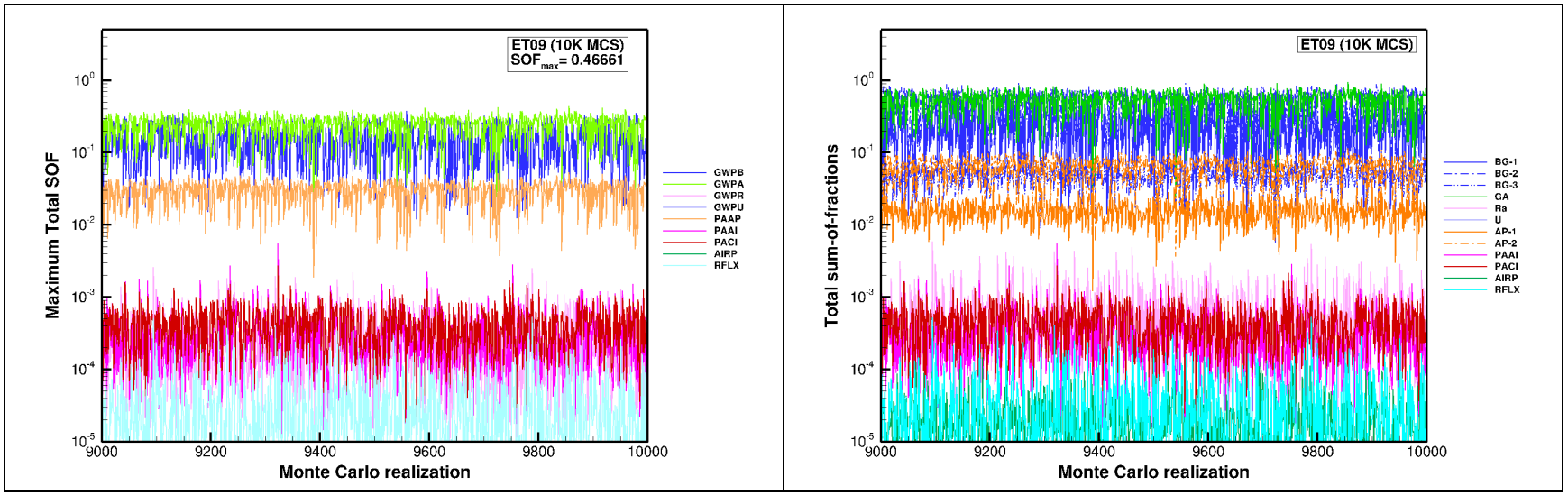


Figure I-119. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ET09

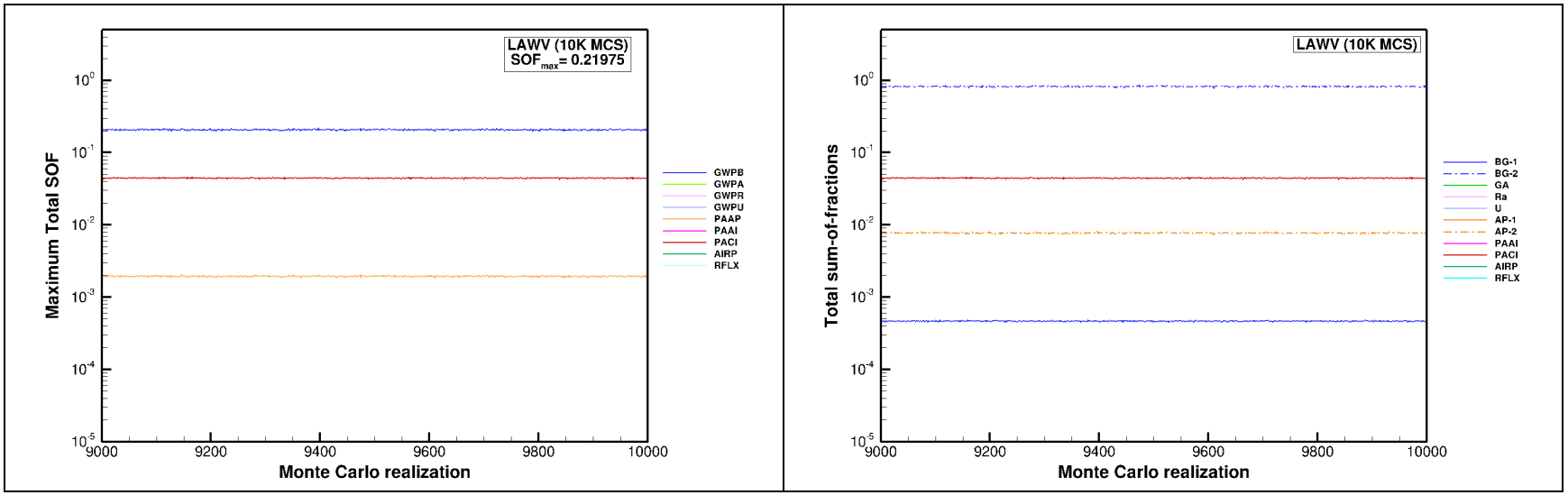


Figure I-120. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for LAWV

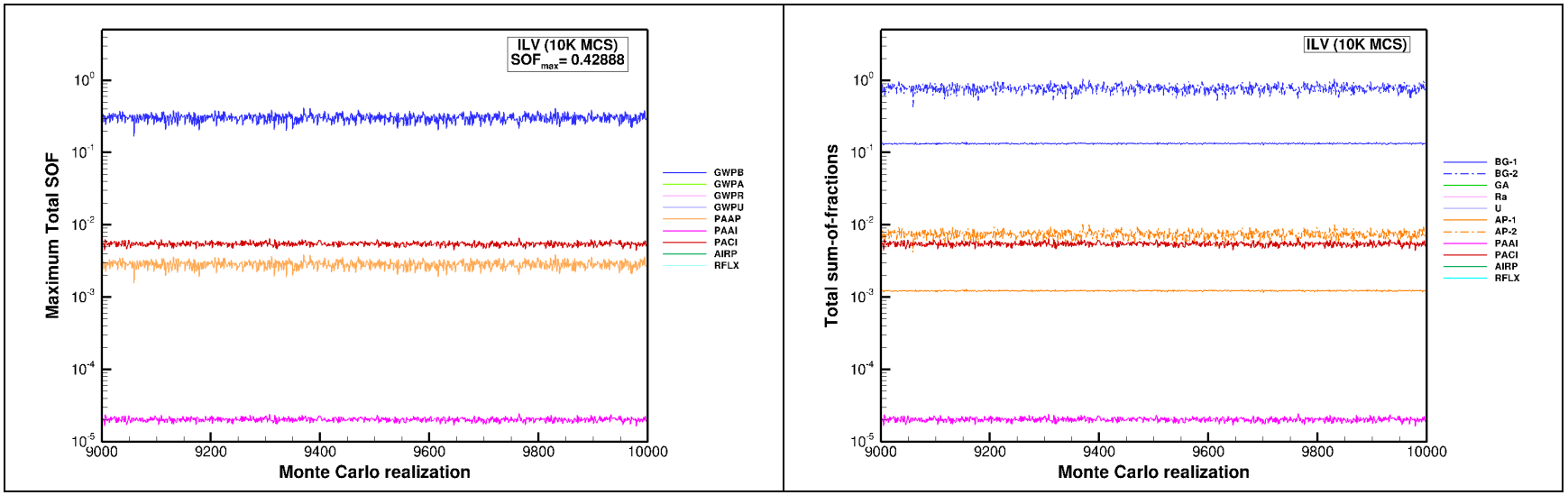


Figure I-121. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for ILV

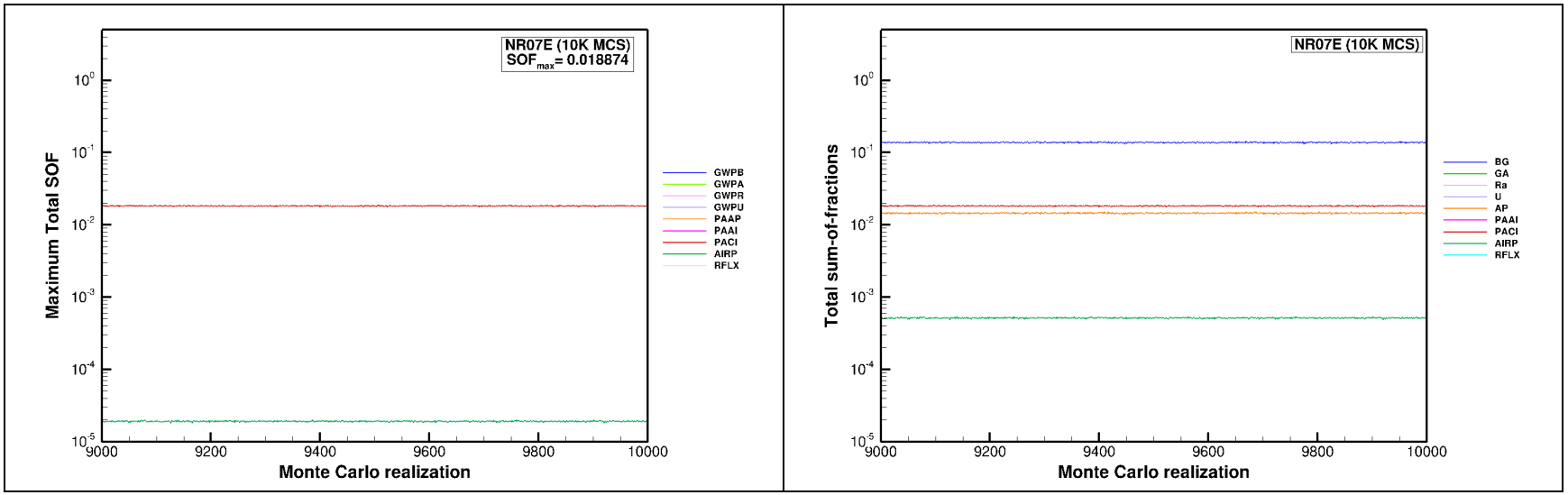


Figure I-122. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for NR07E

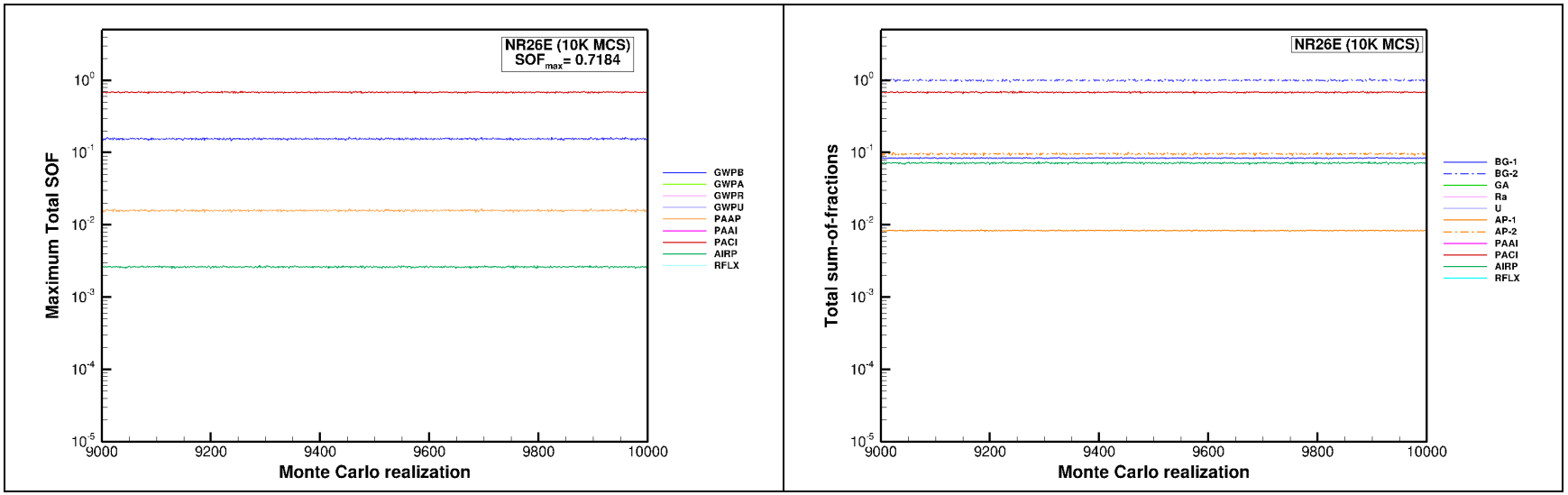


Figure I-123. Stochastic Maximum Total Sum-of-Fractions and Total Sum-of-Fractions (CWTS Time Window) for NR26E

I.4.2.4. Stochastic Maximum Sum-of-Fractions Histograms for ELLWF and PA2022 Disposal Units

Figure I-124 through Figure I-138 display the stochastic maximum SOF histograms for the ELLWF and PA2022 DUs for each exposure pathway as well as the maximum SOF histograms for all 10,000 MC realizations. Histograms are generated for only those exposure pathways where the mean of the maximum SOFs exceeds 0.1. This exclusion eliminates histograms for the radium, uranium, all-pathways, IHI, air, and radon exposure pathways.

Figure I-124 presents the conditional probability curve for the ELLWF: a frequency diagram (histogram) for maximum total SOF. The mean maximum total SOF for the ELLWF equals 0.69 with an exceedance probability of 2.9%. The peak of the histogram is driven by the IHI-Chronic dose in NR26E.

The beta-gamma maximum SOF histogram for the ELLWF (Figure I-124) represents a composite of beta-gamma contributions with SOFs > 0.47 from ST01, ST09, ST23, and ST24 in Figure I-125, Figure I-127, Figure I-130, and Figure I-131, respectively.

The gross-alpha maximum SOF histogram for the ELLWF (Figure I-124) is a composite of gross-alpha contributions with SOFs > 0.14 from ST06, ST24, ET07, ET08, and ET09 in Figure I-126, Figure I-131, Figure I-133, Figure I-134, and Figure I-135, respectively.

The IHI-Chronic maximum SOF histogram for the ELLWF (Figure I-124) is identical to the NR26E histogram in Figure I-138.

Closed DUs, ST01 and ET01, exhibit narrow, sharp peak distributions (Figure I-125 and Figure I-132, respectively) because the deterministic CWTS inventories with biases are not sampled from log-normal inventory distributions. The stochastic CWTS inventory uncertainties applied are relatively small.

The open DUs, LAWV, ILV, and NR26E, also exhibit sharp peak distributions (Figure I-136, Figure I-137, and Figure I-138, respectively) but, in this case, because the projected CWTS inventories with biases are computed from a deterministic composition vector. The applied stochastic CWTS inventory uncertainties are also relatively small.

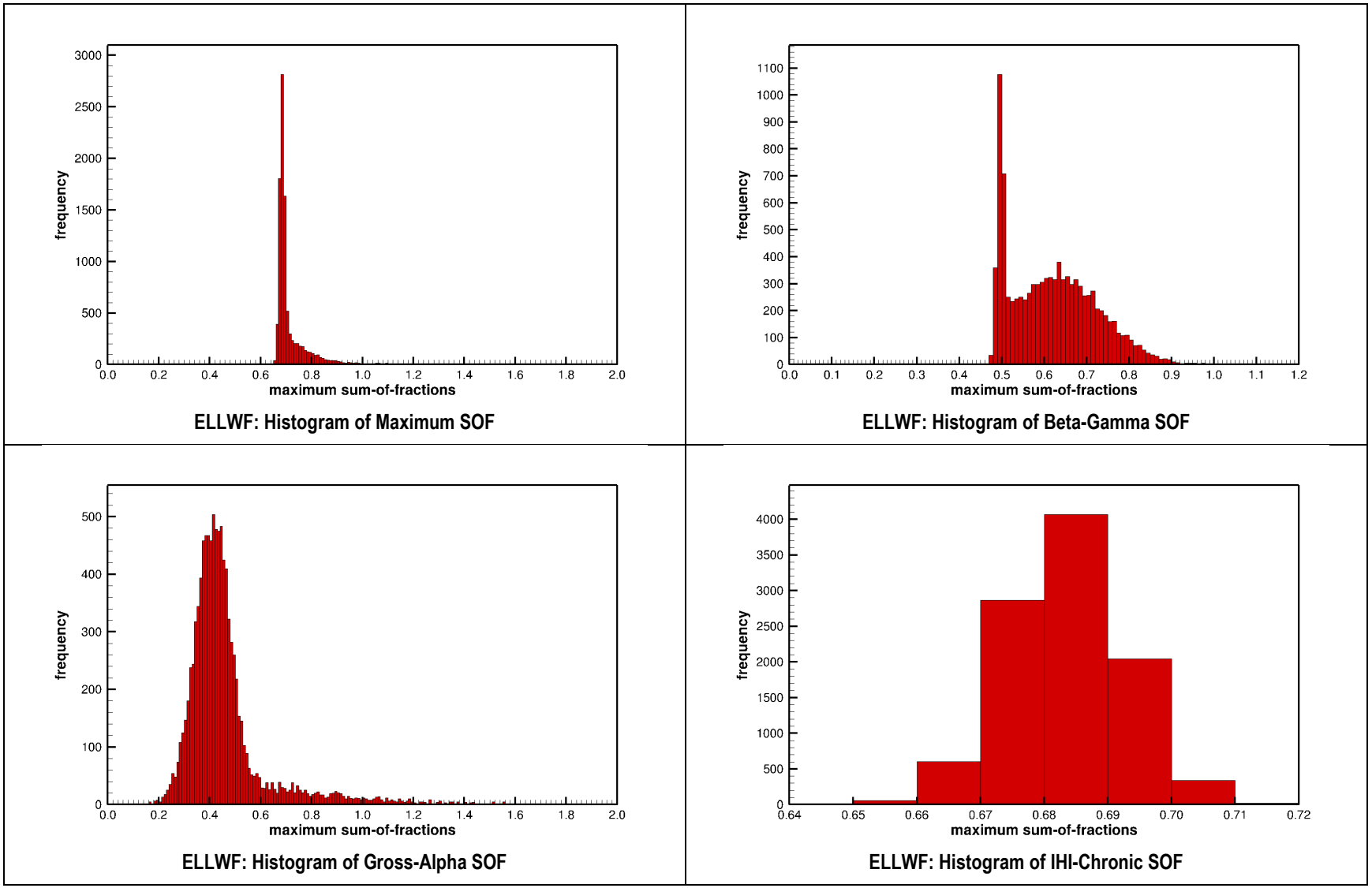


Figure I-124. Stochastic Maximum Sum-of-Fractions Histograms for ELLWF

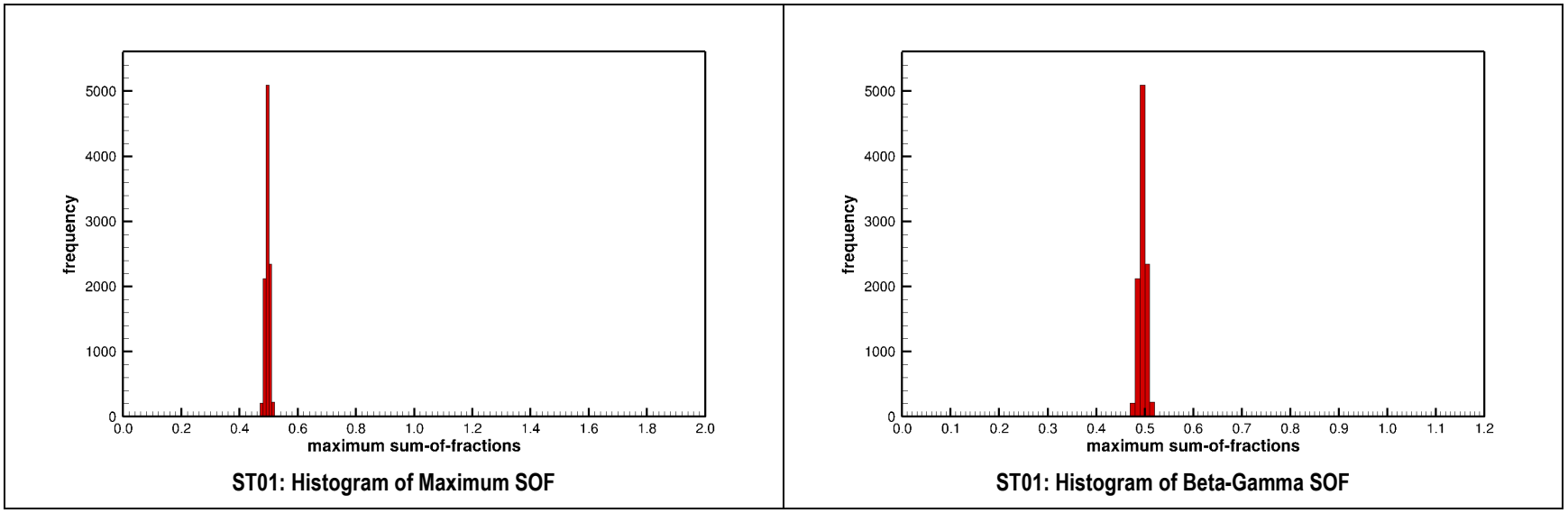


Figure I-125. Stochastic Maximum Sum-of-Fractions Histograms for ST01

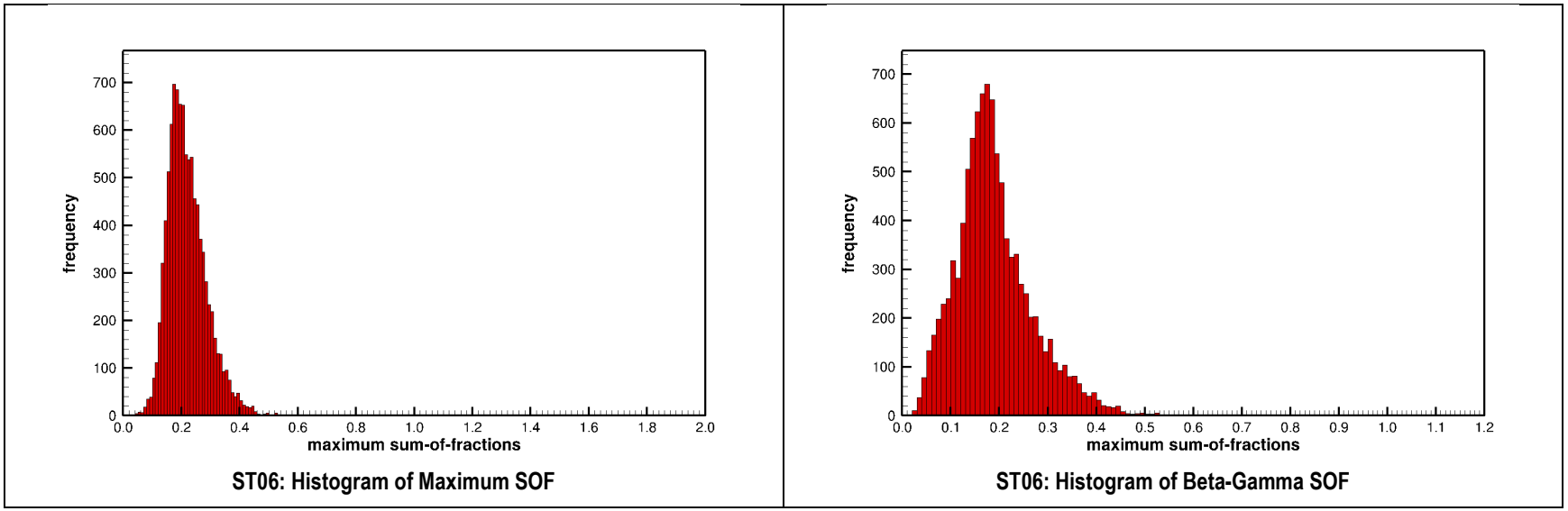
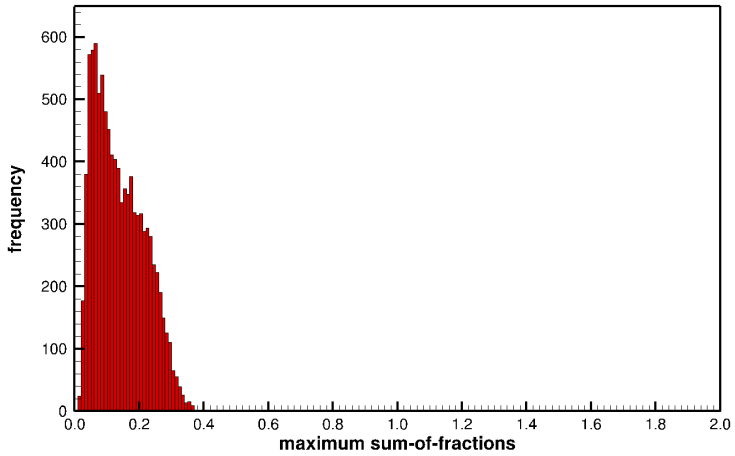


Figure I-126. Stochastic Maximum Sum-of-Fractions Histograms for ST06



ST06: Histogram of Gross-Alpha SOF

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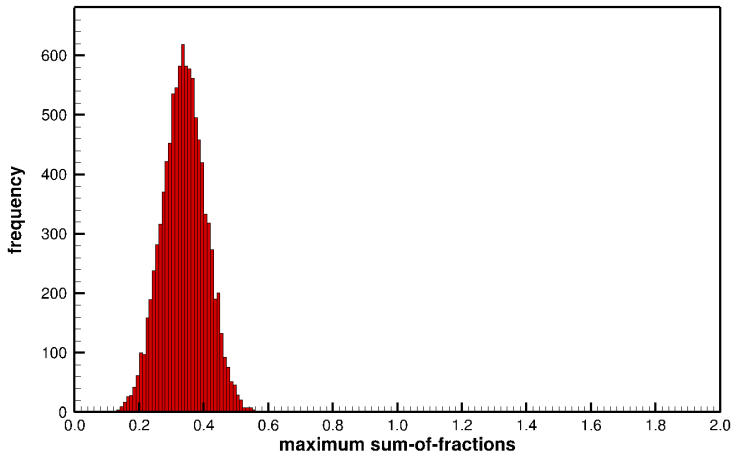
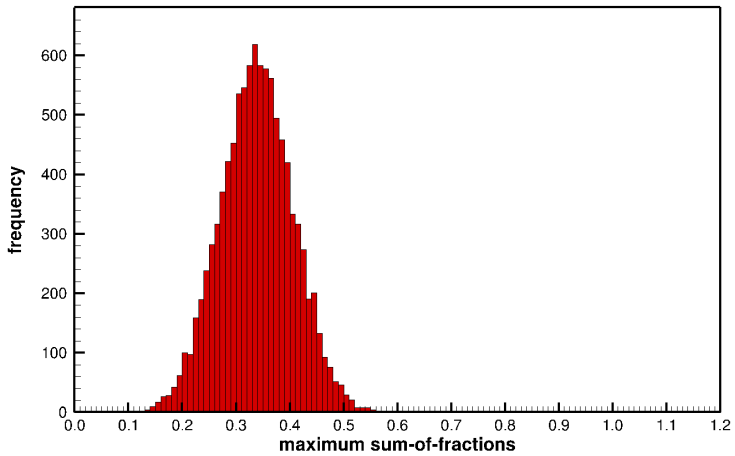
Figure I-126 (cont'd). Stochastic Maximum Sum-of-Fractions Histograms for ST06



ST09: Histogram of Maximum SOF



ST09: Histogram of Beta-Gamma SOF

Figure I-127. Stochastic Maximum Sum-of-Fractions Histograms for ST09

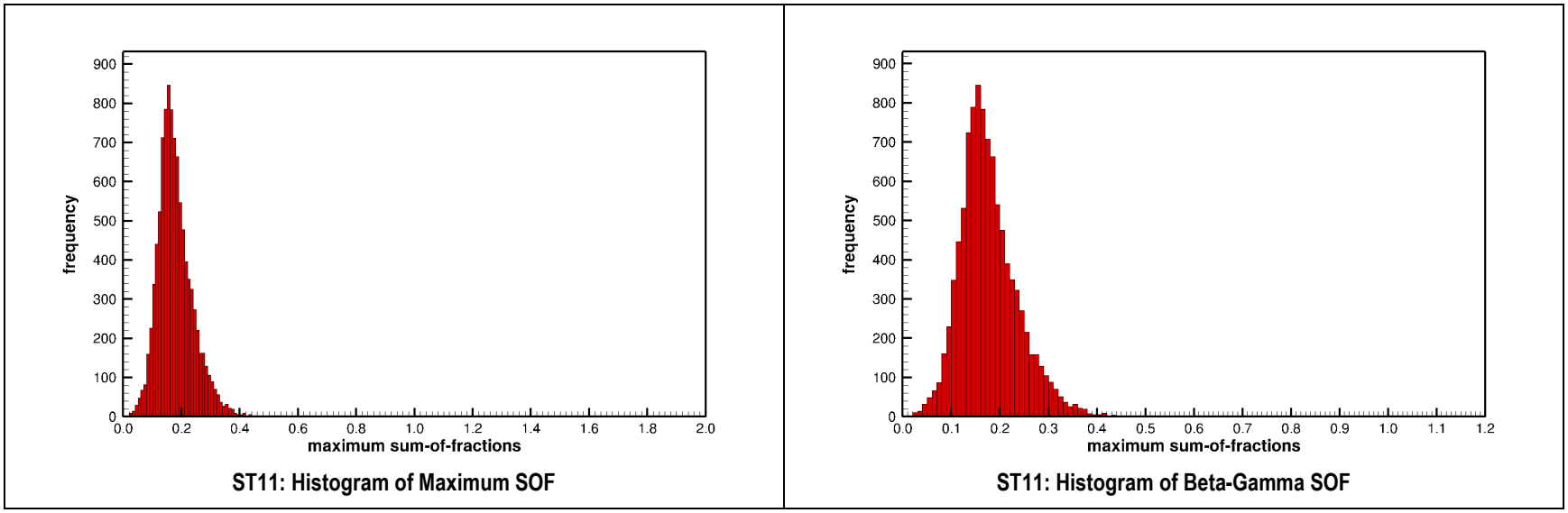


Figure I-128. Stochastic Maximum Sum-of-Fractions Histograms for ST11

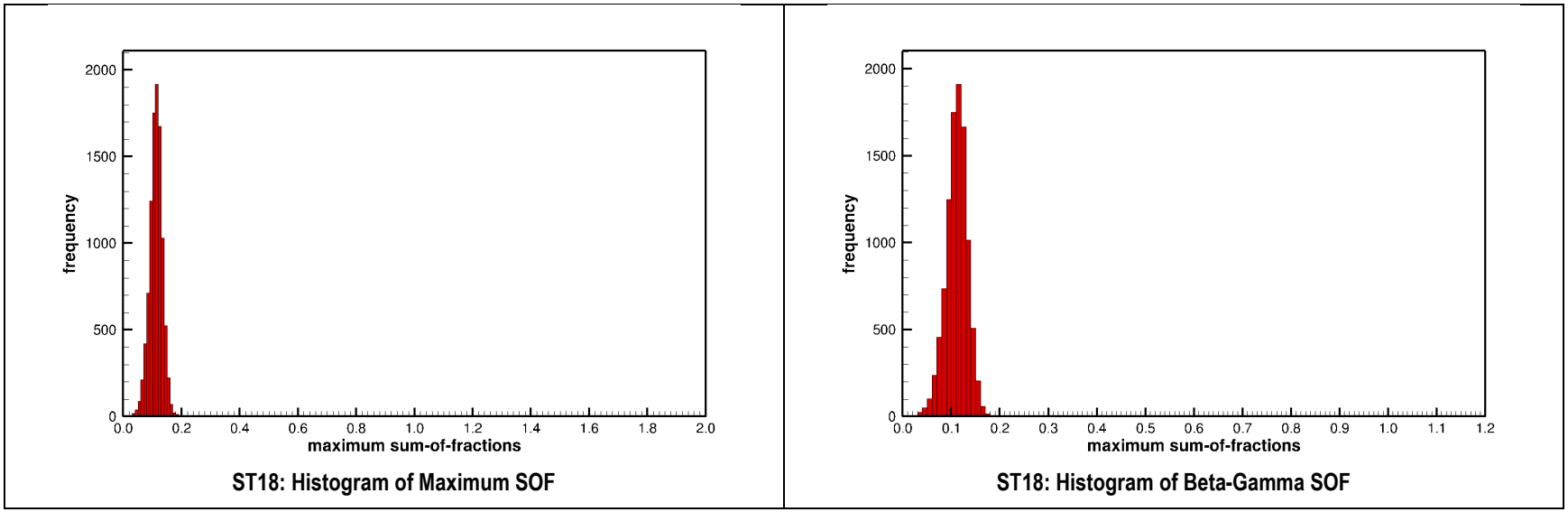


Figure I-129. Stochastic Maximum Sum-of-Fractions Histograms for ST18

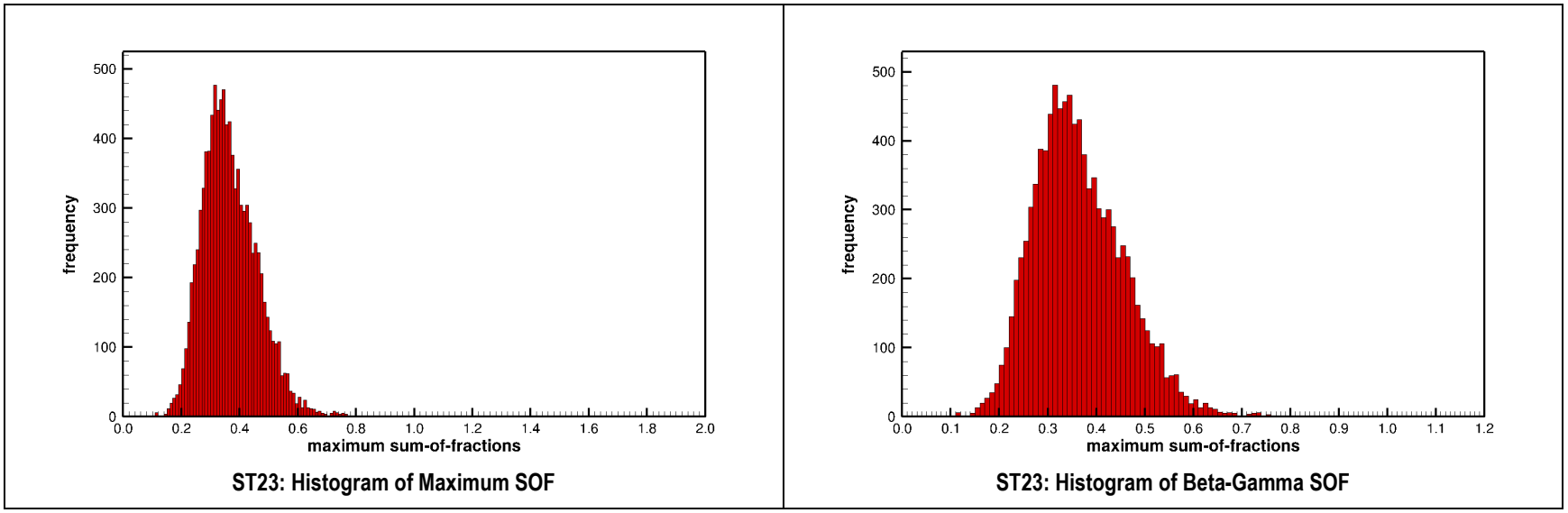


Figure I-130. Stochastic Maximum Sum-of-Fractions Histograms for ST23

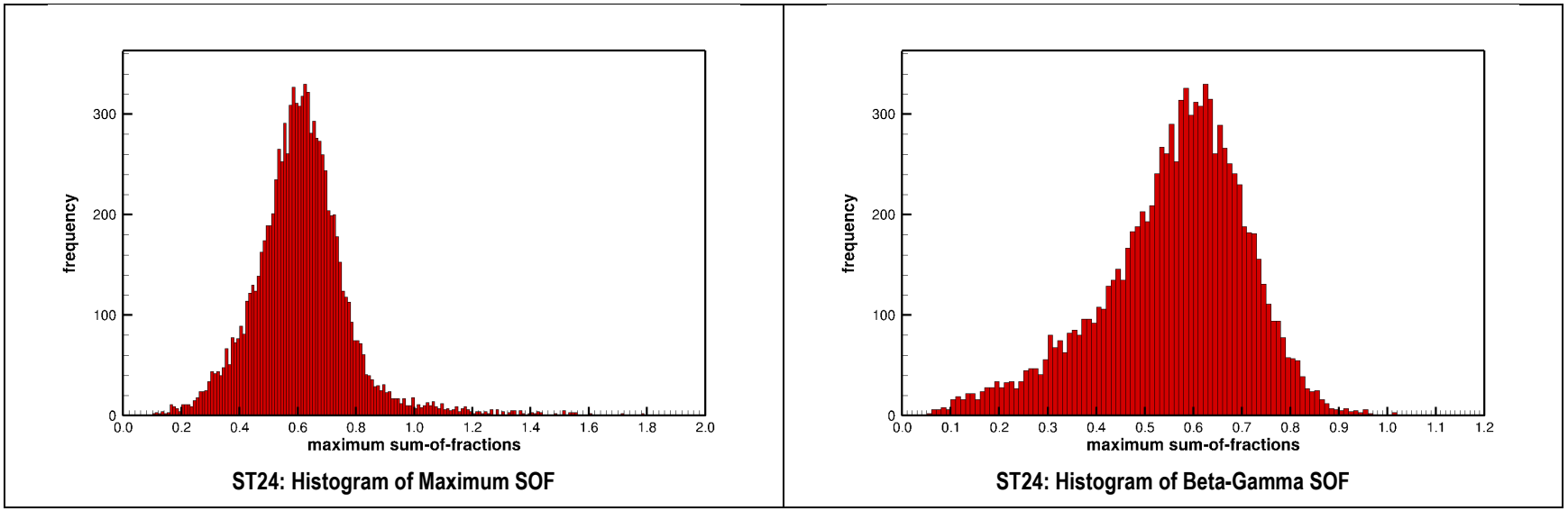
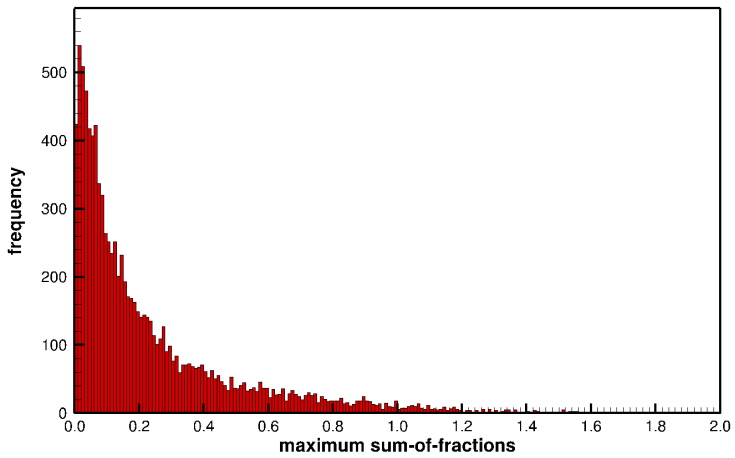


Figure I-131. Stochastic Maximum Sum-of-Fractions Histograms for ST24



ST24: Histogram of Gross-Alpha SOF

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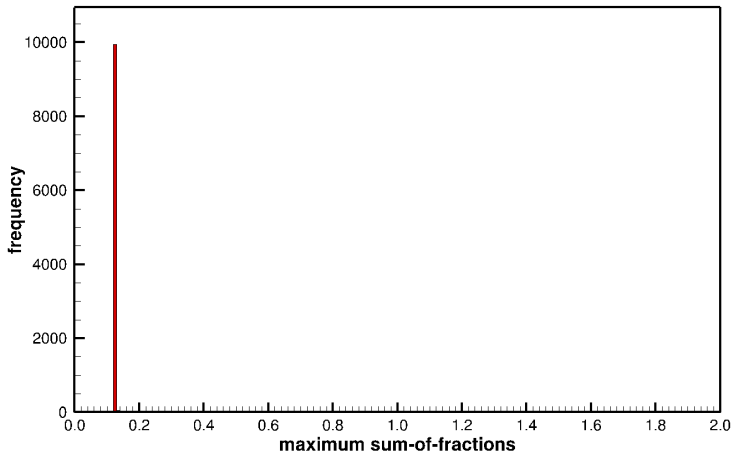
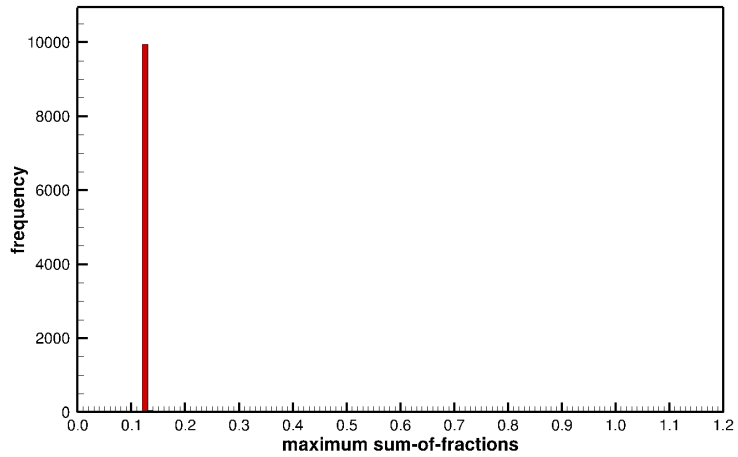
Figure I-131 (cont'd). Stochastic Maximum Sum-of-Fractions Histograms for ST24

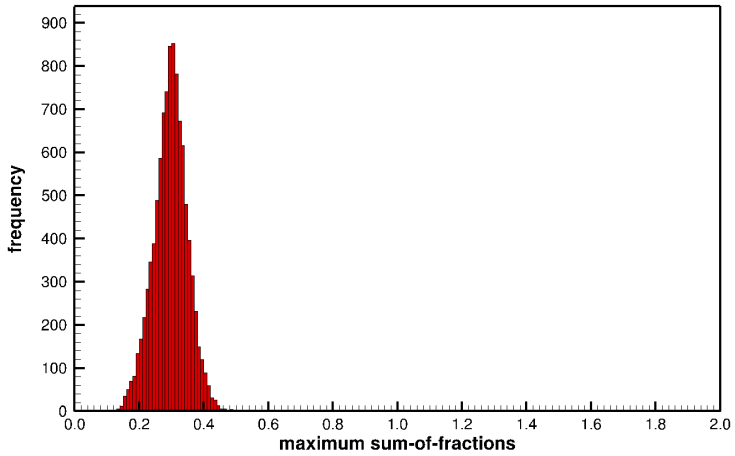


ET01: Histogram of Maximum SOF

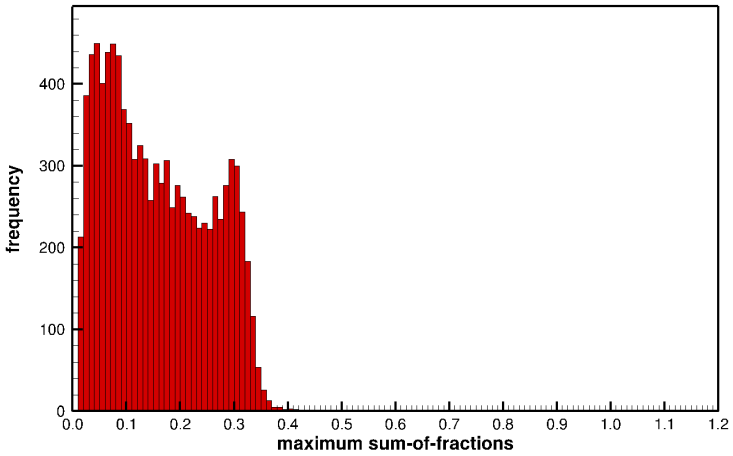


ET01: Histogram of Beta-Gamma SOF

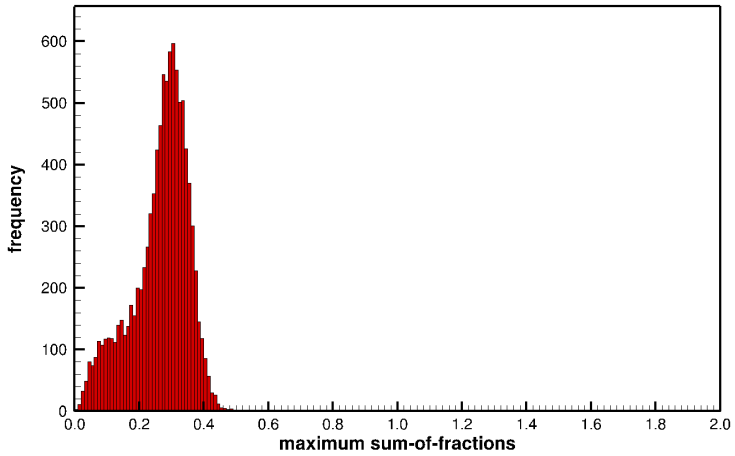
Figure I-132. Stochastic Maximum Sum-of-Fractions Histograms for ET01



ET07: Histogram of Maximum SOF



ET07: Histogram of Beta-Gamma SOF



ET07: Histogram of Gross-Alpha SOF

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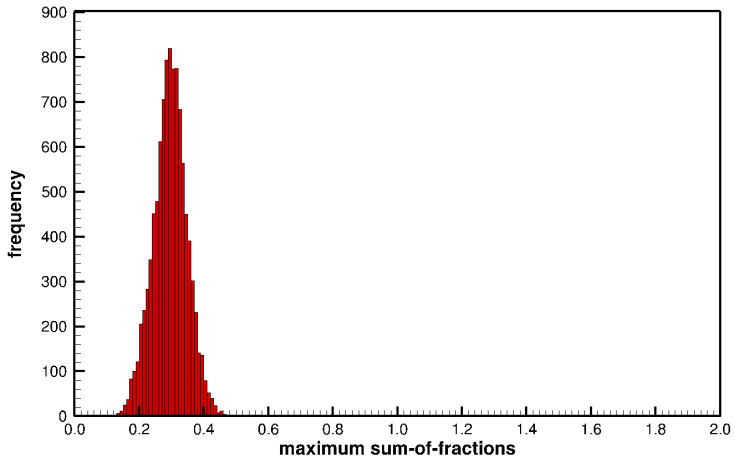
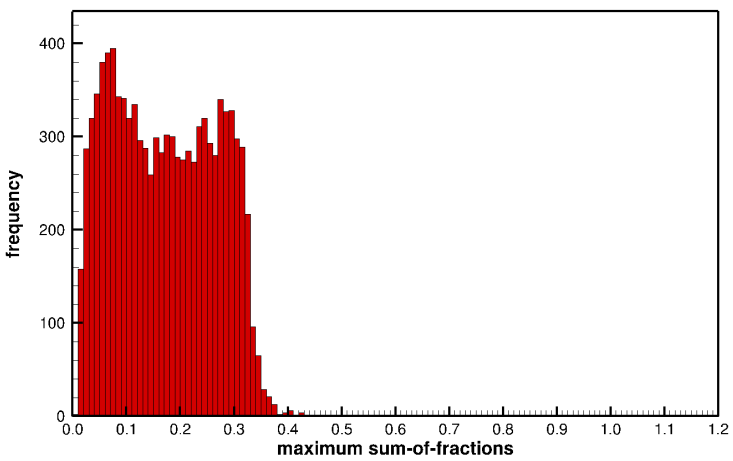
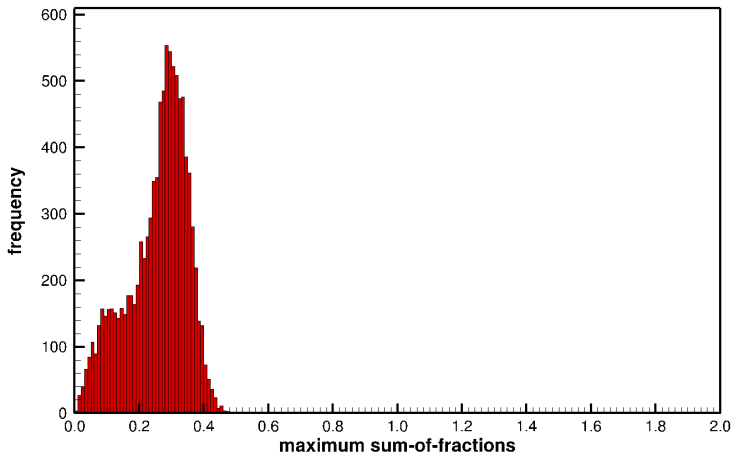
Figure I-133. Stochastic Maximum Sum-of-Fractions Histograms for ET07



ET08: Histogram of Maximum SOF



ET08: Histogram of Beta-Gamma SOF



ET08: Histogram of Gross-Alpha SOF

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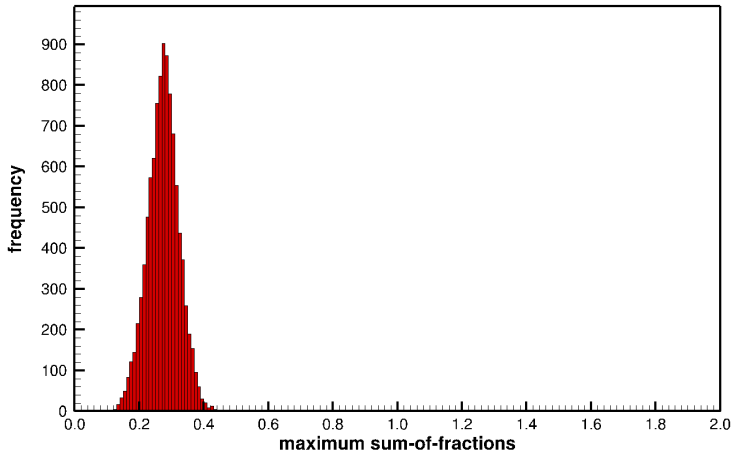
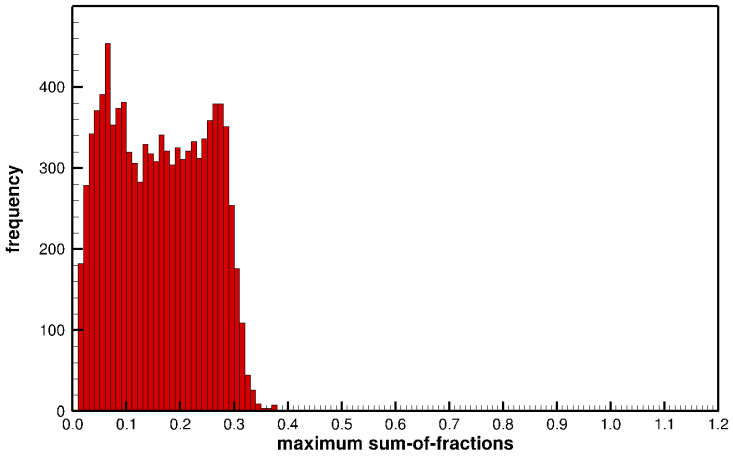
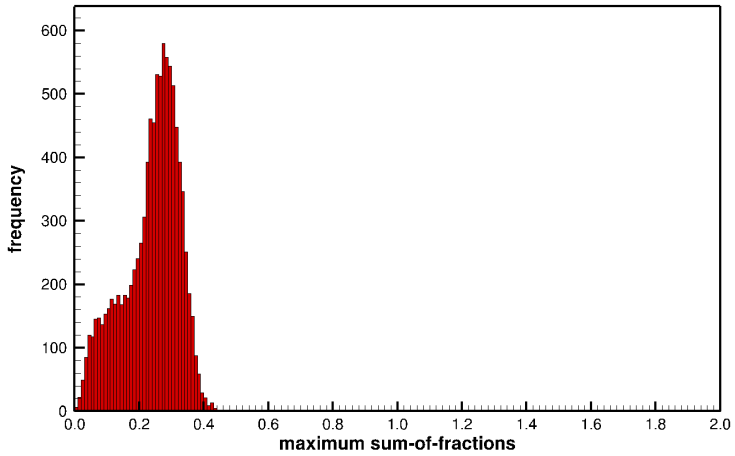
Figure I-134. Stochastic Maximum Sum-of-Fractions Histograms for ET08



ET09: Histogram of Maximum SOF



ET09: Histogram of Beta-Gamma SOF



ET09: Histogram of Gross-Alpha SOF

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Figure I-135. Stochastic Maximum Sum-of-Fractions Histograms for ET09

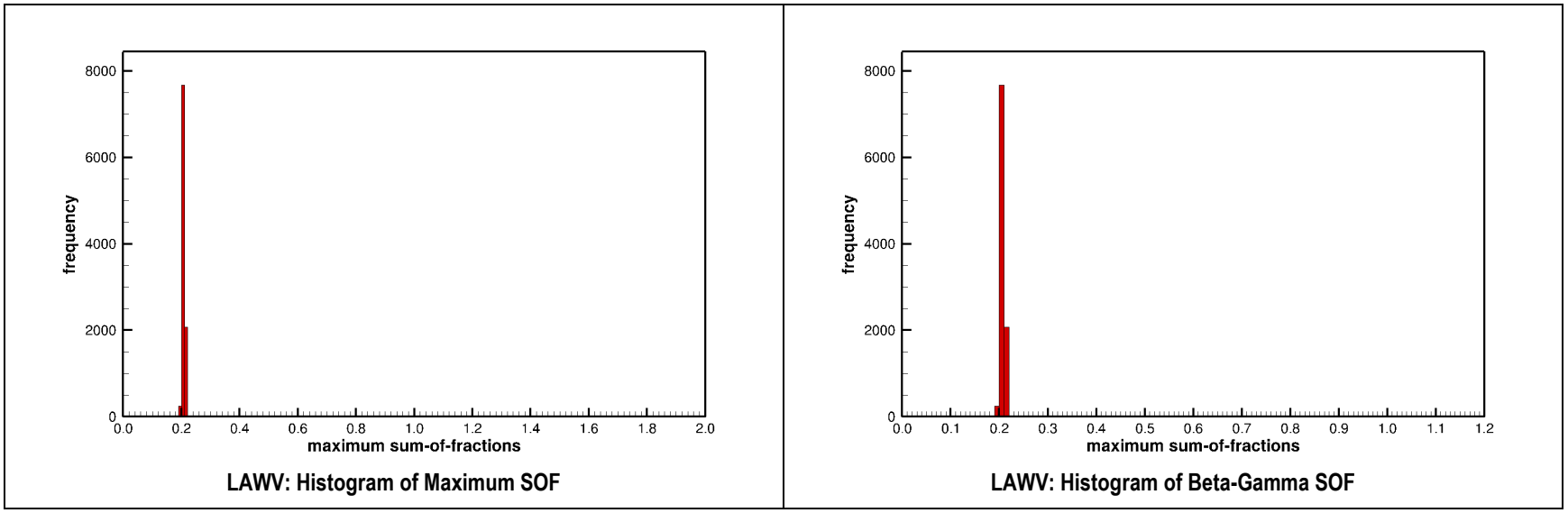


Figure I-136. Stochastic Maximum Sum-of-Fractions Histograms for LAWV

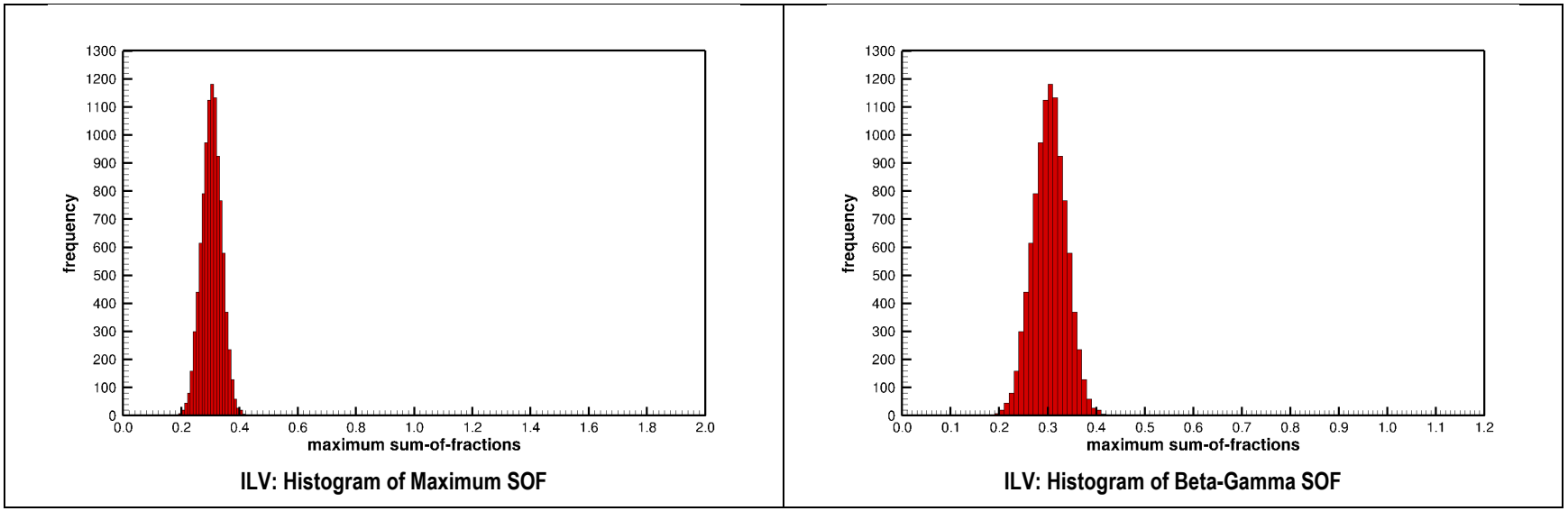
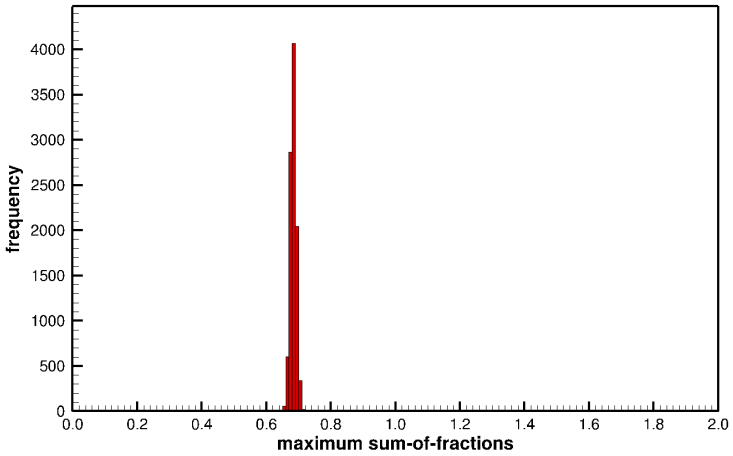
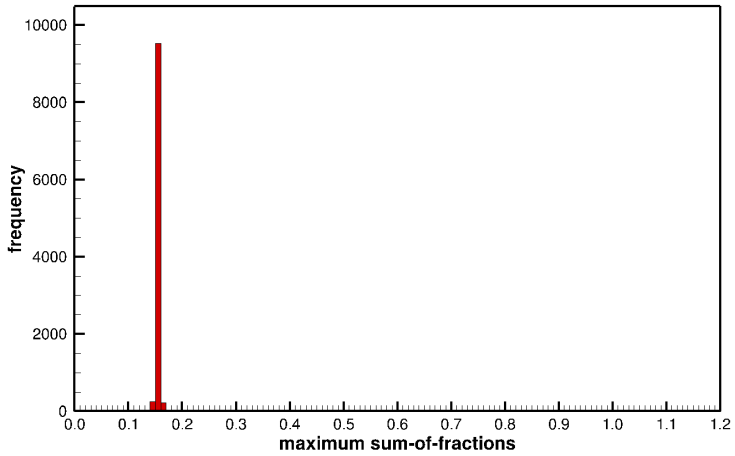


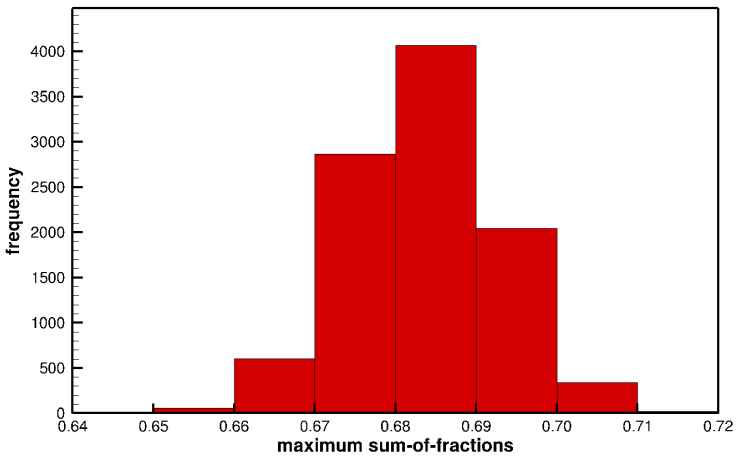
Figure I-137. Stochastic Maximum Sum-of-Fractions Histograms for ILV



NR26E: Histogram of Maximum SOF



NR26E: Histogram of Beta-Gamma SOF



NR26E: Histogram of IHI-Chronic SOF

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Figure I-138. Stochastic Maximum Sum-of-Fractions Histograms for NR26E

I.4.2.5. Stochastic Maximum Sum-of-Fractions Statistics for ELLWF and PA2022 Disposal Units

Table I-75 through Table I-84 summarize the stochastic maximum SOF statistics for the ELLWF and PA2022 DUs for each exposure pathway as well as the maximum SOF for all 10,000 MC realizations. The statistics include the arithmetic mean, standard deviation, and coefficient of variation (standard deviation divided by mean) of the maximum SOF values. The coefficient of variation (*cvar*) is a statistical measure of the relative dispersion of data within each histogram. This spread has two potential sources: (1) uncertainty in a DU's closure composition and (2) uncertainty in waste generator inventories. The first source applies to open and future DUs only, while the second source applies to all DUs. As Table I-75 and Figure I-124 indicate for the overall ELLWF, the spread is greater for gross-alpha concentration than beta-gamma dose.

Table I-75. Stochastic Maximum Sum-of-Fractions Statistics for ELLWF

Pathway	Maximum SOF for ELLWF (-)		
	mean	*sdev*	*cvar*
GWPB	6.20E-01	1.02E-01	1.65E-01
GWPA	4.66E-01	1.81E-01	3.89E-01
GWPR	6.65E-04	7.78E-04	1.17E+00
GWPU	1.23E-10	6.74E-11	5.46E-01
PAAP	5.72E-02	2.16E-02	3.78E-01
PAAI	3.01E-03	2.95E-03	9.82E-01
PACI	6.84E-01	9.12E-03	1.33E-02
AIRP	2.66E-03	4.16E-05	1.56E-02
RFLX	4.40E-04	2.81E-04	6.40E-01
Max	7.25E-01	1.06E-01	1.46E-01

Notes:

Statistics parameters are (1) arithmetic mean (mean); (2) standard deviation (sdev); (3) coefficient of variation (cvar).

GWPB (GWP beta-gamma); GWPA (GWP gross-alpha); GWPR (GWP radium); GWPU (GWP uranium); PAAP (PA all-pathways); PAAI (PA IHI-Acute); PACI (PA IHI-Chronic); AIRP (air pathway); RFLX (radon flux).

Table I-76. Stochastic Maximum Sum-of-Fractions Statistics for ET01, ET02 and ET03

Pathway	Maximum SOF (-)								
	ET01			ET02			ET03		
	mean	*sdev*	*cvar*	*mean*	*sdev*	*cvar*	*mean*	*sdev*	*cvar*
GWPB	1.26E-01	1.43E-03	1.13E-02	5.21E-02	7.59E-03	1.46E-01	4.46E-02	2.89E-02	6.49E-01
GWPA	5.72E-03	5.14E-04	8.98E-02	8.98E-02	1.32E-02	1.47E-01	9.58E-02	1.95E-02	2.03E-01
GWPR	1.78E-06	1.18E-07	6.61E-02	8.04E-06	3.63E-06	4.51E-01	2.81E-35	5.03E-35	1.79E+00
GWPU	1.78E-12	1.59E-13	8.93E-02	4.26E-11	6.27E-12	1.47E-01	1.41E-11	2.87E-12	2.04E-01
PAAP	7.27E-04	5.50E-05	7.57E-02	1.08E-02	1.59E-03	1.47E-01	1.18E-02	2.35E-03	1.98E-01
PAAI	3.95E-05	1.06E-06	2.68E-02	9.50E-05	2.54E-05	2.68E-01	3.95E-04	3.92E-04	9.91E-01
PACI	6.43E-05	1.16E-06	1.81E-02	2.99E-04	8.96E-05	3.00E-01	3.01E-04	2.52E-04	8.36E-01
AIRP	6.08E-07	4.78E-09	7.86E-03	2.08E-07	5.26E-08	2.53E-01	4.05E-07	3.30E-07	8.15E-01
RFLX	3.61E-05	2.50E-06	6.93E-02	5.33E-06	2.51E-06	4.70E-01	4.59E-06	5.69E-06	1.24E+00
Max	1.26E-01	1.43E-03	1.13E-02	8.98E-02	1.31E-02	1.46E-01	9.95E-02	1.64E-02	1.65E-01

Notes:

Statistics parameters are (1) arithmetic mean (mean); (2) standard deviation (sdev); (3) coefficient of variation (cvar).

GWPB (GWP beta-gamma); GWPA (GWP gross-alpha); GWPR (GWP radium); GWPU (GWP uranium); PAAP (PA all-pathways); PAAI (PA IHI-Acute); PACI (PA IHI-Chronic); AIRP (air pathway); RFLX (radon flux).

Table I-77. Stochastic Maximum Sum-of-Fractions Statistics for ET04, ET05 and ET07

Pathway	Maximum SOF (-)								
	ET04			ET05			ET07		
	mean	*sdev*	*cvar*	*mean*	*sdev*	*cvar*	*mean*	*sdev*	*cvar*
GWPB	7.70E-02	1.60E-02	2.08E-01	2.37E-02	1.42E-02	5.99E-01	1.58E-01	9.53E-02	6.04E-01
GWPA	9.17E-03	1.09E-02	1.19E+00	3.65E-02	1.34E-02	3.68E-01	2.64E-01	8.74E-02	3.31E-01
GWPR	2.16E-06	4.79E-06	2.22E+00	9.14E-06	1.90E-05	2.08E+00	3.29E-04	5.43E-04	1.65E+00
GWPU	1.21E-11	1.43E-11	1.19E+00	1.95E-11	7.18E-12	3.69E-01	5.81E-11	1.93E-11	3.31E-01
PAAP	4.70E-03	2.54E-03	5.42E-01	4.42E-03	1.62E-03	3.66E-01	3.27E-02	1.05E-02	3.21E-01
PAAI	3.69E-04	3.94E-04	1.07E+00	6.52E-05	7.59E-05	1.16E+00	2.49E-04	2.86E-04	1.15E+00
PACI	5.27E-04	4.69E-04	8.89E-01	9.09E-05	9.81E-05	1.08E+00	3.44E-04	2.78E-04	8.08E-01
AIRP	1.07E-06	1.00E-06	9.38E-01	1.09E-07	1.12E-07	1.03E+00	6.62E-07	6.45E-07	9.75E-01
RFLX	4.66E-05	1.10E-04	2.36E+00	5.05E-06	1.16E-05	2.30E+00	3.16E-05	6.82E-05	2.16E+00
Max	7.72E-02	1.60E-02	2.07E-01	4.25E-02	6.94E-03	1.63E-01	2.97E-01	5.20E-02	1.75E-01

Notes:

Statistics parameters are (1) arithmetic mean (mean); (2) standard deviation (sdev); (3) coefficient of variation (cvar).

GWPB (GWP beta-gamma); GWPA (GWP gross-alpha); GWPR (GWP radium); GWPU (GWP uranium); PAAP (PA all-pathways); PAAI (PA IHI-Acute); PACI (PA IHI-Chronic); AIRP (air pathway); RFLX (radon flux).

Table I-78. Stochastic Maximum Sum-of-Fractions Statistics for ET08, ET09 and ST01

Pathway	Maximum SOF (-)								
	ET08			ET09			ST01		
	mean	*sdev*	*cvar*	*mean*	*sdev*	*cvar*	*mean*	*sdev*	*cvar*
GWPB	1.72E-01	9.46E-02	5.51E-01	1.61E-01	8.70E-02	5.39E-01	4.95E-01	7.34E-03	1.48E-02
GWPA	2.56E-01	9.23E-02	3.60E-01	2.37E-01	8.62E-02	3.64E-01	7.70E-06	3.85E-07	5.01E-02
GWPR	3.27E-04	5.36E-04	1.64E+00	2.93E-04	4.60E-04	1.57E+00	0.00E+00	0.00E+00	--
GWPU	5.89E-11	2.13E-11	3.61E-01	5.53E-11	2.02E-11	3.65E-01	4.72E-16	2.36E-17	5.01E-02
PAAP	3.16E-02	1.11E-02	3.51E-01	2.92E-02	1.03E-02	3.54E-01	2.62E-04	4.56E-05	1.74E-01
PAAI	3.08E-04	3.31E-04	1.07E+00	3.28E-04	3.54E-04	1.08E+00	4.86E-06	7.65E-07	1.57E-01
PACI	4.14E-04	2.99E-04	7.22E-01	4.32E-04	3.04E-04	7.03E-01	5.07E-06	4.65E-07	9.17E-02
AIRP	8.17E-07	7.63E-07	9.34E-01	8.82E-07	8.44E-07	9.57E-01	2.82E-07	4.95E-09	1.75E-02
RFLX	4.05E-05	8.67E-05	2.14E+00	4.17E-05	8.49E-05	2.04E+00	5.69E-05	4.09E-07	7.19E-03
Max	2.95E-01	5.23E-02	1.77E-01	2.74E-01	4.83E-02	1.76E-01	4.95E-01	7.34E-03	1.48E-02

Notes:

Statistics parameters are (1) arithmetic mean (mean); (2) standard deviation (sdev); (3) coefficient of variation (cvar).

GWPB (GWP beta-gamma); GWPA (GWP gross-alpha); GWPR (GWP radium); GWPU (GWP uranium); PAAP (PA all-pathways); PAAI (PA IHI-Acute); PACI (PA IHI-Chronic); AIRP (air pathway); RFLX (radon flux).

Table I-79. Stochastic Maximum Sum-of-Fractions Statistics for ST02, ST03 and ST04

Pathway	Maximum SOF (-)								
	ST02			ST03			ST04		
	mean	*sdev*	*cvar*	*mean*	*sdev*	*cvar*	*mean*	*sdev*	*cvar*
GWPB	3.17E-02	7.04E-04	2.22E-02	2.45E-02	5.46E-04	2.23E-02	4.04E-02	3.58E-03	8.87E-02
GWPA	8.16E-04	4.32E-05	5.29E-02	1.68E-02	1.11E-03	6.60E-02	5.16E-03	8.47E-04	1.64E-01
GWPR	1.58E-10	2.76E-12	1.75E-02	6.69E-12	1.28E-13	1.91E-02	9.13E-10	1.42E-11	1.56E-02
GWPU	8.66E-13	4.56E-14	5.26E-02	1.73E-11	1.14E-12	6.59E-02	5.49E-12	9.00E-13	1.64E-01
PAAP	1.03E-03	7.03E-05	6.86E-02	2.39E-03	9.01E-05	3.77E-02	2.34E-03	1.04E-04	4.42E-02
PAAI	1.46E-05	6.29E-07	4.30E-02	1.77E-05	8.04E-07	4.53E-02	2.78E-05	3.01E-06	1.08E-01
PACI	1.41E-05	9.47E-07	6.70E-02	3.77E-05	1.40E-06	3.71E-02	3.00E-05	7.32E-07	2.44E-02
AIRP	5.82E-07	9.47E-09	1.63E-02	9.99E-08	4.10E-09	4.11E-02	2.64E-07	4.24E-09	1.61E-02
RFLX	1.95E-06	1.15E-08	5.92E-03	1.35E-06	3.23E-08	2.39E-02	3.24E-06	4.77E-08	1.47E-02
Max	3.17E-02	7.04E-04	2.22E-02	2.45E-02	5.46E-04	2.23E-02	4.04E-02	3.58E-03	8.87E-02

Notes:

Statistics parameters are (1) arithmetic mean (mean); (2) standard deviation (sdev); (3) coefficient of variation (cvar).

GWPB (GWP beta-gamma); GWPA (GWP gross-alpha); GWPR (GWP radium); GWPU (GWP uranium); PAAP (PA all-pathways); PAAI (PA IHI-Acute); PACI (PA IHI-Chronic); AIRP (air pathway); RFLX (radon flux).

Table I-80. Stochastic Maximum Sum-of-Fractions Statistics for ST05, ST06 and ST07

Pathway	Maximum SOF (-)								
	ST05			ST06			ST07		
	mean	*sdev*	*cvar*	*mean*	*sdev*	*cvar*	*mean*	*sdev*	*cvar*
GWPB	3.04E-02	9.09E-03	2.99E-01	1.89E-01	7.87E-02	4.16E-01	7.85E-02	1.49E-02	1.90E-01
GWPA	1.41E-02	3.79E-04	2.70E-02	1.40E-01	7.71E-02	5.52E-01	6.50E-02	3.38E-02	5.19E-01
GWPR	4.56E-07	1.29E-08	2.83E-02	4.24E-06	1.83E-07	4.32E-02	7.99E-08	7.56E-08	9.46E-01
GWPU	2.62E-12	7.06E-14	2.70E-02	3.77E-11	2.08E-11	5.51E-01	1.68E-11	8.70E-12	5.18E-01
PAAP	1.76E-03	4.62E-05	2.62E-02	1.75E-02	8.94E-03	5.12E-01	7.92E-03	4.08E-03	5.15E-01
PAAI	3.25E-05	1.05E-06	3.23E-02	3.39E-04	3.11E-04	9.18E-01	1.33E-04	1.17E-04	8.83E-01
PACI	5.72E-05	2.22E-06	3.89E-02	5.23E-04	5.50E-04	1.05E+00	4.98E-05	4.33E-05	8.71E-01
AIRP	1.89E-07	4.55E-09	2.41E-02	2.53E-07	2.17E-07	8.60E-01	3.96E-07	3.05E-07	7.71E-01
RFLX	4.44E-06	1.85E-07	4.15E-02	3.97E-04	1.63E-05	4.10E-02	3.39E-07	3.21E-07	9.48E-01
Max	3.04E-02	9.08E-03	2.99E-01	2.20E-01	6.71E-02	3.05E-01	9.11E-02	1.84E-02	2.02E-01

Notes:

Statistics parameters are (1) arithmetic mean (mean); (2) standard deviation (sdev); (3) coefficient of variation (cvar).

GWPB (GWP beta-gamma); GWPA (GWP gross-alpha); GWPR (GWP radium); GWPU (GWP uranium); PAAP (PA all-pathways); PAAI (PA IHI-Acute); PACI (PA IHI-Chronic); AIRP (air pathway); RFLX (radon flux).

Table I-81. Stochastic Maximum Sum-of-Fractions Statistics for ST08, ST09, and ST10

Pathway	Maximum SOF (-)								
	ST08			ST09			ST10		
	mean	*sdev*	*cvar*	*mean*	*sdev*	*cvar*	*mean*	*sdev*	*cvar*
GWPB	6.70E-02	9.31E-03	1.39E-01	3.38E-01	6.74E-02	1.99E-01	9.51E-02	2.71E-02	2.85E-01
GWPA	1.28E-03	1.55E-03	1.21E+00	1.30E-02	1.37E-02	1.05E+00	1.85E-02	2.01E-02	1.09E+00
GWPR	1.15E-05	2.73E-05	2.38E+00	5.16E-06	6.25E-06	1.21E+00	8.79E-06	1.13E-05	1.28E+00
GWPU	8.94E-13	1.01E-12	1.13E+00	9.98E-12	1.04E-11	1.04E+00	1.75E-11	1.89E-11	1.08E+00
PAAP	7.08E-04	3.15E-04	4.44E-01	2.33E-02	3.36E-03	1.45E-01	6.12E-03	2.95E-03	4.82E-01
PAAI	1.77E-04	1.87E-04	1.06E+00	3.22E-04	2.42E-04	7.53E-01	6.15E-04	4.95E-04	8.05E-01
PACI	4.49E-05	3.63E-05	8.09E-01	1.15E-04	8.05E-05	6.99E-01	2.09E-04	1.28E-04	6.14E-01
AIRP	2.01E-07	1.44E-07	7.16E-01	4.56E-06	7.03E-07	1.54E-01	8.28E-07	8.09E-07	9.77E-01
RFLX	6.30E-06	1.66E-05	2.63E+00	2.59E-06	3.97E-06	1.53E+00	4.99E-06	7.91E-06	1.59E+00
Max	6.70E-02	9.31E-03	1.39E-01	3.38E-01	6.74E-02	1.99E-01	9.59E-02	2.71E-02	2.82E-01

Notes:

Statistics parameters are (1) arithmetic mean (mean); (2) standard deviation (sdev); (3) coefficient of variation (cvar).

GWPB (GWP beta-gamma); GWPA (GWP gross-alpha); GWPR (GWP radium); GWPU (GWP uranium); PAAP (PA all-pathways); PAAI (PA IHI-Acute); PACI (PA IHI-Chronic); AIRP (air pathway); RFLX (radon flux).

Table I-82. Stochastic Maximum Sum-of-Fractions Statistics for ST11, ST14, and ST18

Pathway	Maximum SOF (-)								
	ST11			ST14			ST18		
	mean	*sdev*	*cvar*	*mean*	*sdev*	*cvar*	*mean*	*sdev*	*cvar*
GWPB	1.77E-01	5.95E-02	3.36E-01	6.96E-02	3.09E-03	4.43E-02	1.11E-01	2.20E-02	1.99E-01
GWPA	2.11E-02	3.17E-02	1.50E+00	4.04E-03	3.77E-03	9.31E-01	1.71E-02	2.70E-02	1.58E+00
GWPR	1.05E-05	2.41E-05	2.30E+00	1.15E-07	1.52E-07	1.32E+00	5.19E-08	1.20E-07	2.31E+00
GWPU	2.44E-11	3.64E-11	1.49E+00	2.06E-12	1.91E-12	9.25E-01	6.01E-12	9.46E-12	1.57E+00
PAAP	1.06E-02	5.71E-03	5.39E-01	1.37E-03	9.29E-04	6.80E-01	2.81E-03	3.33E-03	1.19E+00
PAAI	8.19E-04	1.06E-03	1.29E+00	3.63E-04	3.36E-04	9.24E-01	3.90E-04	6.64E-04	1.70E+00
PACI	6.51E-04	7.07E-04	1.09E+00	2.27E-04	1.84E-04	8.12E-01	3.30E-04	6.30E-04	1.91E+00
AIRP	1.32E-06	1.26E-06	9.58E-01	1.23E-05	2.00E-06	1.63E-01	4.75E-07	5.63E-07	1.18E+00
RFLX	6.73E-05	1.87E-04	2.78E+00	3.71E-06	5.72E-06	1.54E+00	1.82E-05	4.59E-05	2.52E+00
Max	1.78E-01	5.98E-02	3.36E-01	6.96E-02	3.09E-03	4.43E-02	1.12E-01	2.28E-02	2.04E-01

Notes:

Statistics parameters are (1) arithmetic mean (mean); (2) standard deviation (sdev); (3) coefficient of variation (cvar).

GWPB (GWP beta-gamma); GWPA (GWP gross-alpha); GWPR (GWP radium); GWPU (GWP uranium); PAAP (PA all-pathways); PAAI (PA IHI-Acute); PACI (PA IHI-Chronic); AIRP (air pathway); RFLX (radon flux).

Table I-83. Stochastic Maximum Sum-of-Fractions Statistics for ST23, ST24, and ILV

Pathway	Maximum SOF (-)								
	ST23			ST24			ILV		
	mean	*sdev*	*cvar*	*mean*	*sdev*	*cvar*	*mean*	*sdev*	*cvar*
GWPB	3.64E-01	9.31E-02	2.55E-01	5.60E-01	1.51E-01	2.70E-01	3.03E-01	3.43E-02	1.13E-01
GWPA	6.24E-02	9.31E-02	1.49E+00	2.40E-01	2.74E-01	1.14E+00	6.88E-32	3.68E-33	5.35E-02
GWPR	6.33E-07	1.62E-06	2.56E+00	1.26E-06	2.46E-06	1.95E+00	0.00E+00	0.00E+00	--
GWPU	4.55E-11	6.76E-11	1.49E+00	6.11E-11	6.96E-11	1.14E+00	0.00E+00	0.00E+00	--
PAAP	1.86E-02	1.22E-02	6.56E-01	3.18E-02	3.22E-02	1.01E+00	2.84E-03	3.21E-04	1.13E-01
PAAI	2.19E-03	2.86E-03	1.30E+00	1.18E-03	1.68E-03	1.42E+00	2.03E-05	1.18E-06	5.81E-02
PACI	2.00E-02	3.49E-03	1.74E-01	1.05E-03	1.55E-03	1.48E+00	5.45E-03	3.17E-04	5.81E-02
AIRP	1.32E-06	1.29E-06	9.78E-01	9.06E-07	1.00E-06	1.10E+00	1.03E-09	1.00E-10	9.72E-02
RFLX	8.39E-05	2.47E-04	2.95E+00	5.54E-05	1.27E-04	2.29E+00	1.37E-06	2.00E-07	1.46E-01
Max	3.68E-01	9.88E-02	2.68E-01	6.14E-01	1.72E-01	2.80E-01	3.03E-01	3.43E-02	1.13E-01

Notes:

Statistics parameters are (1) arithmetic mean (mean); (2) standard deviation (sdev); (3) coefficient of variation (cvar).

GWPB (GWP beta-gamma); GWPA (GWP gross-alpha); GWPR (GWP radium); GWPU (GWP uranium); PAAP (PA all-pathways); PAAI (PA IHI-Acute); PACI (PA IHI-Chronic); AIRP (air pathway); RFLX (radon flux).

Table I-84. Stochastic Maximum Sum-of-Fractions Statistics for LAWV, NR07E, and NR26E

Pathway	Maximum SOF (-)								
	LAWV			NR07E			NR26E		
	mean	*sdev*	*cvar*	*mean*	*sdev*	*cvar*	*mean*	*sdev*	*cvar*
GWPB	2.07E-01	3.60E-03	1.74E-02	6.29E-06	9.09E-08	1.44E-02	1.55E-01	2.53E-03	1.63E-02
GWPA	6.83E-22	3.01E-23	4.40E-02	2.43E-29	2.82E-31	1.16E-02	1.93E-08	1.10E-10	5.70E-03
GWPR	0.00E+00	0.00E+00	--	0.00E+00	0.00E+00	--	0.00E+00	0.00E+00	--
GWPU	1.43E-32	6.30E-34	4.42E-02	0.00E+00	0.00E+00	--	2.00E-18	1.14E-20	5.69E-03
PAAP	1.94E-03	3.37E-05	1.74E-02	6.64E-07	9.60E-09	1.44E-02	1.58E-02	2.67E-04	1.69E-02
PAAI	5.33E-07	1.52E-08	2.84E-02	1.99E-08	2.98E-10	1.50E-02	1.45E-06	3.15E-08	2.18E-02
PACI	4.44E-02	5.52E-04	1.24E-02	1.83E-02	1.72E-04	9.40E-03	6.84E-01	9.12E-03	1.33E-02
AIRP	2.24E-14	3.29E-16	1.47E-02	1.91E-05	2.78E-07	1.45E-02	2.62E-03	4.15E-05	1.59E-02
RFLX	6.06E-07	2.56E-08	4.23E-02	0.00E+00	0.00E+00	--	0.00E+00	0.00E+00	--
Max	2.07E-01	3.60E-03	1.74E-02	1.83E-02	1.72E-04	9.40E-03	6.84E-01	9.12E-03	1.33E-02

Notes:

Statistics parameters are (1) arithmetic mean (mean); (2) standard deviation (sdev); (3) coefficient of variation (cvar).

GWPB (GWP beta-gamma); GWPA (GWP gross-alpha); GWPR (GWP radium); GWPU (GWP uranium); PAAP (PA all-pathways); PAAI (PA IHI-Acute); PACI (PA IHI-Chronic); AIRP (air pathway); RFLX (radon flux).

I.5 REFERENCES

Hamm, L. L., Aleman, S. E., Danielson, T. L., and Butcher, B. T. (2018). "Special Analysis: Impact of Updated GSA Flow Model on E-Area Low-Level Waste Facility Groundwater Performance." SRNL-STI-2018-00624, Rev. 0. Savannah River National Laboratory, Aiken, SC.