

## Chapter DHS 157

### APPENDIX E

#### Annual Limits on Intake (ALI) and Derived Air Concentrations (DAC) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sanitary Sewerage

##### Introduction

For each radionuclide, Table I indicates the chemical form which is to be used for selecting the appropriate ALI or DAC value. The ALIs and DACs for inhalation are given for an aerosol with an activity median aerodynamic diameter (AMAD) of 1  $\mu$ (micron), and for the D, W and Y classes of radioactive material, which refer to their retention in the pulmonary region of the lung. This classification applies to a range of clearance half-times for D if less than 10 days, for W from 10 to 100 days, and for Y greater than 100 days. The D, W or Y class given in the column headed "Class" applies only to the inhalation ALIs and DACs given in Table I, column 2 and 3. Table II provides concentration limits for airborne and liquid effluents released to the general environment. Table III provides concentration limits for discharges to sanitary sewerage.

Note: The values in Tables I, II, and III are presented in the computer "E" notation. In this notation a value of 6E-02 represents a value of  $6 \times 10^{-2}$  or 0.06, 6E+2 represents  $6 \times 10^2$  or 600, and 6E+0 represents  $6 \times 10^0$  or 6.

##### Table I "Occupational Values"

Note that the columns in Table I of this appendix captioned "Oral Ingestion ALI," "Inhalation ALI" and "DAC" are applicable to occupational exposure to radioactive material.

The ALIs in this appendix are the annual intakes of given radionuclide by "reference man" which would result in either (1) a committed effective dose equivalent of 0.05 Sv (5 rem), stochastic ALI, or (2) a committed dose equivalent of 0.5 Sv (50 rem) to an organ or tissue, non-stochastic ALI. The stochastic ALIs were derived to result in a risk, due to irradiation of organs and tissues, comparable to the risk associated with deep dose equivalent to the whole body of 0.05 Sv (5 rem). The derivation includes multiplying the committed dose equivalent to an organ or tissue by a weighting factor,  $w_T$ . This weighting factor is the proportion of the risk of stochastic effects resulting from irradiation of the organ or tissue, T, to the total risk of stochastic effects when the whole body is irradiated uniformly. The values of  $w_T$  are listed under the definition of weighting factor in s. DHS 157.03. The non-stochastic ALIs were derived to avoid non-stochastic effects, such as prompt damage to tissue or reduction in organ function.

Note: A description of the reference man is contained in the International Commission on Radiological Protection report, ICRP Publication 23, Reference Man: Anatomical Physiological and Metabolic Characteristics, Pergamon Press, Oxford (1975). The publication may be ordered from the web-site <http://www.icrp.org/ordering.htm>.

A value of  $w_T = 0.06$  is applicable to each of the 5 organs or tissues in the "remainder" category receiving the highest dose equivalents, and the dose equivalents of all other remaining tissues may be disregarded. The following portions of the GI tract — stomach, small intestine, upper large intestine, and lower large intestine — are to be treated as 4 separate organs.

Note that the dose equivalents for an extremity, skin and lens of the eye are not considered in computing the committed effective dose equivalent, but are subject to limits that must be met separately.

When an ALI is defined by the stochastic dose limit, this value alone is given. When an ALI is determined by the non-stochastic dose limit to an organ, the organ or tissue to which the limit applies is shown, and the ALI for the stochastic limit is shown in parentheses. Abbreviated organ or tissue designations are used:

LLI wall = lower large intestine wall;

St wall = stomach wall;

Blad wall = bladder wall; and

Bone surf = bone surface.

The use of the ALIs listed first, the more limiting of the stochastic and non-stochastic ALIs, will ensure that non-stochastic effects are avoided and that the risk of stochastic effects is limited to an acceptably low value. If, in a particular situation involving a radionuclide for which the non-stochastic ALI is limiting, use of that non-stochastic ALI is considered unduly conservative, the licensee may use the stochastic ALI to determine the committed effective dose equivalent. However, the licensee shall also ensure that the 0.5 Sv (50 rem) dose equivalent limit for any organ or tissue is not exceeded by the sum of the external deep dose equivalent plus the internal committed dose equivalent to that organ, not the effective dose. For the case where there is no external dose contribution, this would be demonstrated if the sum of the fractions of the nonstochastic ALIs that contribute to the committed dose equivalent to the organ receiving the highest dose does not exceed unity, that is, intake of each radionuclide/ $ALI_{ns} = 1.0$ . If there is an external deep dose equivalent contribution of  $H_d$ , then this sum must be less than  $1 - (H_d/50)$ , instead of  $= 1.0$ .

Note that the dose equivalents for an extremity, skin, and lens of the eye are not considered in computing the committed effective dose equivalent, but are subject to limits that must be met separately.

The derived air concentration (DAC) values are derived limits intended to control chronic occupational exposures. The relationship between the DAC and the ALI is given by:

$$DAC = ALI \text{ in } :Ci/(2000 \text{ hours per working year} \times 60 \text{ minutes/hour} \times 2 \times 10^4 \text{ ml per minute}) = [ALI/2.4 \times 10^9] :Ci/ml,$$

where  $2 \times 10^4$  ml is the volume of air breathed per minute at work by reference man under working conditions of light work.

The DAC values relate to 1 of 2 modes of exposure: either external submersion or the internal committed dose equivalents resulting from inhalation of radioactive materials. DACs based upon submersion are for immersion in a semi-infinite cloud of uniform concentration and apply to each radionuclide separately.

The ALI and DAC values include contributions to exposure by the single radionuclide named and any in-growth of daughter radionuclides produced in the body by decay of the parent. How-

ever, intakes that include both the parent and daughter radionuclides should be treated by the general method appropriate for mixtures.

The values of ALI and DAC do not apply directly when the individual both ingests and inhales a radionuclide, when the individual is exposed to a mixture of radionuclides by either inhalation or ingestion or both or when the individual is exposed to both internal and external irradiation. See s. DHS 157.22 (2). When an individual is exposed to radioactive materials that fall under several of the translocation classifications of the same radionuclide, such as Class D, Class W or Class Y, the exposure may be evaluated as if it were a mixture of different radionuclides.

It should be noted that the classification of a compound as Class D, W, or Y is based on the chemical form of the compound and does not take into account the radiological half-life of different radionuclides. For this reason, values are given for Class D, W, and Y compounds, even for very short-lived radionuclides.

#### Table II "Effluent Concentrations"

The columns in Table II of this appendix captioned "Effluents," "Air" and "Water" are applicable to the assessment and control of dose to the public, particularly in the implementation of the provisions of s. DHS 157.23 (2). The concentration values given in Columns 1 and 2 of Table II are equivalent to the radionuclide concentrations which, if inhaled or ingested continuously over the course of a year, would produce a total effective dose equivalent of 0.5 mSv (0.05 rem).

Consideration of non-stochastic limits has not been included in deriving the air and water effluent concentration limits because non-stochastic effects are presumed not to occur at or below the dose levels established for individual members of the public. For radionuclides, where the non-stochastic limit was governing in deriving the occupational DAC, the stochastic ALI was used in deriving the corresponding airborne effluent limit in Table II. For this reason, the DAC and airborne effluent limits are not always proportional.

The air concentration values listed in Table II, Column 1 were derived by one of 2 methods. For those radionuclides for which the stochastic limit is governing, the occupational stochastic inhalation ALI was divided by  $2.4 \times 10^9$  ml, relating the inhalation ALI to the DAC, as explained above, and then divided by a factor

of 300. The factor of 300 includes the following components: a factor of 50 to relate the 0.05 Sv (5 rem) annual occupational dose limit to the 1 mSv (0.1 rem) limit for members of the public, a factor of 3 to adjust for the difference in exposure time and the inhalation rate for a worker and that for members of the public; and a factor of 2 to adjust the occupational values, derived for adults, so that they are applicable to other age groups.

For those radionuclides for which submersion, that is external dose, is limiting, the occupational DAC in Table I, Column 3 was divided by 219. The factor of 219 is composed of a factor of 50, as described above, and a factor of 4.38 relating occupational exposure for 2,000 hours of a 8,760 hour full-time exposure per year. Note that an additional factor of 2 for age considerations is not warranted in the submersion case.

The water concentrations were derived by taking the most restrictive occupational stochastic oral ingestion ALI and dividing by  $7.3 \times 10^7$ . The factor of  $7.3 \times 10^7$  ml includes the following components: the factors of 50 and 2 described above and a factor of  $7.3 \times 10^5$  ml which is the annual water intake of reference man.

Note 2 of this appendix provides groupings of radionuclides which are applicable to unknown mixtures of radionuclides. These groupings, including occupational inhalation ALIs and DACs, air and water effluent concentrations and releases to sewer, require demonstrating that the most limiting radionuclides in successive classes are absent. The limit for the unknown mixture is defined when the presence of one of the listed radionuclides cannot be definitely excluded as being present either from knowledge of the radionuclide composition of the source or from actual measurements.

#### Table III "Releases to Sewers"

The monthly average concentrations for release to sanitary sewerage are applicable to the provisions in s. DHS 157.30 (3). The concentration values were derived by taking the most restrictive occupational stochastic oral ingestion ALI and dividing by  $7.3 \times 10^6$  ml. The factor of  $7.3 \times 10^6$  ml is composed of a factor of  $7.3 \times 10^5$  ml, the annual water intake by reference man, and a factor of 10, such that the concentrations, if the sewage released by the licensee were the only source of water ingested by a reference man during a year, would result in a committed effective dose equivalent of 5 mSv (0.5 rem).

List of Elements			List of Elements (Cont.)		
Name	Symbol	Atomic Number	Name	Symbol	Atomic Number
Actinium	Ac	89	Mendelevium	Md	101
Aluminum	A	13	Mercury	Hg	80
Americium	Am	95	Molybdenum	Mo	42
Antimony	Sb	51	Neodymium	Nd	60
Argon	Ar	18	Neptunium	Np	93
Arsenic	As	33	Nickel	Ni	28
Astatine	At	85	Niobium	Nb	41
Barium	Ba	56	Osmium	Os	76
Berkelium	Bk	97	Palladium	Pd	46
Beryllium	Be	4	Phosphorus	P	15
Bismuth	Bi	83	Platinum	Pt	78
Bromine	Br	35	Plutonium	Pu	94
Cadmium	Cd	48	Polonium	Po	84
Calcium	Ca	20	Potassium	K	19
Californium	Cf	98	Praseodymium	Pr	59
Carbon	C	6	Promethium	Pm	61
Cerium	Ce	58	Protactinium	Pa	91
Cesium	Cs	55	Radium	Ra	88
Chlorine	Cl	17	Radon	Rn	86
Chromium	Cr	24	Rhenium	Re	75
Cobalt	Co	27	Rhodium	Rh	45
Copper	Cu	29	Rubidium	Rb	37
Curium	Cm	96	Ruthenium	Ru	44
Dysprosium	Dy	66	Samarium	Sm	62
Einsteinium	Es	99	Scandium	Sc	21
Erbium	Er	68	Selenium	Se	34
Europium	Eu	63	Silicon	Si	14
Fermium	Fm	100	Silver	Ag	47
Fluorine	F	9	Sodium	Na	11
Francium	Fr	87	Strontium	Sr	38
Gadolinium	Gd	64	Sulfur	S	16
Gallium	Ga	31	Tantalum	Ta	73
Germanium	Ge	32	Technetium	Tc	43
Gold	Au	79	Tellurium	Te	52
Hafnium	Hf	72	Terbium	Tb	65
Holmium	Ho	67	Thallium	Tl	81
Hydrogen	H	1	Thorium	Th	90
Indium	In	49	Thulium	Tm	69
Iodine	I	53	Tin	Sn	50
Iridium	Ir	77	Titanium	Ti	22
Iron	Fe	26	Tungsten	W	74
Krypton	Kr	36	Uranium	U	92
Lanthanum	La	57	Vanadium	V	23
Lead	Pb	82	Xenon	Xe	54
Lutetium	Lu	71	Ytterbium	Yb	70
Magnesium	Mg	12	Yttrium	Y	39
Manganese	Mn	25	Zinc	Zn	30

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI      DAC ( $\mu\text{Ci}$ )    ( $\mu\text{Ci/ml}$ )		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
1	Hydrogen-3	Water, DAC includes skin absorption	8E+4	8E+4	2E-5	1E-7	1E-3	1E-2
4	Beryllium-7	Gas (HT or T <sub>2</sub> ) Submersion <sup>a/</sup> : W, all compounds except those given for Y	4E+4	2E+4	9E-6	3E-8	6E-4	6E-3
4	Beryllium-10	Y, oxides, halides, and nitrates W, see <sup>7</sup> Be	1E+3	2E+2	6E-8	2E-10	-	-
			LLI wall (1E+3)	-	-	-	2E-5	2E-4
6	Carbon-11 <sub>b/</sub>	Y, see <sup>7</sup> Be Monoxide	-	1E+1	6E-9	2E-11	-	-
		Dioxide	-	1E+6	5E-4	2E-6	-	-
		Compounds	4E+5	4E+5	2E-4	6E-7	6E-3	6E-2
6	Carbon-14	Monoxide	-	2E+6	7E-4	2E-6	-	-
		Dioxide	-	2E+5	9E-5	3E-7	-	-
		Compounds	2E+3	2E+3	1E-6	3E-9	3E-5	3E-4
9	Fluorine-18 <sub>b/</sub>	D, fluorides of H, Li, Na, K, Rb, Cs, and Fr	5E+4	7E+4	3E-5	1E-7	-	-
			St wall (5E+4)	-	-	-	7E-4	7E-3
		W, fluorides of Be, Mg, Ca, Sr, Ba, Ra, Al, Ga, In, Tl, As, Sb, Bi, Fe, Ru, Os, Co, Ni, Pd, Pt, Cu, Ag, Au, Zn, Cd, Hg, Sc, Y, Ti, Zr, V, Nb, Ta, Mn, Tc, and Re	-	9E+4	4E-5	1E-7	-	-
		Y, lanthanum fluoride	-	8E+4	3E-5	1E-7	-	-
11	Sodium-22	D, all compounds	4E+2	6E+2	3E-7	9E-10	6E-6	6E-5
11	Sodium-24	D, all compounds	4E+3	5E+3	2E-6	7E-9	5E-5	5E-4
12	Magnesium-28	D, all compounds except those given for W	7E+2	2E+3	7E-7	2E-9	9E-6	9E-5
		W, oxides, hydroxides, carbides, halides, and nitrates	-	1E+3	5E-7	2E-9	-	-
13	Aluminum-26	D, all compounds except those given for W	4E+2	6E+1	3E-8	9E-11	6E-6	6E-5
		W, oxides, hydroxides, carbides, halides, and nitrates	-	9E+1	4E-8	1E-10	-	-
14	Silicon-31	D, all compounds except those given for W and Y	9E+3	3E+4	1E-5	4E-8	1E-4	1E-3
		W, oxides, hydroxides, carbides, and nitrates	-	3E+4	1E-5	5E-8	-	-
		Y, aluminosilicate glass	-	3E+4	1E-5	4E-8	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI      DAC ( $\mu\text{Ci/ml}$ )		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
14	Silicon-32	D, see <sup>31</sup> Si	2E+3	2E+2	1E-7	3E-10	-	-
			LLI wall (3E+3)	-	-	-	4E-5	4E-4
		W, see <sup>31</sup> Si-	1E+2	5E-8	2E-10	-	-	-
		Y, see <sup>31</sup> Si	-	5E+0	2E-9	7E-12	-	-
15	Phosphorus-32	D, all compounds except phosphates given for W	6E+2	9E+2	4E-7	1E-9	9E-6	9E-5
		W, phosphates of Zn <sup>2+</sup> , S <sup>3+</sup> , Mg <sup>2+</sup> , Fe <sup>3+</sup> , Bi <sup>3+</sup> , and lanthanides	-	4E+2	2E-7	5E-10	-	-
15	Phosphorus-33	D, see <sup>32</sup> P	6E+3	8E+3	4E-6	1E-8	8E-5	8E-4
		W, see <sup>32</sup> P	-	3E+3	1E-6	4E-9	-	-
16	Sulfur-35	Vapor	-	1E+4	6E-6	2E-8	-	-
		D, sulfides and sulfates except those given for W	1E+4	2E+4	7E-6	2E-8	-	-
			LLI wall (8E+3)	-	-	-	1E-4	1E-3
		W, elemental sulfur, sulfides of Sr, Ba, Ge, Sn, Pb, As, Sb, Bi, Cu, Ag, Au, Zn, Cd, Hg, W, and Mo. Sulfates of Ca, Sr, Ba, Ra, As, Sb, and Bi	-	2E+3	9E-7	3E-9	-	-
17	Chlorine-36	D, chlorides of H, Li, Na, K, Rb, Cs, and Fr	2E+3	2E+3	1E-6	3E-9	2E-5	2E-4
		W, chlorides of lanthanides, Be, Mg, Ca, Sr, Ba, Ra, Al, Ga, In, Tl, Ge, Sn, Pb, As, Sb, Bi, Fe, Ru, Os, Co, Rh, Ir, Ni, Pd, Pt, Cu, Ag, Au, Zn, Cd, Hg, Sc, Y, Ti, Zr, Hf, V, Nb, Ta, Cr, Mo, W, Mn, Tc, and Re	-	2E+2	1E-7	3E-10	-	-
17	Chlorine-38 <sup>b/</sup>	D, see <sup>36</sup> Cl	2E+4	4E+4	2E-5	6E-8	-	-
			St wall (3E+4)	-	-	-	3E-4	3E-3
		W, see <sup>36</sup> Cl	-	5E+4	2E-5	6E-8	-	-
17	Chlorine-39 <sup>b/</sup>	D, see <sup>36</sup> Cl	2E+4	5E+4	2E-5	7E-8	-	-
			St wall (4E+4)	-	-	-	5E-4	5E-3
		W, see <sup>36</sup> Cl	-	6E+4	2E-5	8E-8	-	-
18	Argon-37	Submersion <sup>a/</sup>	-	-	1E+0	6E-3	-	-
18	Argon-39	Submersion <sup>a/</sup>	-	-	2E-4	8E-7	-	-
18	Argon-41	Submersion <sup>a/</sup>	-	-	3E-6	1E-8	-	-
19	Potassium-40	D, all compounds	3E+2	4E+2	2E-7	6E-10	4E-6	4E-5
19	Potassium-42	D, all compounds	5E+3	5E+3	2E-6	7E-9	6E-5	6E-4
19	Potassium-43	D, all compounds	6E+3	9E+3	4E-6	1E-8	9E-5	9E-4

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI      DAC ( $\mu\text{Ci}$ )    ( $\mu\text{Ci/ml}$ )		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
19	Potassium-44 <sub>b</sub>	D, all compounds	2E+4	7E+4	3E-5	9E-8	-	-
			St wall (4E+4)	-	-	-	5E-4	5E-3
19	Potassium-45 <sub>b</sub>	D, all compounds	3E+4	1E+5	5E-5	2E-7	-	-
			St wall (5E+4)	-	-	-	7E-4	7E-3
20	Calcium-41	W, all compounds	3E+3	4E+3	2E-6	-	-	-
			Bone surf (4E+3)	Bone surf (4E+3)	-	5E-9	6E-5	6E-4
20	Calcium-45	W, all compounds	2E+3	8E+2	4E-7	1E-9	2E-5	2E-4
20	Calcium-47	W, all compounds	8E+2	9E+2	4E-7	1E-9	1E-5	1E-4
21	Scandium-43	Y, all compounds	7E+3	2E+4	9E-6	3E-8	1E-4	1E-3
21	Scandium-44 <sub>m</sub>	Y, all compounds	5E+2	7E+2	3E-7	1E-9	7E-6	7E-5
21	Scandium-44	Y, all compounds	4E+3	1E+4	5E-6	2E-8	5E-5	5E-4
21	Scandium-46	Y, all compounds	9E+2	2E+2	1E-7	3E-10	1E-5	1E-4
21	Scandium-47	Y, all compounds	2E+3	3E+3	1E-6	4E-9	-	-
			LLI wall (3E+3)	-	-	-	4E-5	4E-4
21	Scandium-48	Y, all compounds	8E+2	1E+3	6E-7	2E-9	1E-5	1E-4
21	Scandium-49 <sub>b</sub>	Y, all compounds	2E+4	5E+4	2E-5	8E-8	3E-4	3E-3
22	Titanium-44	D, all compounds except those given for W and Y	3E+2	1E+1	5E-9	2E-11	4E-6	4E-5
		W, oxides, hydroxides, carbides, halides, and nitrates	-	3E+1	1E-8	4E-11	-	-
		Y, SrTiO	-	6E+0	2E-9	8E-12	-	-
22	Titanium-45	D, see <sup>44</sup> Ti	9E+3	3E+4	1E-5	3E-8	1E-4	1E-3
		W, see <sup>44</sup> Ti	-	4E+4	1E-5	5E-8	-	-
		Y, see <sup>44</sup> Ti	-	3E+4	1E-5	4E-8	-	-
23	Vanadium-47 <sub>b</sub>	D, all compounds except those given for W	3E+4	8E+4	3E-5	1E-7	-	-
			St wall (3E+4)	-	-	-	4E-4	4E-3
		W, oxides, hydroxides, carbides, and halides	-	1E+5	4E-5	1E-7	-	-
23	Vanadium-48	D, see <sup>47</sup> V	6E+2	1E+3	5E-7	2E-9	9E-6	9E-5
		W, see <sup>47</sup> V	-	6E+2	3E-7	9E-10	-	-
23	Vanadium-49	D, see <sup>47</sup> V	7E+4	3E+4	1E-5	-	-	-
			LLI wall (9E+4)	Bone surf (3E+4)	-	5E-8	1E-3	1E-2
		W, see <sup>47</sup> V	-	2E+4	8E-6	2E-8	-	-
24	Chromium-48	D, all compounds except those given for W and Y	6E+3	1E+4	5E-6	2E-8	8E-5	8E-4
		W, halides and nitrates	-	7E+3	3E-6	1E-8	-	-
		Y, oxides and hydroxides	-	7E+3	3E-6	1E-8	-	-
24	Chromium-49 <sub>b</sub>	D, see <sup>48</sup> Cr	3E+4	8E+4	4E-5	1E-7	4E-4	4E-3
		W, see <sup>48</sup> Cr	-	1E+5	4E-5	1E-7	-	-
		Y, see <sup>48</sup> Cr	-	9E+4	4E-5	1E-7	-	-
24	Chromium-51	D, see <sup>48</sup> Cr	4E+4	5E+4	2E-5	6E-8	5E-4	5E-3
		W, see <sup>48</sup> Cr	-	2E+4	1E-5	3E-8	-	-
		Y, see <sup>48</sup> Cr	-	2E+4	8E-6	3E-8	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI ( $\mu\text{Ci}$ )		DAC ( $\mu\text{Ci/ml}$ )	Air ( $\mu\text{Ci/ml}$ )	
25	Manganese-51 <sup>b/</sup>	D, all compounds except those given for W	2E+4	5E+4	2E-5	7E-8	3E-4	3E-3
		W, oxides, hydroxides, halides, and nitrates	-	6E+4	3E-5	8E-8	-	-
25	Manganese-52m <sup>b/</sup>	D, see <sup>51</sup> Mn	3E+4	9E+4	4E-5	1E-7	-	-
		St wall	(4E+4)	-	-	-	5E-4	5E-3
		W, see <sup>51</sup> Mn	-	1E+5	4E-5	1E-7	-	-
25	Manganese-52	D, see <sup>51</sup> Mn	7E+2	1E+3	5E-7	2E-9	1E-5	1E-4
		W, see <sup>51</sup> Mn	-	9E+2	4E-7	1E-9	-	-
25	Manganese-53	D, see <sup>51</sup> Mn	5E+4	1E+4	5E-6	-	7E-4	7E-3
		Bone surf	-	(2E+4)	-	3E-8	-	-
		W, see <sup>51</sup> Mn	-	1E+4	5E-6	2E-8	-	-
25	Manganese-54	D, see <sup>51</sup> Mn	2E+3	9E+2	4E-7	1E-9	3E-5	3E-4
		W, see <sup>51</sup> Mn	-	8E+2	3E-7	1E-9	-	-
25	Manganese-56	D, see <sup>51</sup> Mn	5E+3	2E+4	6E-6	2E-8	7E-5	7E-4
		W, see <sup>51</sup> Mn	-	2E+4	9E-6	3E-8	-	-
26	Iron-52	D, all compounds except those given for W	9E+2	3E+3	1E-6	4E-9	1E-5	1E-4
		W, oxides, hydroxides, and halides	-	2E+3	1E-6	3E-9	-	-
26	Iron-55	D, see <sup>52</sup> Fe	9E+3	2E+3	8E-7	3E-9	1E-4	1E-3
		W, see <sup>52</sup> Fe	-	4E+3	2E-6	6E-9	-	-
26	Iron-59	D, see <sup>52</sup> Fe	8E+2	3E+2	1E-7	5E-10	1E-5	1E-4
		W, see <sup>52</sup> Fe	-	5E+2	2E-7	7E-10	-	-
26	Iron-60	D, see <sup>52</sup> Fe	3E+1	6E+0	3E-9	9E-12	4E-7	4E-6
		W, see <sup>52</sup> Fe	-	2E+1	8E-9	3E-11	-	-
27	Cobalt-55	W, all compounds except those given for Y	1E+3	3E+3	1E-6	4E-9	2E-5	2E-4
		Y, oxides, hydroxides, halides, and nitrates	-	3E+3	1E-6	4E-9	-	-
27	Cobalt-56	W, see <sup>55</sup> Co	5E+2	3E+2	1E-7	4E-10	6E-6	6E-5
		Y, see <sup>55</sup> Co	4E+2	2E+2	8E-8	3E-10	-	-
27	Cobalt-57	W, see <sup>55</sup> Co	8E+3	3E+3	1E-6	4E-9	6E-5	6E-4
		Y, see <sup>55</sup> Co	4E+3	7E+2	3E-7	9E-10	-	-
27	Cobalt-58m	W, see <sup>55</sup> Co	6E+4	9E+4	4E-5	1E-7	8E-4	8E-3
		Y, see <sup>55</sup> Co	-	6E+4	3E-5	9E-8	-	-
27	Cobalt-58	W, see <sup>55</sup> Co	2E+3	1E+3	5E-7	2E-9	2E-5	2E-4
		Y, see <sup>55</sup> Co	1E+3	7E+2	3E-7	1E-9	-	-
27	Cobalt-60m <sup>b/</sup>	W, see <sup>55</sup> Co	1E+6	4E+6	2E-3	6E-6	-	-
		St wall	(1E+6)	-	-	-	2E-2	2E-1
		Y, see <sup>55</sup> Co	-	3E+6	1E-3	4E-6	-	-
27	Cobalt-60	W, see <sup>55</sup> Co	5E+2	2E+2	7E-8	2E-10	3E-6	3E-5
		Y, see <sup>55</sup> Co	2E+2	3E+1	1E-8	5E-11	-	-
27	Cobalt-61 <sup>b/</sup>	W, see <sup>55</sup> Co	2E+4	6E+4	3E-5	9E-8	3E-4	3E-3
		Y, see <sup>55</sup> Co	2E+4	6E+4	2E-5	8E-8	-	-



**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI ( $\mu\text{Ci}$ )		DAC ( $\mu\text{Ci/ml}$ )	Air ( $\mu\text{Ci/ml}$ )	
27	Cobalt-62m <sup>b/</sup>	W, see <sup>55</sup> Co	4E+4	2E+5	7E-5	2E-7	-	-
		St wall (5E+4)	-	-	-	-	7E-4	7E-3
		Y, see <sup>55</sup> Co	-	2E+5	6E-5	2E-7	-	-
28	Nickel-56	D, all compounds except those given for W	1E+3	2E+3	8E-7	3E-9	2E-5	2E-4
		W, oxides, hydroxides, and carbides	-	1E+3	5E-7	2E-9	-	-
		Vapor	-	1E+3	5E-7	2E-9	-	-
28	Nickel-57	D, see <sup>56</sup> Ni	2E+3	5E+3	2E-6	7E-9	2E-5	2E-4
		W, see <sup>56</sup> Ni	-	3E+3	1E-6	4E-9	-	-
		Vapor	-	6E+3	3E-6	9E-9	-	-
28	Nickel-59	D, see <sup>56</sup> Ni	2E+4	4E+3	2E-6	5E-9	3E-4	3E-3
		W, see <sup>56</sup> Ni	-	7E+3	3E-6	1E-8	-	-
		Vapor	-	E+3	8E-7	3E-9	-	-
28	Nickel-63	D, see <sup>56</sup> Ni	9E+3	2E+3	7E-7	2E-9	1E-4	1E-3
		W, see <sup>56</sup> Ni	-	3E+3	1E-6	4E-9	-	-
		Vapor	-	8E+2	3E-7	1E-9	-	-
28	Nickel-65	D, see <sup>56</sup> Ni	8E+3	2E+4	1E-5	3E-8	1E-4	1E-3
		W, see <sup>56</sup> Ni	-	3E+4	1E-5	4E-8	-	-
		Vapor	-	2E+4	7E-6	2E-8	-	-
28	Nickel-66	D, see <sup>56</sup> Ni	4E+2	2E+3	7E-7	2E-9	-	-
		LLI wall (5E+2)	-	-	-	-	6E-6	6E-5
		W, see <sup>56</sup> Ni	-	6E+2	3E-7	9E-10	-	-
		Vapor	-	3E+3	1E-6	4E-9	-	-
29	Copper-60 <sup>b/</sup>	D, all compounds except those given for W and Y	3E+4	9E+4	4E-5	1E-7	-	-
		St wall (3E+4)	-	-	-	-	4E-4	4E-3
		W, sulfides, halides, and nitrates	-	1E+5	5E-5	2E-7	-	-
		Y, oxides and hydroxides	-	1E+5	4E-5	1E-7	-	-
29	Copper-61	D, see <sup>60</sup> Cu	1E+4	3E+4	1E-5	4E-8	2E-4	2E-3
		W, see <sup>60</sup> Cu	-	4E+4	2E-5	6E-8	-	-
		Y, see <sup>60</sup> Cu	-	4E+4	1E-5	5E-8	-	-
29	Copper-64	D, see <sup>60</sup> Cu	1E+4	3E+4	1E-5	4E-8	2E-4	2E-3
		W, see <sup>60</sup> Cu	-	2E+4	1E-5	3E-8	-	-
		Y, see <sup>60</sup> Cu	-	2E+4	9E-6	3E-8	-	-
29	Copper-67	D, see <sup>60</sup> Cu	5E+3	8E+3	3E-6	1E-8	6E-5	6E-4
		W, see <sup>60</sup> Cu	-	5E+3	2E-6	7E-9	-	-
		Y, see <sup>60</sup> Cu	-	5E+3	2E-6	6E-9	-	-
30	Zinc-62	Y, all compounds	1E+3	3E+3	1E-6	4E-9	2E-5	2E-4
30	Zinc-63 <sup>b/</sup>	Y, all compounds	2E+4	7E+4	3E-5	9E-8	-	-
		St wall (3E+4)	-	-	-	-	3E-4	3E-3
30	Zinc-65	Y, all compounds	4E+2	3E+2	1E-7	4E-10	5E-6	5E-5
30	Zinc-69m	Y, all compounds	4E+3	7E+3	3E-6	1E-8	6E-5	6E-4
30	Zinc-69 <sup>b/</sup>	Y, all compounds	6E+4	1E+5	6E-5	2E-7	8E-4	8E-3
30	Zinc-71m	Y, all compounds	6E+3	2E+4	7E-6	2E-8	8E-5	8E-4



**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
		ALI ( $\mu\text{Ci}$ )	ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )				
30	Zinc-72	Y, all compounds	1E+3	1E+3	5E-7	2E-9	1E-5	1E-4
31	Gallium-65 <sup>b/</sup>	D, all compounds except those given for W	5E+4	2E+5	7E-5	2E-7	-	-
		St wall (6E+4)	-	-	-	-	9E-4	9E-3
		W, oxides, hydroxides, carbides, halides, and nitrates	-	2E+5	8E-5	3E-7	-	-
31	Gallium-66	D, see <sup>65</sup> Ga	1E+3	4E+3	1E-6	5E-9	1E-5	1E-4
		W, see <sup>65</sup> Ga	-	3E+3	1E-6	4E-9	-	-
31	Gallium-67	D, see <sup>65</sup> Ga	7E+3	1E+4	6E-6	2E-8	1E-4	1E-3
		W, see <sup>65</sup> Ga	-	1E+4	4E-6	1E-8	-	-
31	Gallium-68 <sup>b/</sup>	D, see <sup>65</sup> Ga	2E+4	4E+4	2E-5	6E-8	2E-4	2E-3
		W, see <sup>65</sup> Ga	-	5E+4	2E-5	7E-8	-	-
31	Gallium-70 <sup>b/</sup>	D, see <sup>65</sup> Ga	5E+4	2E+5	7E-5	2E-7	-	-
		St wall (7E+4)	-	-	-	-	1E-3	1E-2
		W, see <sup>65</sup> Ga	-	2E+5	8E-5	3E-7	-	-
31	Gallium-72	D, see <sup>65</sup> Ga	1E+3	4E+3	1E-6	5E-9	2E-5	2E-4
		W, see <sup>65</sup> Ga	-	3E+3	1E-6	4E-9	-	-
31	Gallium-73	D, see <sup>65</sup> Ga	5E+3	2E+4	6E-6	2E-8	7E-5	7E-4
		W, see <sup>65</sup> Ga	-	2E+4	6E-6	2E-8	-	-
32	Germanium-66	D, all compounds except those given for W	2E+4	3E+4	1E-5	4E-8	3E-4	3E-3
		W, oxides, sulfides, and halides	-	2E+4	8E-6	3E-8	-	-
32	Germanium-67 <sup>b/</sup>	D, see <sup>66</sup> Ge	3E+4	9E+4	4E-5	1E-7	-	-
		St wall (4E+4)	-	-	-	-	6E-4	6E-3
		W, see <sup>66</sup> Ge	-	1E+5	4E-5	1E-7	-	-
32	Germanium-68	D, see <sup>66</sup> Ge	5E+3	4E+3	2E-6	5E-9	6E-5	6E-4
		W, see <sup>66</sup> Ge	-	1E+2	4E-8	1E-10	-	-
32	Germanium-69	D, see <sup>66</sup> Ge	1E+4	2E+4	6E-6	2E-8	2E-4	2E-3
		W, see <sup>66</sup> Ge	-	8E+3	3E-6	1E-8	-	-
32	Germanium-71	D, see <sup>66</sup> Ge	5E+5	4E+5	2E-4	6E-7	7E-3	7E-2
		W, see <sup>66</sup> Ge	-	4E+4	2E-5	6E-8	-	-
32	Germanium-75 <sup>b/</sup>	D, see <sup>66</sup> Ge	4E+4	8E+4	3E-5	1E-7	-	-
		St wall (7E+4)	-	-	-	-	9E-4	9E-3
		W, see <sup>66</sup> Ge	-	8E+4	4E-5	1E-7	-	-
32	Germanium-77	D, see <sup>66</sup> Ge	9E+3	1E+4	4E-6	1E-8	1E-4	1E-3
		W, see <sup>66</sup> Ge	-	6E+3	2E-6	8E-9	-	-
32	Germanium-78 <sup>b/</sup>	D, see <sup>66</sup> Ge	2E+4	2E+4	9E-6	3E-8	-	-
		St wall (2E+4)	-	-	-	-	3E-4	3E-3
		W, see <sup>66</sup> Ge	-	2E+4	9E-6	3E-8	-	-
33	Arsenic-69 <sup>b/</sup>	W, all compounds	3E+4	1E+5	5E-5	2E-7	-	-
		St wall (4E+4)	-	-	-	-	6E-4	6E-3
33	Arsenic-70 <sup>b/</sup>	W, all compounds	1E+4	5E+4	2E-5	7E-8	2E-4	2E-3

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion	Inhalation		Air	Water	
				ALI ( $\mu\text{Ci}$ )	ALI ( $\mu\text{Ci}$ )			
33	Arsenic-71	W, all compounds	4E+3	5E+3	2E-6	6E-9	5E-5	5E-4
33	Arsenic-72	W, all compounds	9E+2	1E+3	6E-7	2E-9	1E-5	1E-4
33	Arsenic-73	W, all compounds	8E+3	2E+3	7E-7	2E-9	1E-4	1E-3
33	Arsenic-74	W, all compounds	1E+3	8E+2	3E-7	1E-9	2E-5	2E-4
33	Arsenic-76	W, all compounds	1E+3	1E+3	6E-7	2E-9	1E-5	1E-4
33	Arsenic-77	W, all compounds	4E+3	5E+3	2E-6	7E-9	-	-
			LLI wall (5E+3)	-	-	-	6E-5	6E-4
33	Arsenic-78 <sup>b/</sup>	W, all compounds	8E+3	2E+4	9E-6	3E-8	1E-4	1E-3
34	Selenium-70 <sup>b/</sup>	D, all compounds except those given for W	2E+4	4E+4	2E-5	5E-8	1E-4	1E-3
		W, oxides, hydroxides, carbides, and elemental Se	1E+4	4E+4	2E-5	6E-8	-	-
34	Selenium-73m <sup>b/</sup>	D, see <sup>70</sup> Se	6E+4	2E+5	6E-5	2E-7	4E-4	4E-3
		W, see <sup>70</sup> Se	3E+4	1E+5	6E-5	2E-7	-	-
34	Selenium-73	D, see <sup>70</sup> Se	3E+3	1E+4	5E-6	2E-8	4E-5	4E-4
		W, see <sup>70</sup> Se	-	2E+4	7E-6	2E-8	-	-
34	Selenium-75	D, see <sup>70</sup> Se	5E+2	7E+2	3E-7	1E-9	7E-6	7E-5
		W, see <sup>70</sup> Se	-	6E+2	3E-7	8E-10	-	-
34	Selenium-79	D, see <sup>70</sup> Se	6E+2	8E+2	3E-7	1E-9	8E-6	8E-5
		W, see <sup>70</sup> Se	-	6E+2	2E-7	8E-10	-	-
34	Selenium-81m <sup>b/</sup>	D, see <sup>70</sup> Se	4E+4	7E+4	3E-5	9E-8	3E-4	3E-3
		W, see <sup>70</sup> Se	2E+4	7E+4	3E-5	1E-7	-	-
34	Selenium-81 <sup>b/</sup>	D, see <sup>70</sup> Se	6E+4	2E+5	9E-5	3E-7	-	-
			St wall (8E+4)	-	-	-	1E-3	1E-2
		W, see <sup>70</sup> Se	-	2E+5	1E-4	3E-7	-	-
34	Selenium-83 <sup>b/</sup>	D, see <sup>70</sup> Se	4E+4	1E+5	5E-5	2E-7	4E-4	4E-3
		W, see <sup>70</sup> Se	3E+4	1E+5	5E-5	2E-7	-	-
35	Bromine-74m <sup>b/</sup>	D, bromides of H, Li, Na, K, Rb, Cs, and Fr	1E+4	4E+4	2E-5	5E-8	-	-
			St wall (2E+4)	-	-	-	3E-4	3E-3
		W, bromides of lantha- nides, Be, Mg, Ca, Sr, Ba, Ra, Al, Ga, In, Tl, Ge, Sn, Pb, As, Sb, Bi, Fe, Ru, Os, Co, Rh, Ir, Ni, Pd, Pt, Cu, Ag, Au, Zn, Cd, Hg, Sc, Y, Ti, Zr, Hf, V, Nb, Ta, Mn, Tc, and Re	-	4E+4	2E-5	6E-8	-	-
35	Bromine-74 <sup>b/</sup>	D, see <sup>74m</sup> Br	2E+4	7E+4	3E-5	1E-7	-	-
			St wall (4E+4)	-	-	-	5E-4	5E-3
		W, see <sup>74m</sup> Br	-	8E+4	4E-5	1E-7	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )							
35	Bromine-75 <sub>b</sub>	D, see <sup>74m</sup> Br	3E+4	5E+4	2E-5	7E-8	-	-
			St wall (4E+4)	-	-	-	5E-4	5E-3
		W, see <sup>74m</sup> Br	-	5E+4	2E-5	7E-8	-	-
35	Bromine-76	D, see <sup>74m</sup> Br	4E+3	5E+3	2E-6	7E-9	5E-5	5E-4
		W, see <sup>74m</sup> Br	-	4E+3	2E-6	6E-9	-	-
35	Bromine-77	D, see <sup>74m</sup> Br	2E+4	2E+4	1E-5	3E-8	2E-4	2E-3
		W, see <sup>74m</sup> Br	-	2E+4	8E-6	3E-8	-	-
35	Bromine-80m	D, see <sup>74m</sup> Br	2E+4	2E+4	7E-6	2E-8	3E-4	3E-3
		W, see <sup>74m</sup> Br	-	1E+4	6E-6	2E-8	-	-
35	Bromine-80 <sub>b</sub>	D, see <sup>74m</sup> Br	5E+4	2E+5	8E-5	3E-7	-	-
			St wall (9E+4)	-	-	-	1E-3	1E-2
		W, see <sup>74m</sup> Br	-	2E+5	9E-5	3E-7	-	-
35	Bromine-82	D, see <sup>74m</sup> Br	3E+3	4E+3	2E-6	6E-9	4E-5	4E-4
		W, see <sup>74m</sup> Br	-	4E+3	2E-6	5E-9	-	-
35	Bromine-83	D, see <sup>74m</sup> Br	5E+4	6E+4	3E-5	9E-8	-	-
			St wall (7E+4)	-	-	-	9E-4	9E-3
		W, see <sup>74m</sup> Br	-	6E+4	3E-5	9E-8	-	-
35	Bromine-84 <sub>b</sub>	D, see <sup>74m</sup> Br	2E+4	6E+4	2E-5	8E-8	-	-
			St wall (3E+4)	-	-	-	4E-4	4E-3
		W, see <sup>74m</sup> Br	-	6E+4	3E-5	9E-8	-	-
36	Krypton-74 <sub>b</sub>	Submersion <sup>a</sup>	-	-	3E-6	1E-8	-	-
36	Krypton-76	Submersion <sup>a</sup>	-	-	9E-6	4E-8	-	-
36	Krypton-77 <sub>b</sub>	Submersion <sup>a</sup>	-	-	4E-6	2E-8	-	-
36	Krypton-79	Submersion <sup>a</sup>	-	-	2E-5	7E-8	-	-
36	Krypton-81	Submersion <sup>a</sup>	-	-	7E-4	3E-6	-	-
36	Krypton-83m <sub>b</sub>	Submersion <sup>a</sup>	-	-	1E-2	5E-5	-	-
36	Krypton-85m	Submersion <sup>a</sup>	-	-	2E-5	1E-7	-	-
36	Krypton-85	Submersion <sup>a</sup>	-	-	1E-4	7E-7	-	-
36	Krypton-87 <sub>b</sub>	Submersion <sup>a</sup>	-	-	5E-6	2E-8	-	-
36	Krypton-88	Submersion <sup>a</sup>	-	-	2E-6	9E-9	-	-
37	Rubidium-79 <sub>b</sub>	D, all compounds	4E+4	1E+5	5E-5	2E-7	-	-
			St wall (6E+4)	-	-	-	8E-4	8E-3
37	Rubidium-81m <sub>b</sub>	D, all compounds	2E+5	3E+5	1E-4	5E-7	-	-
			St wall (3E+5)	-	-	-	4E-3	4E-2
37	Rubidium-81	D, all compounds	4E+4	5E+4	2E-5	7E-8	5E-4	5E-3
37	Rubidium-82m	D, all compounds	1E+4	2E+4	7E-6	2E-8	2E-4	2E-3
37	Rubidium-83	D, all compounds	6E+2	1E+3	4E-7	1E-9	9E-6	9E-5
37	Rubidium-84	D, all compounds	5E+2	8E+2	3E-7	1E-9	7E-6	7E-5
37	Rubidium-86	D, all compounds	5E+2	8E+2	3E-7	1E-9	7E-6	7E-5
37	Rubidium-87	D, all compounds	1E+3	2E+3	6E-7	2E-9	1E-5	1E-4
37	Rubidium-88 <sub>b</sub>	D, all compounds	2E+4	6E+4	3E-5	9E-8	-	-
			St wall (3E+4)	-	-	-	4E-4	4E-3

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )							
37	Rubidium-89 <sup>b/</sup>	D, all compounds	4E+4	1E+5	6E-5	2E-7	-	-
			St wall (6E+4)	-	-	-	9E-4	9E-3
38	Strontium-80 <sup>b/</sup>	D, all soluble compounds except SrTiO <sub>3</sub>	4E+3	1E+4	5E-6	2E-8	6E-5	6E-4
		Y, all insoluble compounds and SrTiO <sub>3</sub>	-	1E+4	5E-6	2E-8	-	-
38	Strontium-81 <sup>b/</sup>	D, see <sup>80</sup> Sr	3E+4	8E+4	3E-5	1E-7	3E-4	3E-3
		Y, see <sup>80</sup> Sr	2E+4	8E+4	3E-5	1E-7	-	-
38	Strontium-82	D, see <sup>80</sup> Sr	3E+2	4E+2	2E-7	6E-10	-	-
			LLI wall (2E+2)	-	-	-	3E-6	3E-5
		Y, see <sup>80</sup> Sr	2E+2	9E+1	4E-8	1E-10	-	-
38	Strontium-83	D, see <sup>80</sup> Sr	3E+3	7E+3	3E-6	1E-8	3E-5	3E-4
		Y, see <sup>80</sup> Sr	2E+3	4E+3	1E-6	5E-9	-	-
38	Strontium-85 <sup>m/b/</sup>	D, see <sup>80</sup> Sr	2E+5	6E+5	3E-4	9E-7	3E-3	3E-2
		Y, see <sup>80</sup> Sr	-	8E+5	4E-4	1E-6	-	-
38	Strontium-85	D, see <sup>80</sup> Sr	3E+3	3E+3	1E-6	4E-9	4E-5	4E-4
		Y, see <sup>80</sup> Sr	-	2E+3	6E-7	2E-9	-	-
38	Strontium-87 <sup>m</sup>	D, see <sup>80</sup> Sr	5E+4	1E+5	5E-5	2E-7	6E-4	6E-3
		Y, see <sup>80</sup> Sr	4E+4	2E+5	6E-5	2E-7	-	-
38	Strontium-89	D, see <sup>80</sup> Sr	6E+2	8E+2	4E-7	1E-9	-	-
			LLI wall (6E+2)	-	-	-	8E-6	8E-5
		Y, see <sup>80</sup> Sr	5E+2	1E+2	6E-8	2E-10	-	-
38	Strontium-90	D, see <sup>80</sup> Sr	3E+1	2E+1	8E-9	-	-	-
			Bone surf (4E+1)	Bone surf (2E+1)	-	3E-11	5E-7	5E-6
		Y, see <sup>80</sup> Sr	-	4E+0	2E-9	6E-12	-	-
38	Strontium-91	D, see <sup>80</sup> Sr	2E+3	6E+3	2E-6	8E-9	2E-5	2E-4
		Y, see <sup>80</sup> Sr	-	4E+3	1E-6	5E-9	-	-
38	Strontium-92	D, see <sup>80</sup> Sr	3E+3	9E+3	4E-6	1E-8	4E-5	4E-4
		Y, see <sup>80</sup> Sr	-	7E+3	3E-6	9E-9	-	-
39	Yttrium-86 <sup>m/b/</sup>	W, all compounds except those given for Y	2E+4	6E+4	2E-5	8E-8	3E-4	3E-3
		Y, oxides and hydroxides	-	5E+4	2E-5	8E-8	-	-
39	Yttrium-86	W, see <sup>86m</sup> Y	1E+3	3E+3	1E-6	5E-9	2E-5	2E-4
		Y, see <sup>86m</sup> Y	-	3E+3	1E-6	5E-9	-	-
39	Yttrium-87	W, see <sup>86m</sup> Y	2E+3	3E+3	1E-6	5E-9	3E-5	3E-4
		Y, see <sup>86m</sup> Y	-	3E+3	1E-6	5E-9	-	-
39	Yttrium-88	W, see <sup>86m</sup> Y	1E+3	3E+2	1E-7	3E-10	1E-5	1E-4
		Y, see <sup>86m</sup> Y	-	2E+2	1E-7	3E-10	-	-
39	Yttrium-90 <sup>m</sup>	W, see <sup>86m</sup> Y	8E+3	1E+4	5E-6	2E-8	1E-4	1E-3
		Y, see <sup>86m</sup> Y	-	1E+4	5E-6	2E-8	-	-
39	Yttrium-90	W, see <sup>86m</sup> Y	4E+2	7E+2	3E-7	9E-10	-	-
			LLI wall (5E+2)	-	-	-	7E-6	7E-5
		Y, see <sup>86m</sup> Y	-	6E+2	3E-7	9E-10	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI      DAC ( $\mu\text{Ci/ml}$ )    ( $\mu\text{Ci/ml}$ )		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
39	Yttrium-91m <sup>b/</sup>	W, see <sup>86m</sup> Y	1E+5	2E+5	1E-4	3E-7	2E-3	2E-2
		Y, see <sup>86m</sup> Y	-	2E+5	7E-5	2E-7	-	-
39	Yttrium-91	W, see <sup>86m</sup> Y	5E+2	2E+2	7E-8	2E-10	-	-
		LLI wall (6E+2)	-	-	-	-	8E-6	8E-5
		Y, see <sup>86m</sup> Y	-	1E+2	5E-8	2E-10	-	-
39	Yttrium-92	W, see <sup>86m</sup> Y	3E+3	9E+3	4E-6	1E-8	4E-5	4E-4
		Y, see <sup>86m</sup> Y	-	8E+3	3E-6	1E-8	-	-
39	Yttrium-93	W, see <sup>86m</sup> Y	1E+3	3E+3	1E-6	4E-9	2E-5	2E-4
		Y, see <sup>86m</sup> Y	-	2E+3	1E-6	3E-9	-	-
39	Yttrium-94 <sup>b/</sup>	W, see <sup>86m</sup> Y	2E+4	8E+4	3E-5	1E-7	-	-
		St wall (3E+4)	-	-	-	-	4E-4	4E-3
		Y, see <sup>86m</sup> Y	-	8E+4	3E-5	1E-7	-	-
39	Yttrium-95 <sup>b/</sup>	W, see <sup>86m</sup> Y	4E+4	2E+5	6E-5	2E-7	-	-
		St wall (5E+4)	-	-	-	-	7E-4	7E-3
		Y, see <sup>86m</sup> Y	-	1E+5	6E-5	2E-7	-	-
40	Zirconium-86	D, all compounds except those given for W and Y	1E+3	4E+3	2E-6	6E-9	2E-5	2E-4
		W, oxides, hydroxides, halides, and nitrates	-	3E+3	1E-6	4E-9	-	-
		Y, carbide	-	2E+3	1E-6	3E-9	-	-
40	Zirconium-88	D, see <sup>86</sup> Zr	4E+3	2E+2	9E-8	3E-10	5E-5	5E-4
		W, see <sup>86</sup> Zr	-	5E+2	2E-7	7E-10	-	-
		Y, see <sup>86</sup> Zr	-	3E+2	1E-7	4E-10	-	-
40	Zirconium-89	D, see <sup>86</sup> Zr	2E+3	4E+3	1E-6	5E-9	2E-5	2E-4
		W, see <sup>86</sup> Zr	-	2E+3	1E-6	3E-9	-	-
		Y, see <sup>86</sup> Zr	-	2E+3	1E-6	3E-9	-	-
40	Zirconium-93	D, see <sup>86</sup> Zr	1E+3	6E+0	3E-9	-	-	-
		Bone surf (3E+3)	-	Bone surf (2E+1)	-	2E-11	4E-5	4E-4
		W, see <sup>86</sup> Zr	-	2E+1	1E-8	-	-	-
		Bone surf	-	(6E+1)	-	9E-11	-	-
		Y, see <sup>86</sup> Zr	-	6E+1	2E-8	-	-	-
		Bone surf	-	(7E+1)	-	9E-11	-	-
40	Zirconium-95	D, see <sup>86</sup> Zr	1E+3	1E+2	5E-8	-	2E-5	2E-4
		-	Bone surf (3E+2)	-	4E-10	-	-	-
		W, see <sup>86</sup> Zr	-	4E+2	2E-7	5E-10	-	-
		Y, see <sup>86</sup> Zr	-	3E+2	1E-7	4E-10	-	-
40	Zirconium-97	D, see <sup>86</sup> Zr	6E+2	2E+3	8E-7	3E-9	9E-6	9E-5
		W, see <sup>86</sup> Zr	-	1E+3	6E-7	2E-9	-	-
		Y, see <sup>86</sup> Zr	-	1E+3	5E-7	2E-9	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion	Inhalation		Air	Water	
				ALI ( $\mu\text{Ci}$ )	ALI ( $\mu\text{Ci}$ )			
41	Niobium-88 <sup>b/</sup>	W, all compounds except those given for Y	5E+4	2E+5	9E-5	3E-7	-	-
			St wall (7E+4)	-	-	-	1E-3	1E-2
41	Niobium-89 <sup>b/</sup> (66 min)	Y, oxides and hydroxides W, see <sup>88</sup> Nb	-	2E+5	9E-5	3E-7	-	-
		Y, see <sup>88</sup> Nb	-	4E+4	2E-5	5E-8	-	-
41	Niobium-89 (122 min)	W, see <sup>88</sup> Nb	5E+3	2E+4	8E-6	3E-8	7E-5	7E-4
		Y, see <sup>88</sup> Nb	-	2E+4	6E-6	2E-8	-	-
41	Niobium-90	W, see <sup>88</sup> Nb	1E+3	3E+3	1E-6	4E-9	1E-5	1E-4
		Y, see <sup>88</sup> Nb	-	2E+3	1E-6	3E-9	-	-
41	Niobium-93m	W, see <sup>88</sup> Nb	9E+3	2E+3	8E-7	3E-9	-	-
			LLI wall (1E+4)	-	-	-	2E-4	2E-3
		Y, see <sup>88</sup> Nb	-	2E+2	7E-8	2E-10	-	-
41	Niobium-94	W, see <sup>88</sup> Nb	9E+2	2E+2	8E-8	3E-10	1E-5	1E-4
		Y, see <sup>88</sup> Nb	-	2E+1	6E-9	2E-11	-	-
41	Niobium-95m	W, see <sup>88</sup> Nb	2E+3	3E+3	1E-6	4E-9	-	-
			LLI wall (2E+3)	-	-	-	3E-5	3E-4
		Y, see <sup>88</sup> Nb	-	2E+3	9E-7	3E-9	-	-
41	Niobium-95	W, see <sup>88</sup> Nb	2E+3	1E+3	5E-7	2E-9	3E-5	3E-4
		Y, see <sup>88</sup> Nb	-	1E+3	5E-7	2E-9	-	-
41	Niobium-96	W, see <sup>88</sup> Nb	1E+3	3E+3	1E-6	4E-9	2E-5	2E-4
		Y, see <sup>88</sup> Nb	-	2E+3	1E-6	3E-9	-	-
41	Niobium-97 <sup>b/</sup>	W, see <sup>88</sup> Nb	2E+4	8E+4	3E-5	1E-7	3E-4	3E-3
		Y, see <sup>88</sup> Nb	-	7E+4	3E-5	1E-7	-	-
41	Niobium-98 <sup>b/</sup>	W, see <sup>88</sup> Nb	1E+4	5E+4	2E-5	8E-8	2E-4	2E-3
		Y, see <sup>88</sup> Nb	-	5E+4	2E-5	7E-8	-	-
42	Molybdenum-90	D, all compounds except those given for Y	4E+3	7E+3	3E-6	1E-8	3E-5	3E-4
		Y, oxides, hydroxides, and MoS <sub>2</sub>	2E+3	5E+3	2E-6	6E-9	-	-
42	Molybdenum-93m	D, see <sup>90</sup> Mo	9E+3	2E+4	7E-6	2E-8	6E-5	6E-4
		Y, see <sup>90</sup> Mo	4E+3	1E+4	6E-6	2E-8	-	-
42	Molybdenum-93	D, see <sup>90</sup> Mo	4E+3	5E+3	2E-6	8E-9	5E-5	5E-4
		Y, see <sup>90</sup> Mo	2E+4	2E+2	8E-8	2E-10	-	-
42	Molybdenum-99	D, see <sup>90</sup> Mo	2E+3	3E+3	1E-6	4E-9	-	-
			LLI wall (1E+3)	-	-	-	2E-5	2E-4
		Y, see <sup>90</sup> Mo	1E+3	1E+3	6E-7	2E-9	-	-
42	Molybdenum-101 <sup>b/</sup>	D, see <sup>90</sup> Mo	4E+4	1E+5	6E-5	2E-7	-	-
			St wall (5E+4)	-	-	-	7E-4	7E-3
		Y, see <sup>90</sup> Mo	-	1E+5	6E-5	2E-7	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI ( $\mu\text{Ci}$ )		DAC ( $\mu\text{Ci/ml}$ )	Air ( $\mu\text{Ci/ml}$ )	
43	Technetium-93m <sup>b/</sup>	D, all compounds except those given for W	7E+4	2E+5	6E-5	2E-7	1E-3	1E-2
		W, oxides, hydroxides, halides, and nitrates	-	3E+5	1E-4	4E-7	-	-
43	Technetium-93	D, see <sup>93m</sup> Tc	3E+4	7E+4	3E-5	1E-7	4E-4	4E-3
		W, see <sup>93m</sup> Tc	-	1E+5	4E-5	1E-7	-	-
43	Technetium-94m <sup>b/</sup>	D, see <sup>93m</sup> Tc	2E+4	4E+4	2E-5	6E-8	3E-4	3E-3
		W, see <sup>93m</sup> Tc	-	6E+4	2E-5	8E-8	-	-
43	Technetium-94	D, see <sup>93m</sup> Tc	9E+3	2E+4	8E-6	3E-8	1E-4	1E-3
		W, see <sup>93m</sup> Tc	-	2E+4	1E-5	3E-8	-	-
43	Technetium-95m	D, see <sup>93m</sup> Tc	4E+3	5E+3	2E-6	8E-9	5E-5	5E-4
		W, see <sup>93m</sup> Tc	-	2E+3	8E-7	3E-9	-	-
43	Technetium-95	D, see <sup>93m</sup> Tc	1E+4	2E+4	9E-6	3E-8	1E-4	1E-3
		W, see <sup>93m</sup> Tc	-	2E+4	8E-6	3E-8	-	-
43	Technetium-96m <sup>b/</sup>	D, see <sup>93m</sup> Tc	2E+5	3E+5	1E-4	4E-7	2E-3	2E-2
		W, see <sup>93m</sup> Tc	-	2E+5	1E-4	3E-7	-	-
43	Technetium-96	D, see <sup>93m</sup> Tc	2E+3	3E+3	1E-6	5E-9	3E-5	3E-4
		W, see <sup>93m</sup> Tc	-	2E+3	9E-7	3E-9	-	-
43	Technetium-97m	D, see <sup>93m</sup> Tc	5E+3	7E+3	3E-6	-	6E-5	6E-4
				St wall (7E+3)	-	1E-8	-	-
		W, see <sup>93m</sup> Tc	-	1E+3	5E-7	2E-9	-	-
43	Technetium-97	D, see <sup>93m</sup> Tc	4E+4	5E+4	2E-5	7E-8	5E-4	5E-3
		W, see <sup>93m</sup> Tc	-	6E+3	2E-6	8E-9	-	-
43	Technetium-98	D, see <sup>93m</sup> Tc	1E+3	2E+3	7E-7	2E-9	1E-5	1E-4
		W, see <sup>93m</sup> Tc	-	3E+2	1E-7	4E-10	-	-
43	Technetium-99m	D, see <sup>93m</sup> Tc	8E+4	2E+5	6E-5	2E-7	1E-3	1E-2
		W, see <sup>93m</sup> Tc	-	2E+5	1E-4	3E-7	-	-
43	Technetium-99	D, see <sup>93m</sup> Tc	4E+3	5E+3	2E-6	-	6E-5	6E-4
				St wall (6E+3)	-	8E-9	-	-
		W, see <sup>93m</sup> Tc	-	7E+2	3E-7	9E-10	-	-
43	Technetium-101 <sup>b/</sup>	D, see <sup>93m</sup> Tc	9E+4	3E+5	1E-4	5E-7	-	-
				St wall (1E+5)	-	-	2E-3	2E-2
		W, see <sup>93m</sup> Tc	-	4E+5	2E-4	5E-7	-	-
43	Technetium-104 <sup>b/</sup>	D, see <sup>93m</sup> Tc	2E+4	7E+4	3E-5	1E-7	-	-
				St wall (3E+4)	-	-	4E-4	4E-3
		W, see <sup>93m</sup> Tc	-	9E+4	4E-5	1E-7	-	-
44	Ruthenium-94 <sup>b/</sup>	D, all compounds except those given for W and Y	2E+4	4E+4	2E-5	6E-8	2E-4	2E-3
		W, halides	-	6E+4	3E-5	9E-8	-	-
		Y, oxides and hydroxides	-	6E+4	2E-5	8E-8	-	-
44	Ruthenium-97	D, see <sup>94</sup> Ru	8E+3	2E+4	8E-6	3E-8	1E-4	1E-3
		W, see <sup>94</sup> Ru	-	1E+4	5E-6	2E-8	-	-
		Y, see <sup>94</sup> Ru	-	1E+4	5E-6	2E-8	-	-
44	Ruthenium-103	D, see <sup>94</sup> Ru	2E+3	2E+3	7E-7	2E-9	3E-5	3E-4
		W, see <sup>94</sup> Ru	-	1E+3	4E-7	1E-9	-	-
		Y, see <sup>94</sup> Ru	-	6E+2	3E-7	9E-10	-	-



**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
				ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )			
44	Ruthenium-105	D, see <sup>94</sup> Ru	5E+3	1E+4	6E-6	2E-8	7E-5	7E-4
		W, see <sup>94</sup> Ru	-	1E+4	6E-6	2E-8	-	-
		Y, see <sup>94</sup> Ru	-	1E+4	5E-6	2E-8	-	-
44	Ruthenium-106	D, see <sup>94</sup> Ru	2E+2	9E+1	4E-8	1E-10	-	-
		LLI wall (2E+2)	-	-	-	-	3E-6	3E-5
		W, see <sup>94</sup> Ru	-	5E+1	2E-8	8E-11	-	-
		Y, see <sup>94</sup> Ru	-	1E+1	5E-9	2E-11	-	-
45	Rhodium-99m	D, all compounds except those given for W and Y	2E+4	6E+4	2E-5	8E-8	2E-4	2E-3
		W, halides	-	8E+4	3E-5	1E-7	-	-
		Y, oxides and hydroxides	-	7E+4	3E-5	9E-8	-	-
45	Rhodium-101m	D, see <sup>99m</sup> Rh	6E+3	1E+4	5E-6	2E-8	8E-5	8E-4
		W, see <sup>99m</sup> Rh	-	8E+3	4E-6	1E-8	-	-
		Y, see <sup>99m</sup> Rh	-	8E+3	3E-6	1E-8	-	-
45	Rhodium-101	D, see <sup>99m</sup> Rh	2E+3	5E+2	2E-7	7E-10	3E-5	3E-4
		W, see <sup>99m</sup> Rh	-	8E+2	3E-7	1E-9	-	-
		Y, see <sup>99m</sup> Rh	-	2E+2	6E-8	2E-10	-	-
45	Rhodium-99	D, see <sup>99m</sup> Rh	2E+3	3E+3	1E-6	4E-9	3E-5	3E-4
		W, see <sup>99m</sup> Rh	-	2E+3	9E-7	3E-9	-	-
		Y, see <sup>99m</sup> Rh	-	2E+3	8E-7	3E-9	-	-
		W, see <sup>99m</sup> Rh	-	4E+3	2E-6	6E-9	-	-
		Y, see <sup>99m</sup> Rh	-	4E+3	2E-6	5E-9	-	-
45	Rhodium-102m	D, see <sup>99m</sup> Rh	1E+3	5E+2	2E-7	7E-10	-	-
		LLI wall (1E+3)	-	-	-	-	2E-5	2E-4
		W, see <sup>99m</sup> Rh	-	4E+2	2E-7	5E-10	-	-
		Y, see <sup>99m</sup> Rh	-	1E+2	5E-8	2E-10	-	-
45	Rhodium-102	D, see <sup>99m</sup> Rh	6E+2	9E+1	4E-8	1E-10	8E-6	8E-5
		W, see <sup>99m</sup> Rh	-	2E+2	7E-8	2E-10	-	-
		Y, see <sup>99m</sup> Rh	-	6E+1	2E-8	8E-11	-	-
45	Rhodium-103m <sup>b/</sup>	D, see <sup>99m</sup> Rh	4E+5	1E+6	5E-4	2E-6	6E-3	6E-2
		W, see <sup>99m</sup> Rh	-	1E+6	5E-4	2E-6	-	-
		Y, see <sup>99m</sup> Rh	-	1E+6	5E-4	2E-6	-	-
45	Rhodium-105	D, see <sup>99m</sup> Rh	4E+3	1E+4	5E-6	2E-8	-	-
		LLI wall (4E+3)	-	-	-	-	5E-5	5E-4
		W, see <sup>99m</sup> Rh	-	6E+3	3E-6	9E-9	-	-
		Y, see <sup>99m</sup> Rh	-	6E+3	2E-6	8E-9	-	-
45	Rhodium-106m	D, see <sup>99m</sup> Rh	8E+3	3E+4	1E-5	4E-8	1E-4	1E-3
		W, see <sup>99m</sup> Rh	-	4E+4	2E-5	5E-8	-	-
		Y, see <sup>99m</sup> Rh	-	4E+4	1E-5	5E-8	-	-
45	Rhodium-107 <sup>b/</sup>	D, see <sup>99m</sup> Rh	7E+4	2E+5	1E-4	3E-7	-	-
		St wall (9E+4)	-	-	-	-	1E-3	1E-2
		W, see <sup>99m</sup> Rh	-	3E+5	1E-4	4E-7	-	-
		Y, see <sup>99m</sup> Rh	-	3E+5	1E-4	3E-7	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )							
46	Palladium-100	D, all compound44s except those given for W and4 Y	1E+3	1E+3	6E-7	2E-9	2E-5	2E-4
		W, nitrates	-	1E+3	5E-7	2E-9	-	-
		Y, oxides and hydroxides	-	1E+3	6E-7	2E-9	-	-
46	Palladium-101	D, see <sup>100</sup> Pd	1E+4	3E+4	1E-5	5E-8	2E-4	2E-3
		W, see <sup>100</sup> Pd	-	3E+4	1E-5	5E-8	-	-
		Y, see <sup>100</sup> Pd	-	3E+4	1E-5	4E-8	-	-
46	Palladium-103	D, see <sup>100</sup> Pd	6E+3	6E+3	3E-6	9E-9	-	-
		LLI wall (7E+3)	-	-	-	-	1E-4	1E-3
		W, see <sup>100</sup> Pd	-	4E+3	2E-6	6E-9	-	-
		Y, see <sup>100</sup> Pd	-	4E+3	1E-6	5E-9	-	-
46	Palladium-107	D, see <sup>100</sup> Pd	3E+4	2E+4	9E-6	-	-	-
		LLI wall Kidneys (4E+4)	-	(2E+4)	-	3E-8	5E-4	5E-3
		W, see <sup>100</sup> Pd	-	7E+3	3E-6	1E-8	-	-
		Y, see <sup>100</sup> Pd	-	4E+2	2E-7	6E-10	-	-
46	Palladium-109	D, see <sup>100</sup> Pd	2E+3	6E+3	3E-6	9E-9	3E-5	3E-4
		W, see <sup>100</sup> Pd	-	5E+3	2E-6	8E-9	-	-
		Y, see <sup>100</sup> Pd	-	5E+3	2E-6	6E-9	-	-
47	Silver-102 <sub>2</sub> <sup>b/</sup>	D, all compounds except those given for W and Y	5E+4	2E+5	8E-5	2E-7	-	-
		St wall (6E+4)	-	-	-	-	9E-4	9E-3
		W, nitrates and sulfides	-	2E+5	9E-5	3E-7	-	-
		Y, oxides and hydroxides	-	2E+5	8E-5	3E-7	-	-
47	Silver-103 <sub>2</sub> <sup>b/</sup>	D, see <sup>102</sup> Ag	4E+4	1E+5	4E-5	1E-7	5E-4	5E-3
		W, see <sup>102</sup> Ag	-	1E+5	5E-5	2E-7	-	-
		Y, see <sup>102</sup> Ag	-	1E+5	5E-5	2E-7	-	-
47	Silver-104m <sub>2</sub> <sup>b/</sup>	D, see <sup>102</sup> Ag	3E+4	9E+4	4E-5	1E-7	4E-4	4E-3
		W, see <sup>102</sup> Ag	-	1E+5	5E-5	2E-7	-	-
		Y, see <sup>102</sup> Ag	-	1E+5	5E-5	2E-7	-	-
47	Silver-104 <sub>2</sub> <sup>b/</sup>	D, see <sup>102</sup> Ag	2E+4	7E+4	3E-5	1E-7	3E-4	3E-3
		W, see <sup>102</sup> Ag	-	1E+5	6E-5	2E-7	-	-
		Y, see <sup>102</sup> Ag	-	1E+5	6E-5	2E-7	-	-
47	Silver-105	D, see <sup>102</sup> Ag	3E+3	1E+3	4E-7	1E-9	4E-5	4E-4
		W, see <sup>102</sup> Ag	-	2E+3	7E-7	2E-9	-	-
		Y, see <sup>102</sup> Ag	-	2E+3	7E-7	2E-9	-	-
47	Silver-106m	D, see <sup>102</sup> Ag	8E+2	7E+2	3E-7	1E-9	1E-5	1E-4
		W, see <sup>102</sup> Ag	-	9E+2	4E-7	1E-9	-	-
		Y, see <sup>102</sup> Ag	-	9E+2	4E-7	1E-9	-	-
47	Silver-106 <sub>2</sub> <sup>b/</sup>	D, see <sup>102</sup> Ag	6E+4	2E+5	8E-5	3E-7	-	-
		St wall (6E+4)	-	-	-	-	9E-4	9E-3
		W, see <sup>102</sup> Ag	-	2E+5	9E-5	3E-7	-	-
		Y, see <sup>102</sup> Ag	-	2E+5	8E-5	3E-7	-	-
47	Silver-108m	D, see <sup>102</sup> Ag	6E+2	2E+2	8E-8	3E-10	9E-6	9E-5
		W, see <sup>102</sup> Ag	-	3E+2	1E-7	4E-10	-	-
		Y, see <sup>102</sup> Ag	-	2E+1	1E-8	3E-11	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI ( $\mu\text{Ci}$ )		DAC ( $\mu\text{Ci/ml}$ )	Air ( $\mu\text{Ci/ml}$ )	
47	Silver-110m	D, see <sup>102</sup> Ag	5E+2	1E+2	5E-8	2E-10	6E-6	6E-5
		W, see <sup>102</sup> Ag	-	2E+2	8E-8	3E-10	-	-
		Y, see <sup>102</sup> Ag	-	9E+1	4E-8	1E-10	-	-
47	Silver-111	D, see <sup>102</sup> Ag	9E+2	2E+3	6E-7	-	-	-
		LLI wall	(1E+3)	Liver (2E+3)	-	2E-9	2E-5	2E-4
		W, see <sup>102</sup> Ag	-	9E+2	4E-7	1E-9	-	-
		Y, see <sup>102</sup> Ag	-	9E+2	4E-7	1E-9	-	-
47	Silver-112	D, see <sup>102</sup> Ag	3E+3	8E+3	3E-6	1E-8	4E-5	4E-4
		W, see <sup>102</sup> Ag	-	1E+4	4E-6	1E-8	-	-
		Y, see <sup>102</sup> Ag	-	9E+3	4E-6	1E-8	-	-
47	Silver-115 <sub>b</sub> '	D, see <sup>102</sup> Ag	3E+4	9E+4	4E-5	1E-7	-	-
		St wall	(3E+4)	-	-	-	4E-4	4E-3
		W, see <sup>102</sup> Ag	-	9E+4	4E-5	1E-7	-	-
		Y, see <sup>102</sup> Ag	-	8E+4	3E-5	1E-7	-	-
48	Cadmium-104 <sub>b</sub> '	D, all compounds except those given for W and Y	2E+4	7E+4	3E-5	9E-8	3E-4	3E-3
		W, sulfides, halides, and nitrates	-	1E+5	5E-5	2E-7	-	-
		Y, oxides and hydroxides	-	1E+5	5E-5	2E-7	-	-
48	Cadmium-107	D, see <sup>104</sup> Cd	2E+4	5E+4	2E-5	8E-8	3E-4	3E-3
		W, see <sup>104</sup> Cd	-	6E+4	2E-5	8E-8	-	-
		Y, see <sup>104</sup> Cd	-	5E+4	2E-5	7E-8	-	-
48	Cadmium-109	D, see <sup>104</sup> Cd	3E+2	4E+1	1E-8	-	-	-
		Kidneys	(4E+2)	Kidneys (5E+1)	-	7E-11	6E-6	6E-5
		W, see <sup>104</sup> Cd	-	1E+2	5E-8	-	-	-
		Kidneys	-	(1E+2)	-	2E-10	-	-
		Y, see <sup>104</sup> Cd	-	1E+2	5E-8	2E-10	-	-
48	Cadmium-113m	D, see <sup>104</sup> Cd	2E+1	2E+0	1E-9	-	-	-
		Kidneys	(4E+1)	Kidneys (4E+0)	-	5E-12	5E-7	5E-6
		W, see <sup>104</sup> Cd	-	8E+0	4E-9	-	-	-
		Kidneys	-	(1E+1)	-	2E-11	-	-
		Y, see <sup>104</sup> Cd	-	1E+1	5E-9	2E-11	-	-
48	Cadmium-113	D, see <sup>104</sup> Cd	2E+1	2E+0	9E-10	-	-	-
		Kidneys	(3E+1)	Kidneys (3E+0)	-	5E-12	4E-7	4E-6
		W, see <sup>104</sup> Cd	-	8E+0	3E-9	-	-	-
		Kidneys	-	(1E+1)	-	2E-11	-	-
		Y, see <sup>104</sup> Cd	-	1E+1	6E-9	2E-11	-	-
48	Cadmium-115m	D, see <sup>104</sup> Cd	3E+2	5E+1	2E-8	-	4E-6	4E-5
		Kidneys	-	(8E+1)	-	1E-10	-	-
		W, see <sup>104</sup> Cd	-	1E+2	5E-8	2E-10	-	-
		Y, see <sup>104</sup> Cd	-	1E+2	6E-8	2E-10	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI      DAC ( $\mu\text{Ci/ml}$ )    ( $\mu\text{Ci/ml}$ )		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
48	Cadmium-115	D, see <sup>104</sup> Cd	9E+2	1E+3	6E-7	2E-9	-	-
			LLI wall (1E+3)	-	-	-	1E-5	1E-4
		W, see <sup>104</sup> Cd	-	1E+3	5E-7	2E-9	-	-
		Y, see <sup>104</sup> Cd	-	1E+3	6E-7	2E-9	-	-
48	Cadmium-117m	D, see <sup>104</sup> Cd	5E+3	1E+4	5E-6	2E-8	6E-5	6E-4
		W, see <sup>104</sup> Cd	-	2E+4	7E-6	2E-8	-	-
		Y, see <sup>104</sup> Cd	-	1E+4	6E-6	2E-8	-	-
48	Cadmium-117	D, see <sup>104</sup> Cd	5E+3	1E+4	5E-6	2E-8	6E-5	6E-4
		W, see <sup>104</sup> Cd	-	2E+4	7E-6	2E-8	-	-
		Y, see <sup>104</sup> Cd	-	1E+4	6E-6	2E-8	-	-
49	Indium-109	D, all compounds except those given for W	2E+4	4E+4	2E-5	6E-8	3E-4	3E-3
		W, oxides, hydroxides, halides, and nitrates	-	6E+4	3E-5	9E-8	-	-
49	Indium-110 <sup>b/</sup> (69.1 min)	D, see <sup>109</sup> In	2E+4	4E+4	2E-5	6E-8	2E-4	2E-3
		W, see <sup>109</sup> In	-	6E+4	2E-5	8E-8	-	-
49	Indium-110 (4.9 h)	D, see <sup>109</sup> In	5E+3	2E+4	7E-6	2E-8	7E-5	7E-4
		W, see <sup>109</sup> In	-	2E+4	8E-6	3E-8	-	-
49	Indium-111	D, see <sup>109</sup> In	4E+3	6E+3	3E-6	9E-9	6E-5	6E-4
		W, see <sup>109</sup> In	-	6E+3	3E-6	9E-9	-	-
49	Indium-112 <sup>b/</sup>	D, see <sup>109</sup> In	2E+5	6E+5	3E-4	9E-7	2E-3	2E-2
		W, see <sup>109</sup> In	-	7E+5	3E-4	1E-6	-	-
49	Indium-113m <sup>b/</sup>	D, see <sup>109</sup> In	5E+4	1E+5	6E-5	2E-7	7E-4	7E-3
		W, see <sup>109</sup> In	-	2E+5	8E-5	3E-7	-	-
49	Indium-114m	D, see <sup>109</sup> In	3E+2	6E+1	3E-8	9E-11	-	-
			LLI wall (4E+2)	-	-	-	5E-6	5E-5
		W, see <sup>109</sup> In	-	1E+2	4E-8	1E-10	-	-
49	Indium-115m	D, see <sup>109</sup> In	1E+4	4E+4	2E-5	6E-8	2E-4	2E-3
		W, see <sup>109</sup> In	-	5E+4	2E-5	7E-8	-	-
49	Indium-115	D, see <sup>109</sup> In	4E+1	1E+0	6E-10	2E-12	5E-7	5E-6
		W, see <sup>109</sup> In	-	5E+0	2E-9	8E-12	-	-
49	Indium-116m <sup>b/</sup>	D, see <sup>109</sup> In	2E+4	8E+4	3E-5	1E-7	3E-4	3E-3
		W, see <sup>109</sup> In	-	1E+5	5E-5	2E-7	-	-
49	Indium-117m <sup>b/</sup>	D, see <sup>109</sup> In	1E+4	3E+4	1E-5	5E-8	2E-4	2E-3
		W, see <sup>109</sup> In	-	4E+4	2E-5	6E-8	-	-
49	Indium-117 <sup>b/</sup>	D, see <sup>109</sup> In	6E+4	2E+5	7E-5	2E-7	8E-4	8E-3
		W, see <sup>109</sup> In	-	2E+5	9E-5	3E-7	-	-
49	Indium-119m <sup>b/</sup>	D, see <sup>109</sup> In	4E+4	1E+5	5E-5	2E-7	-	-
			St wall (5E+4)	-	-	-	7E-4	7E-3
		W, see <sup>109</sup> In	-	1E+5	6E-5	2E-7	-	-
50	Tin-110	D, all compounds except those given for W	4E+3	1E+4	5E-6	2E-8	5E-5	5E-4
		W, sulfides, oxides, hydroxides, halides, nitrates, and stannic phosphate	-	1E+4	5E-6	2E-8	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )	Air ( $\mu\text{Ci/ml}$ )						
50	Tin-111 <sup>b/</sup>	D, see <sup>110</sup> Sn	7E+4	2E+5	9E-5	3E-7	1E-3	1E-2
		W, see <sup>110</sup> Sn	-	3E+5	1E-4	4E-7	-	-
50	Tin-113	D, see <sup>110</sup> Sn	2E+3	1E+3	5E-7	2E-9	-	-
			LLI wall (2E+3)	-	-	-	3E-5	3E-4
		W, see <sup>110</sup> Sn	-	5E+2	2E-7	8E-10	-	-
50	Tin-117m	D, see <sup>110</sup> Sn	2E+3	1E+3	5E-7	-	-	-
			LLI wall	Bone surf (2E+3)	-	3E-9	3E-5	3E-4
		W, see <sup>110</sup> Sn	-	1E+3	6E-7	2E-9	-	-
50	Tin-119m	D, see <sup>110</sup> Sn	3E+3	2E+3	1E-6	3E-9	-	-
			LLI wall (4E+3)	-	-	-	6E-5	6E-4
		W, see <sup>110</sup> Sn	-	1E+3	4E-7	1E-9	-	-
50	Tin-121m	D, see <sup>110</sup> Sn	3E+3	9E+2	4E-7	1E-9	-	-
			LLI wall (4E+3)	-	-	-	5E-5	5E-4
		W, see <sup>110</sup> Sn	-	5E+2	2E-7	8E-10	-	-
50	Tin-121	D, see <sup>110</sup> Sn	6E+3	2E+4	6E-6	2E-8	-	-
			LLI wall (6E+3)	-	-	-	8E-5	8E-4
		W, see <sup>110</sup> Sn	-	1E+4	5E-6	2E-8	-	-
50	Tin-123m <sup>b/</sup>	D, see <sup>110</sup> Sn	5E+4	1E+5	5E-5	2E-7	7E-4	7E-3
		W, see <sup>110</sup> Sn	-	1E+5	6E-5	2E-7	-	-
50	Tin-123	D, see <sup>110</sup> Sn	5E+2	6E+2	3E-7	9E-10	-	-
			LLI wall (6E+2)	-	-	-	9E-6	9E-5
		W, see <sup>110</sup> Sn	-	2E+2	7E-8	2E-10	-	-
50	Tin-125	D, see <sup>110</sup> Sn	4E+2	9E+2	4E-7	1E-9	-	-
			LLI wall (5E+2)	-	-	-	6E-6	6E-5
		W, see <sup>110</sup> Sn	-	4E+2	1E-7	5E-10	-	-
50	Tin-126	D, see <sup>110</sup> Sn	3E+2	6E+1	2E-8	8E-11	4E-6	4E-5
		W, see <sup>110</sup> Sn	-	7E+1	3E-8	9E-11	-	-
50	Tin-127	D, see <sup>110</sup> Sn	7E+3	2E+4	8E-6	3E-8	9E-5	9E-4
		W, see <sup>110</sup> Sn	-	2E+4	8E-6	3E-8	-	-
50	Tin-128 <sup>b/</sup>	D, see <sup>110</sup> Sn	9E+3	3E+4	1E-5	4E-8	1E-4	1E-3
		W, see <sup>110</sup> Sn	-	4E+4	1E-5	5E-8	-	-
51	Antimony-115 <sup>b/</sup>	D, all compounds except those given for W	8E+4	2E+5	1E-4	3E-7	1E-3	1E-2
		W, oxides, hydroxides, halides, sulfides, sulfates, and nitrates	-	3E+5	1E-4	4E-7	-	-
51	Antimony-116m <sup>b/</sup>	D, see <sup>115</sup> Sb	2E+4	7E+4	3E-5	1E-7	3E-4	3E-3
		W, see <sup>115</sup> Sb	-	1E+5	6E-5	2E-7	-	-
51	Antimony-116 <sup>b/</sup>	D, see <sup>115</sup> Sb	7E+4	3E+5	1E-4	4E-7	-	-
			St wall (9E+4)	-	-	-	1E-3	1E-2
		W, see <sup>115</sup> Sb	-	3E+5	1E-4	5E-7	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )							
51	Antimony-117	D, see <sup>115</sup> Sb	7E+4	2E+5	9E-5	3E-7	9E-4	9E-3
		W, see <sup>115</sup> Sb	-	3E+5	1E-4	4E-7	-	-
51	Antimony-118m	D, see <sup>115</sup> Sb	6E+3	2E+4	8E-6	3E-8	7E-5	7E-4
		W, see <sup>115</sup> Sb	5E+3	2E+4	9E-6	3E-8	-	-
51	Antimony-119	D, see <sup>115</sup> Sb	2E+4	5E+4	2E-5	6E-8	2E-4	2E-3
		W, see <sup>115</sup> Sb	2E+4	3E+4	1E-5	4E-8	-	-
51	Antimony-120 <sup>b/</sup> (16 min)	D, see <sup>115</sup> Sb	1E+5	4E+5	2E-4	6E-7	-	-
		St wall (2E+5)	-	-	-	-	2E-3	2E-2
		W, see <sup>115</sup> Sb	-	5E+5	2E-4	7E-7	-	-
51	Antimony-120 (5.76 d)	D, see <sup>115</sup> Sb	1E+3	2E+3	9E-7	3E-9	1E-5	1E-4
		W, see <sup>115</sup> Sb	9E+2	1E+3	5E-7	2E-9	-	-
51	Antimony-122	D, see <sup>115</sup> Sb	8E+2	2E+3	1E-6	3E-9	-	-
		LLI wall (8E+2)	-	-	-	-	1E-5	1E-4
		W, see <sup>115</sup> Sb	7E+2	1E+3	4E-7	2E-9	-	-
51	Antimony-124m <sup>b/</sup>	D, see <sup>115</sup> Sb	3E+5	8E+5	4E-4	1E-6	3E-3	3E-2
		W, see <sup>115</sup> Sb	2E+5	6E+5	2E-4	8E-7	-	-
51	Antimony-124	D, see <sup>115</sup> Sb	6E+2	9E+2	4E-7	1E-9	7E-6	7E-5
		W, see <sup>115</sup> Sb	5E+2	2E+2	1E-7	3E-10	-	-
51	Antimony-125	D, see <sup>115</sup> Sb	2E+3	2E+3	1E-6	3E-9	3E-5	3E-4
		W, see <sup>115</sup> Sb	-	5E+2	2E-7	7E-10	-	-
51	Antimony-126m <sup>b/</sup>	D, see <sup>115</sup> Sb	5E+4	2E+5	8E-5	3E-7	-	-
		St wall (7E+4)	-	-	-	-	9E-4	9E-3
		W, see <sup>115</sup> Sb	-	2E+5	8E-5	3E-7	-	-
51	Antimony-126	D, see <sup>115</sup> Sb	6E+2	1E+3	5E-7	2E-9	7E-6	7E-5
		W, see <sup>115</sup> Sb	5E+2	5E+2	2E-7	7E-10	-	-
51	Antimony-127	D, see <sup>115</sup> Sb	8E+2	2E+3	9E-7	3E-9	-	-
		LLI wall (8E+2)	-	-	-	-	1E-5	1E-4
		W, see <sup>115</sup> Sb	7E+2	9E+2	4E-7	1E-9	-	-
51	Antimony-128 <sup>b/</sup> (10.4 min)	D, see <sup>115</sup> Sb	8E+4	4E+5	2E-4	5E-7	-	-
		St wall (1E+5)	-	-	-	-	1E-3	1E-2
		W, see <sup>115</sup> Sb	-	4E+5	2E-4	6E-7	-	-
51	Antimony-128 (9.01 h)	D, see <sup>115</sup> Sb	1E+3	4E+3	2E-6	6E-9	2E-5	2E-4
		W, see <sup>115</sup> Sb	-	3E+3	1E-6	5E-9	-	-
51	Antimony-129	D, see <sup>115</sup> Sb	3E+3	9E+3	4E-6	1E-8	4E-5	4E-4
		W, see <sup>115</sup> Sb	-	9E+3	4E-6	1E-8	-	-
51	Antimony-130 <sup>b/</sup>	D, see <sup>115</sup> Sb	2E+4	6E+4	3E-5	9E-8	3E-4	3E-3
		W, see <sup>115</sup> Sb	-	8E+4	3E-5	1E-7	-	-
51	Antimony-131 <sup>b/</sup>	D, see <sup>115</sup> Sb	1E+4	2E+4	1E-5	-	-	-
		Thyroid (2E+4)	-	Thyroid (4E+4)	-	6E-8	2E-4	2E-3
		W, see <sup>115</sup> Sb	-	Thyroid (2E+4)	1E-5	-	-	-
			-	Thyroid (4E+4)	-	6E-8	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI      DAC ( $\mu\text{Ci}$ )    ( $\mu\text{Ci/ml}$ )		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
52	Tellurium-116	D, all compounds except those given for W	8E+3	2E+4	9E-6	3E-8	1E-4	1E-3
		W, oxides, hydroxides, and nitrates	-	3E+4	1E-5	4E-8	-	-
52	Tellurium-121m	D, see <sup>116</sup> Te	5E+2	2E+2	8E-8	-	-	-
			Bone surf (7E+2)	Bone surf (4E+2)	-	5E-10	1E-5	1E-4
52	Tellurium-121	W, see <sup>116</sup> Te	-	4E+2	2E-7	6E-10	-	-
		D, see <sup>116</sup> Te	3E+3	4E+3	2E-6	6E-9	4E-5	4E-4
		W, see <sup>116</sup> Te	-	3E+3	1E-6	4E-9	-	-
52	Tellurium-123m	D, see <sup>116</sup> Te	6E+2	2E+2	9E-8	-	-	-
			Bone surf (1E+3)	Bone surf (5E+2)	-	8E-10	1E-5	1E-4
		W, see <sup>116</sup> Te	-	5E+2	2E-7	8E-10	-	-
52	Tellurium-123	D, see <sup>116</sup> Te	5E+2	2E+2	8E-8	-	-	-
			Bone surf (1E+3)	Bone surf (5E+2)	-	7E-10	2E-5	2E-4
		W, see <sup>116</sup> Te	-	4E+2	2E-7	-	-	-
			Bone surf (1E+3)	(1E+3)	-	2E-9	-	-
52	Tellurium-125m	D, see <sup>116</sup> Te	1E+3	4E+2	2E-7	-	-	-
			Bone surf (1E+3)	Bone surf (1E+3)	-	1E-9	2E-5	2E-4
		W, see <sup>116</sup> Te	-	7E+2	3E-7	1E-9	-	-
52	Tellurium-127m	D, see <sup>116</sup> Te	6E+2	3E+2	1E-7	-	9E-6	9E-5
			Bone surf (1E+3)	(4E+2)	-	6E-10	-	-
		W, see <sup>116</sup> Te	-	3E+2	1E-7	4E-10	-	-
52	Tellurium-127	D, see <sup>116</sup> Te	7E+3	2E+4	9E-6	3E-8	1E-4	1E-3
		W, see <sup>116</sup> Te	-	2E+4	7E-6	2E-8	-	-
52	Tellurium-129m	D, see <sup>116</sup> Te	5E+2	6E+2	3E-7	9E-10	7E-6	7E-5
		W, see <sup>116</sup> Te	-	2E+2	1E-7	3E-10	-	-
52	Tellurium-129 <sup>b/</sup>	D, see <sup>116</sup> Te	3E+4	6E+4	3E-5	9E-8	4E-4	4E-3
		W, see <sup>116</sup> Te	-	7E+4	3E-5	1E-7	-	-
52	Tellurium-131m	D, see <sup>116</sup> Te	3E+2	4E+2	2E-7	-	-	-
			Thyroid (6E+2)	Thyroid (1E+3)	-	2E-9	8E-6	8E-5
		W, see <sup>116</sup> Te	-	4E+2	2E-7	-	-	-
			-	Thyroid (9E+2)	-	1E-9	-	-
52	Tellurium-131 <sup>b/</sup>	D, see <sup>116</sup> Te	3E+3	5E+3	2E-6	-	-	-
			Thyroid (6E+3)	Thyroid (1E+4)	-	2E-8	8E-5	8E-4
		W, see <sup>116</sup> Te	-	5E+3	2E-6	-	-	-
			-	Thyroid (1E+4)	-	2E-8	-	-



**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI      DAC ( $\mu\text{Ci}$ )    ( $\mu\text{Ci/ml}$ )		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
52	Tellurium-132	D, see <sup>116</sup> Te	2E+2 Thyroid (7E+2)	2E+2 Thyroid (8E+2)	9E-8 -	- 1E-9	- 9E-6	- 9E-5
		W, see <sup>116</sup> Te	-	2E+2 Thyroid (6E+2)	9E-8 -	- 9E-10	- -	- -
52	Tellurium-133m <sub>b/</sub>	D, see <sup>116</sup> Te	3E+3 Thyroid (6E+3)	5E+3 Thyroid (1E+4)	2E-6 -	- 2E-8	- 9E-5	- 9E-4
		W, see <sup>116</sup> Te	-	5E+3 Thyroid (1E+4)	2E-6 -	- 2E-8	- -	- -
52	Tellurium-133 <sub>b/</sub>	D, see <sup>116</sup> Te	- 1E+4 Thyroid (3E+4)	2E+4 Thyroid (6E+4)	9E-6 -	- 8E-8	- 4E-4	- 4E-3
		W, see <sup>116</sup> Te	-	2E+4 Thyroid (6E+4)	9E-6 -	- 8E-8	- -	- -
52	Tellurium-134 <sub>b/</sub>	D, see <sup>116</sup> Te	- 2E+4 Thyroid (2E+4)	2E+4 Thyroid (5E+4)	1E-5 -	- 7E-8	- 3E-4	- 3E-3
		W, see <sup>116</sup> Te	-	2E+4 Thyroid (5E+4)	1E-5 -	- 7E-8	- -	- -
53	Iodine-120m <sub>b/</sub>	D, all compounds	1E+4 Thyroid (1E+4)	2E+4 -	9E-6 -	3E-8 -	- 2E-4	- 2E-3
53	Iodine-120 <sub>b/</sub>	D, all compounds	4E+3 Thyroid (8E+3)	9E+3 Thyroid (1E+4)	4E-6 -	- 2E-8	- 1E-4	- 1E-3
53	Iodine-121	D, all compounds	1E+4 Thyroid (3E+4)	2E+4 Thyroid (5E+4)	8E-6 -	- 7E-8	- 4E-4	- 4E-3
53	Iodine-123	D, all compounds	3E+3 Thyroid (1E+4)	6E+3 Thyroid (2E+4)	3E-6 -	- 2E-8	- 1E-4	- 1E-3
53	Iodine-124	D, all compounds	5E+1 Thyroid (2E+2)	8E+1 Thyroid (3E+2)	3E-8 -	- 4E-10	- 2E-6	- 2E-5
53	Iodine-125	D, all compounds	4E+1 Thyroid (1E+2)	6E+1 Thyroid (2E+2)	3E-8 -	- 3E-10	- 2E-6	- 2E-5
53	Iodine-126	D, all compounds	2E+1 Thyroid (7E+1)	4E+1 Thyroid (1E+2)	1E-8 -	- 2E-10	- 1E-6	- 1E-5
53	Iodine-128 <sub>b/</sub>	D, all compounds	4E+4 St wall (6E+4)	1E+5 -	5E-5 -	2E-7 -	- 8E-4	- 8E-3

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI      DAC ( $\mu\text{Ci}$ )    ( $\mu\text{Ci/ml}$ )		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
53	Iodine-129	D, all compounds	5E+0	9E+0	4E-9	-	-	-
			Thyroid (2E+1)	Thyroid (3E+1)	-	4E-11	2E-7	2E-6
53	Iodine-130	D, all compounds	4E+2	7E+2	3E-7	-	-	-
			Thyroid (1E+3)	Thyroid (2E+3)	-	3E-9	2E-5	2E-4
53	Iodine-131	D, all compounds	3E+1	5E+1	2E-8	-	-	-
			Thyroid (9E+1)	Thyroid (2E+2)	-	2E-10	1E-6	1E-5
53	Iodine-132m <sup>b/</sup>	D, all compounds	4E+3	8E+3	4E-6	-	-	-
			Thyroid (1E+4)	Thyroid (2E+4)	-	3E-8	1E-4	1E-3
53	Iodine-132	D, all compounds	4E+3	8E+3	3E-6	-	-	-
			Thyroid (9E+3)	Thyroid (1E+4)	-	2E-8	1E-4	1E-3
53	Iodine-133	D, all compounds	1E+2	3E+2	1E-7	-	-	-
			Thyroid (5E+2)	Thyroid (9E+2)	-	1E-9	7E-6	7E-5
53	Iodine-134 <sup>b/</sup>	D, all compounds	2E+4	5E+4	2E-5	6E-8	-	-
			Thyroid (3E+4)	-	-	-	4E-4	4E-3
53	Iodine-135	D, all compounds	8E+2	2E+3	7E-7	-	-	-
			Thyroid (3E+3)	Thyroid (4E+3)	-	6E-9	3E-5	3E-4
54	Xenon-120 <sup>b/</sup>	Submersion <sup>a/</sup>	-	-	1E-5	4E-8	-	-
54	Xenon-121 <sup>b/</sup>	Submersion <sup>a/</sup>	-	-	2E-6	1E-8	-	-
54	Xenon-122	Submersion <sup>a/</sup>	-	-	7E-5	3E-7	-	-
54	Xenon-123	Submersion <sup>a/</sup>	-	-	6E-6	3E-8	-	-
54	Xenon-125	Submersion <sup>a/</sup>	-	-	2E-5	7E-8	-	-
54	Xenon-127	Submersion <sup>a/</sup>	-	-	1E-5	6E-8	-	-
54	Xenon-129m	Submersion <sup>a/</sup>	-	-	2E-4	9E-7	-	-
54	Xenon-131m	Submersion <sup>a/</sup>	-	-	4E-4	2E-6	-	-
54	Xenon-133m	Submersion <sup>a/</sup>	-	-	1E-4	6E-7	-	-
54	Xenon-133	Submersion <sup>a/</sup>	-	-	1E-4	5E-7	-	-
54	Xenon-135m <sup>b/</sup>	Submersion <sup>a/</sup>	-	-	9E-6	4E-8	-	-
54	Xenon-135	Submersion <sup>a/</sup>	-	-	1E-5	7E-8	-	-
54	Xenon-138 <sup>b/</sup>	Submersion <sup>a/</sup>	-	-	4E-6	2E-8	-	-
55	Cesium-125 <sup>b/</sup>	D, all compounds	5E+4	1E+5	6E-5	2E-7	-	-
			St wall (9E+4)	-	-	-	1E-3	1E-2
55	Cesium-127	D, all compounds	6E+4	9E+4	4E-5	1E-7	9E-4	9E-3
55	Cesium-129	D, all compounds	2E+4	3E+4	1E-5	5E-8	3E-4	3E-3
55	Cesium-130 <sup>b/</sup>	D, all compounds	6E+4	2E+5	8E-5	3E-7	-	-
			St wall (1E+5)	-	-	-	1E-3	1E-2
55	Cesium-131	D, all compounds	2E+4	3E+4	1E-5	4E-8	3E-4	3E-3
55	Cesium-132	D, all compounds	3E+3	4E+3	2E-6	6E-9	4E-5	4E-4
55	Cesium-134m	D, all compounds	1E+5	1E+5	6E-5	2E-7	-	-
			St wall (1E+5)	-	-	-	2E-3	2E-2

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion  ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
				ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )			
55	Cesium-134	D, all compounds	7E+1	1E+2	4E-8	2E-10	9E-7	9E-6
55	Cesium-135m <sup>b/</sup>	D, all compounds	1E+5	2E+5	8E-5	3E-7	1E-3	1E-2
55	Cesium-135	D, all compounds	7E+2	1E+3	5E-7	2E-9	1E-5	1E-4
55	Cesium-136	D, all compounds	4E+2	7E+2	3E-7	9E-10	6E-6	6E-5
55	Cesium-137	D, all compounds	1E+2	2E+2	6E-8	2E-10	1E-6	1E-5
55	Cesium-138 <sup>b/</sup>	D, all compounds	2E+4	6E+4	2E-5	8E-8	-	-
		St wall (3E+4)	-	-	-	-	4E-4	4E-3
56	Barium-126 <sup>b/</sup>	D, all compounds	6E+3	2E+4	6E-6	2E-8	8E-5	8E-4
56	Barium-128	D, all compounds	5E+2	2E+3	7E-7	2E-9	7E-6	7E-5
56	Barium-131m <sup>b/</sup>	D, all compounds	4E+5	1E+6	6E-4	2E-6	-	-
		St wall (5E+5)	-	-	-	-	7E-3	7E-2
56	Barium-131	D, all compounds	3E+3	8E+3	3E-6	1E-8	4E-5	4E-4
56	Barium-133m	D, all compounds	2E+3	9E+3	4E-6	1E-8	-	-
		LLI wall (3E+3)	-	-	-	-	4E-5	4E-4
56	Barium-135m	D, all compounds	3E+3	1E+4	5E-6	2E-8	4E-5	4E-4
56	Barium-139 <sup>b/</sup>	D, all compounds	1E+4	3E+4	1E-5	4E-8	2E-4	2E-3
56	Barium-140	D, all compounds	5E+2	1E+3	6E-7	2E-9	-	-
		LLI wall (6E+2)	-	-	-	-	8E-6	8E-5
56	Barium-141 <sup>b/</sup>	D, all compounds	2E+4	7E+4	3E-5	1E-7	3E-4	3E-3
56	Barium-142 <sup>b/</sup>	D, all compounds	5E+4	1E+5	6E-5	2E-7	7E-4	7E-3
57	Lanthanum-131 <sup>b/</sup>	D, all compounds except those given for W	5E+4	1E+5	5E-5	2E-7	6E-4	6E-3
		W, oxides and hydroxides	-	2E+5	7E-5	2E-7	-	-
57	Lanthanum-132	D, see <sup>131</sup> La	3E+3	1E+4	4E-6	1E-8	4E-5	4E-4
		W, see <sup>131</sup> La	-	1E+4	5E-6	2E-8	-	-
57	Lanthanum-135	D, see <sup>131</sup> La	4E+4	1E+5	4E-5	1E-7	5E-4	5E-3
		W, see <sup>131</sup> La	-	9E+4	4E-5	1E-7	-	-
57	Lanthanum-137	D, see <sup>131</sup> La	1E+4	6E+1	3E-8	-	2E-4	2E-3
		Liver	-	(7E+1)	-	1E-10	-	-
		W, see <sup>131</sup> La	-	3E+2	1E-7	-	-	-
		Liver	-	(3E+2)	-	4E-10	-	-
57	Lanthanum-138	D, see <sup>131</sup> La	9E+2	4E+0	1E-9	5E-12	1E-5	1E-4
		W, see <sup>131</sup> La	-	1E+1	6E-9	2E-11	-	-
57	Lanthanum-140	D, see <sup>131</sup> La	6E+2	1E+3	6E-7	2E-9	9E-6	9E-5
		W, see <sup>131</sup> La	-	1E+3	5E-7	2E-9	-	-
57	Lanthanum-141	D, see <sup>131</sup> La	4E+3	9E+3	4E-6	1E-8	5E-5	5E-4
		W, see <sup>131</sup> La	-	1E+4	5E-6	2E-8	-	-
57	Lanthanum-142 <sup>b/</sup>	D, see <sup>131</sup> La	8E+3	2E+4	9E-6	3E-8	1E-4	1E-3
		W, see <sup>131</sup> La	-	3E+4	1E-5	5E-8	-	-
57	Lanthanum-143 <sup>b/</sup>	D, see <sup>131</sup> La	4E+4	1E+5	4E-5	1E-7	-	-
		St wall (4E+4)	-	-	-	-	5E-4	5E-3
		W, see <sup>131</sup> La	-	9E+4	4E-5	1E-7	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI    DAC ( $\mu\text{Ci}$ )    ( $\mu\text{Ci/ml}$ )		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
58	Cerium-134	W, all compounds except those given for Y	5E+2 LLI wall (6E+2)	7E+2	3E-7	1E-9	- 8E-6	- 8E-5
		Y, oxides, hydroxides, and fluorides	-	7E+2	3E-7	9E-10	-	-
58	Cerium-135	W, see <sup>134</sup> Ce	2E+3	4E+3	2E-6	5E-9	2E-5	2E-4
		Y, see <sup>134</sup> Ce	-	4E+3	1E-6	5E-9	-	-
58	Cerium-137m	W, see <sup>134</sup> Ce	2E+3 LLI wall (2E+3)	4E+3	2E-6	6E-9	- 3E-5	- 3E-4
		Y, see <sup>134</sup> Ce	-	4E+3	2E-6	5E-9	-	-
58	Cerium-137	W, see <sup>134</sup> Ce	5E+4	1E+5	6E-5	2E-7	7E-4	7E-3
		Y, see <sup>134</sup> Ce	-	1E+5	5E-5	2E-7	-	-
58	Cerium-139	W, see <sup>134</sup> Ce	5E+3	8E+2	3E-7	1E-9	7E-5	7E-4
		Y, see <sup>134</sup> Ce	-	7E+2	3E-7	9E-10	-	-
58	Cerium-141	W, see <sup>134</sup> Ce	2E+3 LLI wall (2E+3)	7E+2	3E-7	1E-9	- 3E-5	- 3E-4
		Y, see <sup>134</sup> Ce	-	6E+2	2E-7	8E-10	-	-
58	Cerium-143	W, see <sup>134</sup> Ce	1E+3 LLI wall (1E+3)	2E+3	8E-7	3E-9	- 2E-5	- 2E-4
		Y, see <sup>134</sup> Ce	-	2E+3	7E-7	2E-9	-	-
58	Cerium-144	W, see <sup>134</sup> Ce	2E+2 LLI wall (3E+2)	3E+1	1E-8	4E-11	- 3E-6	- 3E-5
		Y, see <sup>134</sup> Ce	-	1E+1	6E-9	2E-11	-	-
59	Praseodymium-136 <sup>b</sup>	W, all compounds except those given for Y	5E+4 St wall (7E+4)	2E+5	1E-4	3E-7	- 1E-3	- 1E-2
		Y, oxides, hydroxides, carbides, and fluorides	-	2E+5	9E-5	3E-7	-	-
59	Praseodymium-137 <sup>b</sup>	W, see <sup>136</sup> Pr	4E+4 5E-4	2E+5 5E-3	6E-5	2E-7	-	-
		Y, see <sup>136</sup> Pr	-	1E+5	6E-5	2E-7	-	-
59	Praseodymium-138m	W, see <sup>136</sup> Pr	1E+4	5E+4	2E-5	8E-8	1E-4	1E-3
		Y, see <sup>136</sup> Pr	-	4E+4	2E-5	6E-8	-	-
59	Praseodymium-139	W, see <sup>136</sup> Pr	4E+4	1E+5	5E-5	2E-7	6E-4	6E-3
		Y, see <sup>136</sup> Pr	-	1E+5	5E-5	2E-7	-	-
59	Praseodymium-142m <sup>b</sup>	W, see <sup>136</sup> Pr	8E+4	2E+5	7E-5	2E-7	1E-3	1E-2
		Y, see <sup>136</sup> Pr	-	1E+5	6E-5	2E-7	-	-
59	Praseodymium-142	W, see <sup>136</sup> Pr	1E+3	2E+3	9E-7	3E-9	1E-5	1E-4
		Y, see <sup>136</sup> Pr	-	2E+3	8E-7	3E-9	-	-
59	Praseodymium-143	W, see <sup>136</sup> Pr	9E+2 LLI wall (1E+3)	8E+2	3E-7	1E-9	- 2E-5	- 2E-4
		Y, see <sup>136</sup> Pr	-	7E+2	3E-7	9E-10	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI ( $\mu\text{Ci}$ )		DAC ( $\mu\text{Ci/ml}$ )	Air ( $\mu\text{Ci/ml}$ )	
59	Praseodymium-144 <sup>b/</sup>	W, see <sup>136</sup> Pr	3E+4	1E+5	5E-5	2E-7	-	-
			St wall (4E+4)	-	-	-	6E-4	6E-3
		Y, see <sup>136</sup> Pr	-	1E+5	5E-5	2E-7	-	-
59	Praseodymium-145	W, see <sup>136</sup> Pr	3E+3	9E+3	4E-6	1E-8	4E-5	4E-4
		Y, see <sup>136</sup> Pr	-	8E+3	3E-6	1E-8	-	-
60	Neodymium-136 <sup>b/</sup>	W, all compounds except those given for Y	1E+4	6E+4	2E-5	8E-8	2E-4	2E-3
		Y, oxides, hydroxides, carbides, and fluorides	-	5E+4	2E-5	8E-8	-	-
60	Neodymium-138	W, see <sup>136</sup> Nd	2E+3	6E+3	3E-6	9E-9	3E-5	3E-4
		Y, see <sup>136</sup> Nd	-	5E+3	2E-6	7E-9	-	-
59	Praseodymium-147 <sup>b/</sup>	W, see <sup>136</sup> Pr	5E+4	2E+5	8E-5	3E-7	-	-
			St wall (8E+4)	-	-	-	1E-3	1E-2
		Y, see <sup>136</sup> Pr	-	2E+5	8E-5	3E-7	-	-
60	Neodymium-139m	W, see <sup>136</sup> Nd	5E+3	2E+4	7E-6	2E-8	7E-5	7E-4
		Y, see <sup>136</sup> Nd	-	1E+4	6E-6	2E-8	-	-
60	Neodymium-139 <sup>b/</sup>	W, see <sup>136</sup> Nd	9E+4	3E+5	1E-4	5E-7	1E-3	1E-2
		Y, see <sup>136</sup> Nd	-	3E+5	1E-4	4E-7	-	-
60	Neodymium-141	W, see <sup>136</sup> Nd	2E+5	7E+5	3E-4	1E-6	2E-3	2E-2
		Y, see <sup>136</sup> Nd	-	6E+5	3E-4	9E-7	-	-
60	Neodymium-147	W, see <sup>136</sup> Nd	1E+3	9E+2	4E-7	1E-9	-	-
			LLI wall (1E+3)	-	-	-	2E-5	2E-4
		Y, see <sup>136</sup> Nd	-	8E+2	4E-7	1E-9	-	-
60	Neodymium-149 <sup>b/</sup>	W, see <sup>136</sup> Nd	1E+4	3E+4	1E-5	4E-8	1E-4	1E-3
		Y, see <sup>136</sup> Nd	-	2E+4	1E-5	3E-8	-	-
60	Neodymium-151 <sup>b/</sup>	W, see <sup>136</sup> Nd	7E+4	2E+5	8E-5	3E-7	9E-4	9E-3
		Y, see <sup>136</sup> Nd	-	2E+5	8E-5	3E-7	-	-
61	Promethium-141 <sup>b/</sup>	W, all compounds except those given for Y	5E+4	2E+5	8E-5	3E-7	-	-
			St wall (6E+4)	-	-	-	8E-4	8E-3
		Y, oxides, hydroxides, carbides, and fluorides	-	2E+5	7E-5	2E-7	-	-
61	Promethium-143	W, see <sup>141</sup> Pm	5E+3	6E+2	2E-7	8E-10	7E-5	7E-4
		Y, see <sup>141</sup> Pm	-	7E+2	3E-7	1E-9	-	-
61	Promethium-144	W, see <sup>141</sup> Pm	1E+3	1E+2	5E-8	2E-10	2E-5	2E-4
		Y, see <sup>141</sup> Pm	-	1E+2	5E-8	2E-10	-	-
61	Promethium-145	W, see <sup>141</sup> Pm	1E+4	2E+2	7E-8	-	1E-4	1E-3
			Bone surf (2E+2)	-	-	3E-10	-	-
		Y, see <sup>141</sup> Pm	-	2E+2	8E-8	3E-10	-	-
61	Promethium-146	W, see <sup>141</sup> Pm	2E+3	5E+1	2E-8	7E-11	2E-5	2E-4
		Y, see <sup>141</sup> Pm	-	4E+1	2E-8	6E-11	-	-
61	Promethium-147	W, see <sup>141</sup> Pm	4E+3	1E+2	5E-8	-	-	-
			LLI wall (5E+3)	Bone surf (2E+2)	-	3E-10	7E-5	7E-4
		Y, see <sup>141</sup> Pm	-	1E+2	6E-8	2E-10	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI      DAC ( $\mu\text{Ci/ml}$ )    ( $\mu\text{Ci/ml}$ )		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
61	Promethium-148m	W, see <sup>141</sup> Pm	7E+2	3E+2	1E-7	4E-10	1E-5	1E-4
		Y, see <sup>141</sup> Pm	-	3E+2	1E-7	5E-10	-	-
61	Promethium-148	W, see <sup>141</sup> Pm	4E+2	5E+2	2E-7	8E-10	-	-
			LLI wall (5E+2)	-	-	-	7E-6	7E-5
		Y, see <sup>141</sup> Pm	-	5E+2	2E-7	7E-10	-	-
61	Promethium-149	W, see <sup>141</sup> Pm	1E+3	2E+3	8E-7	3E-9	-	-
			LLI wall (1E+3)	-	-	-	2E-5	2E-4
		Y, see <sup>141</sup> Pm	-	2E+3	8E-7	2E-9	-	-
61	Promethium-150	W, see <sup>141</sup> Pm	5E+3	2E+4	8E-6	3E-8	7E-5	7E-4
		Y, see <sup>141</sup> Pm	-	2E+4	7E-6	2E-8	-	-
61	Promethium-151	W, see <sup>141</sup> Pm	2E+3	4E+3	1E-6	5E-9	2E-5	2E-4
		Y, see <sup>141</sup> Pm	-	3E+3	1E-6	4E-9	-	-
62	Samarium-141m <sup>b/</sup>	W, all compounds	3E+4	1E+5	4E-5	1E-7	4E-4	4E-3
62	Samarium-141 <sup>b/</sup>	W, all compounds	5E+4	2E+5	8E-5	2E-7	-	-
			St wall (6E+4)	-	-	-	8E-4	8E-3
62	Samarium-142 <sup>b/</sup>	W, all compounds	8E+3	3E+4	1E-5	4E-8	1E-4	1E-3
62	Samarium-145	W, all compounds	6E+3	5E+2	2E-7	7E-10	8E-5	8E-4
62	Samarium-146	W, all compounds	1E+1	4E-2	1E-11	-	-	-
			Bone surf (3E+1)	Bone surf (6E-2)	-	9E-14	3E-7	3E-6
62	Samarium-147	W, all compounds	2E+1	4E-2	2E-11	-	-	-
			Bone surf (3E+1)	Bone surf (7E-2)	-	1E-13	4E-7	4E-6
62	Samarium-151	W, all compounds	1E+4	1E+2	4E-8	-	-	-
			LLI wall (1E+4)	Bone surf (2E+2)	-	2E-10	2E-4	2E-3
62	Samarium-153	W, all compounds	2E+3	3E+3	1E-6	4E-9	-	-
			LLI wall (2E+3)	-	-	-	3E-5	3E-4
62	Samarium-155 <sup>b/</sup>	W, all compounds	6E+4	2E+5	9E-5	3E-7	-	-
			St wall (8E+4)	-	-	-	1E-3	1E-2
62	Samarium-156	W, all compounds	5E+3	9E+3	4E-6	1E-8	7E-5	7E-4
63	Europium-145	W, all compounds	2E+3	2E+3	8E-7	3E-9	2E-5	2E-4
63	Europium-146	W, all compounds	1E+3	1E+3	5E-7	2E-9	1E-5	1E-4
63	Europium-147	W, all compounds	3E+3	2E+3	7E-7	2E-9	4E-5	4E-4
63	Europium-148	W, all compounds	1E+3	4E+2	1E-7	5E-10	1E-5	1E-4
63	Europium-149	W, all compounds	1E+4	3E+3	1E-6	4E-9	2E-4	2E-3
63	Europium-150 (12.62 h)	W, all compounds	3E+3	8E+3	4E-6	1E-8	4E-5	4E-4
63	Europium-150 (34.2 y)	W, all compounds	8E+2	2E+1	8E-9	3E-11	1E-5	1E-4
63	Europium-152m	W, all compounds	3E+3	6E+3	3E-6	9E-9	4E-5	4E-4
63	Europium-152	W, all compounds	8E+2	2E+1	1E-8	3E-11	1E-5	1E-4
63	Europium-154	W, all compounds	5E+2	2E+1	8E-9	3E-11	7E-6	7E-5

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion	Inhalation		Air	Water	
				ALI ( $\mu\text{Ci}$ )	ALI ( $\mu\text{Ci}$ )			
63	Europium-155	W, all compounds	4E+3	9E+1	4E-8	-	5E-5	5E-4
				Bone surf (1E+2)	-	2E-10	-	-
63	Europium-156	W, all compounds	6E+2	5E+2	2E-7	6E-10	8E-6	8E-5
63	Europium-157	W, all compounds	2E+3	5E+3	2E-6	7E-9	3E-5	3E-4
63	Europium-158 <sup>b/</sup>	W, all compounds	2E+4	6E+4	2E-5	8E-8	3E-4	3E-3
64	Gadolinium-145 <sup>b/</sup>	D, all compounds except those given for W	5E+4	2E+5	6E-5	2E-7	-	-
			St wall (5E+4)	-	-	-	6E-4	6E-3
		W, oxides, hydroxides, and fluorides	-	2E+5	7E-5	2E-7	-	-
64	Gadolinium-146	D, see <sup>145</sup> Gd	1E+3	1E+2	5E-8	2E-10	2E-5	2E-4
		W, see <sup>145</sup> Gd	-	3E+2	1E-7	4E-10	-	-
64	Gadolinium-147	D, see <sup>145</sup> Gd	2E+3	4E+3	2E-6	6E-9	3E-5	3E-4
		W, see <sup>145</sup> Gd	-	4E+3	1E-6	5E-9	-	-
64	Gadolinium-148	D, see <sup>145</sup> Gd	1E+1	8E+3	3E-12	-	-	-
			Bone surf (2E+1)	Bone surf (2E-2)	-	2E-14	3E-7	3E-6
		W, see <sup>145</sup> Gd	-	3E-2	1E-11	-	-	-
				Bone surf (6E-2)	-	8E-14	-	-
64	Gadolinium-149	D, see <sup>145</sup> Gd	3E+3	2E+3	9E-7	3E-9	4E-5	4E-4
		W, see <sup>145</sup> Gd	-	2E+3	1E-6	3E-9	-	-
64	Gadolinium-151	D, see <sup>145</sup> Gd	6E+3	4E+2	2E-7	-	9E-5	9E-4
				Bone surf (6E+2)	-	9E-10	-	-
		W, see <sup>145</sup> Gd	-	1E+3	5E-7	2E-9	-	-
64	Gadolinium-152	D, see <sup>145</sup> Gd	2E+1	1E-2	4E-12	-	-	-
			Bone surf (3E+1)	Bone surf (2E-2)	-	3E-14	4E-7	4E-6
		W, see <sup>145</sup> Gd	-	4E-2	2E-11	-	-	-
				Bone surf (8E-2)	-	1E-13	-	-
64	Gadolinium-153	D, see <sup>145</sup> Gd	5E+3	1E+2	6E-8	-	6E-5	6E-4
				Bone surf (2E+2)	-	3E-10	-	-
		W, see <sup>145</sup> Gd	-	6E+2	2E-7	8E-10	-	-
64	Gadolinium-159	D, see <sup>145</sup> Gd	3E+3	8E+3	3E-6	1E-8	4E-5	4E-4
		W, see <sup>145</sup> Gd	-	6E+3	2E-6	8E-9	-	-
65	Terbium-147 <sup>b/</sup>	W, all compounds	9E+3	3E+4	1E-5	5E-8	1E-4	1E-3
65	Terbium-149	W, all compounds	5E+3	7E+2	3E-7	1E-9	7E-5	7E-4
65	Terbium-150	W, all compounds	5E+3	2E+4	9E-6	3E-8	7E-5	7E-4
65	Terbium-151	W, all compounds	4E+3	9E+3	4E-6	1E-8	5E-5	5E-4
65	Terbium-153	W, all compounds	5E+3	7E+3	3E-6	1E-8	7E-5	7E-4
65	Terbium-154	W, all compounds	2E+3	4E+3	2E-6	6E-9	2E-5	2E-4
65	Terbium-155	W, all compounds	6E+3	8E+3	3E-6	1E-8	8E-5	8E-4
65	Terbium-156m (5.0 h)	W, all compounds	2E+4	3E+4	1E-5	4E-8	2E-4	2E-3
65	Terbium-156	W, all compounds	1E+3	1E+3	6E-7	2E-9	1E-5	1E-4



**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI      DAC ( $\mu\text{Ci/ml}$ )    ( $\mu\text{Ci/ml}$ )		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
65	Terbium-157	W, all compounds	5E+4 LLI wall (5E+4)	3E+2 Bone surf (6E+2)	1E-7	-	-	-
65	Terbium-158	W, all compounds	1E+3	2E+1	8E-9	3E-11	2E-5	2E-4
65	Terbium-160	W, all compounds	8E+2	2E+2	9E-8	3E-10	1E-5	1E-4
65	Terbium-161	W, all compounds	2E+3 LLI wall (2E+3)	2E+3	7E-7	2E-9	-	-
66	Dysprosium-155	W, all compounds	9E+3	3E+4	1E-5	4E-8	1E-4	1E-3
66	Dysprosium-157	W, all compounds	2E+4	6E+4	3E-5	9E-8	3E-4	3E-3
66	Dysprosium-159	W, all compounds	1E+4	2E+3	1E-6	3E-9	2E-4	2E-3
66	Dysprosium-165	W, all compounds	1E+4	5E+4	2E-5	6E-8	2E-4	2E-3
66	Dysprosium-166	W, all compounds	6E+2 LLI wall (8E+2)	7E+2	3E-7	1E-9	-	-
67	Holmium-155 <sup>b/</sup>	W, all compounds	4E+4	2E+5	6E-5	2E-7	6E-4	6E-3
67	Holmium-157 <sup>b/</sup>	W, all compounds	3E+5	1E+6	6E-4	2E-6	4E-3	4E-2
67	Holmium-159 <sup>b/</sup>	W, all compounds	2E+5	1E+6	4E-4	1E-6	3E-3	3E-2
67	Holmium-161	W, all compounds	1E+5	4E+5	2E-4	6E-7	1E-3	1E-2
67	Holmium-162m <sup>b/</sup>	W, all compounds	5E+4	3E+5	1E-4	4E-7	7E-4	7E-3
67	Holmium-162 <sup>b/</sup>	W, all compounds	5E+5 St wall (8E+5)	2E+6	1E-3	3E-6	-	-
67	Holmium-164m <sup>b/</sup>	W, all compounds	1E+5	3E+5	1E-4	4E-7	1E-3	1E-2
67	Holmium-164 <sup>b/</sup>	W, all compounds	2E+5 St wall (2E+5)	6E+5	3E-4	9E-7	-	-
67	Holmium-166m	W, all compounds	6E+2	7E+0	3E-9	9E-12	9E-6	9E-5
67	Holmium-166	W, all compounds	9E+2 LLI wall (9E+2)	2E+3	7E-7	2E-9	-	-
67	Holmium-167	W, all compounds	2E+4	6E+4	2E-5	8E-8	2E-4	2E-3
68	Erbium-161	W, all compounds	2E+4	6E+4	3E-5	9E-8	2E-4	2E-3
68	Erbium-165	W, all compounds	6E+4	2E+5	8E-5	3E-7	9E-4	9E-
68	Erbium-169	W, all compounds	3E+3 LLI wall (4E+3)	3E+3	1E-6	4E-9	-	-
68	Erbium-171	W, all compounds	4E+3	1E+4	4E-6	1E-8	5E-5	5E-4
68	Erbium-172	W, all compounds	1E+3 LLI wall (1E+3)	1E+3	6E-7	2E-9	-	-
69	Thulium-162 <sup>b/</sup>	W, all compounds	7E+4 St wall (7E+4)	3E+5	1E-4	4E-7	-	-
69	Thulium-166	W, all compounds	4E+3	1E+4	6E-6	2E-8	6E-5	6E-4
69	Thulium-167	W, all compounds	2E+3 LLI wall (2E+3)	2E+3	8E-7	3E-9	-	-
							3E-5	3E-4

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI      DAC ( $\mu\text{Ci/ml}$ )    ( $\mu\text{Ci/ml}$ )		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
69	Thulium-170	W, all compounds	8E+2	2E+2	9E-8	3E-10	-	-
			LLI wall (1E+3)	-	-	-	1E-5	1E-4
69	Thulium-171	W, all compounds	1E+4	3E+2	1E-7	-	-	-
			LLI wall (1E+4)	Bone surf (6E+2)	-	8E-10	2E-4	2E-3
69	Thulium-172	W, all compounds	7E+2	1E+3	5E-7	2E-9	-	-
			LLI wall (8E+2)	-	-	-	1E-5	1E-4
69	Thulium-173	W, all compounds	4E+3	1E+4	5E-6	2E-8	6E-5	6E-4
69	Thulium-175 <sup>b/</sup>	W, all compounds	7E+4	3E+5	1E-4	4E-7	-	-
			St wall (9E+4)	-	-	-	1E-3	1E-2
70	Ytterbium-162 <sup>b/</sup>	W, all compounds except those given for Y, oxides, hydroxides, and fluorides	7E+4	3E+5	1E-4	4E-7	1E-3	1E-2
			-	3E+5	1E-4	4E-7	-	-
70	Ytterbium-166	W, see <sup>162</sup> Yb	1E+3	2E+3	8E-7	3E-9	2E-5	2E-4
		Y, see <sup>162</sup> Yb	-	2E+3	8E-7	3E-9	-	-
70	Ytterbium-167 <sup>b/</sup>	W, see <sup>162</sup> Yb	3E+5	8E+5	3E-4	1E-6	4E-3	4E-2
		Y, see <sup>162</sup> Yb	-	7E+5	3E-4	1E-6	-	-
70	Ytterbium-169	W, see <sup>162</sup> Yb	2E+3	8E+2	4E-7	1E-9	2E-5	2E-4
		Y, see <sup>162</sup> Yb	-	7E+2	3E-7	1E-9	-	-
70	Ytterbium-175	W, see <sup>162</sup> Yb	3E+3	4E+3	1E-6	5E-9	-	-
			LLI wall (3E+3)	-	-	-	4E-5	4E-4
		Y, see <sup>162</sup> Yb	-	3E+3	1E-6	5E-9	-	-
70	Ytterbium-177 <sup>b/</sup>	W, see <sup>162</sup> Yb	2E+4	5E+4	2E-5	7E-8	2E-4	2E-3
		Y, see <sup>162</sup> Yb	-	5E+4	2E-5	6E-8	-	-
70	Ytterbium-178 <sup>b/</sup>	W, see <sup>162</sup> Yb	1E+4	4E+4	2E-5	6E-8	2E-4	2E-3
		Y, see <sup>162</sup> Yb	-	4E+4	2E-5	5E-8	-	-
71	Lutetium-169	W, all compounds except those given for Y, oxides, hydroxides, and fluorides	3E+3	4E+3	2E-6	6E-9	3E-5	3E-4
			-	4E+3	2E-6	6E-9	-	-
71	Lutetium-170	W, see <sup>169</sup> Lu	1E+3	2E+3	9E-7	3E-9	2E-5	2E-4
		Y, see <sup>169</sup> Lu	-	2E+3	8E-7	3E-9	-	-
71	Lutetium-171	W, see <sup>169</sup> Lu	2E+3	2E+3	8E-7	3E-9	3E-5	3E-4
		Y, see <sup>169</sup> Lu	-	2E+3	8E-7	3E-9	-	-
71	Lutetium-172	W, see <sup>169</sup> Lu	1E+3	1E+3	5E-7	2E-9	1E-5	1E-4
		Y, see <sup>169</sup> Lu	-	1E+3	5E-7	2E-9	-	-
71	Lutetium-173	W, see <sup>169</sup> Lu	5E+3	3E+2	1E-7	-	7E-5	7E-4
			-	Bone surf (5E+2)	-	6E-10	-	-
		Y, see <sup>169</sup> Lu	-	3E+2	1E-7	4E-10	-	-
71	Lutetium-174m	W, see <sup>169</sup> Lu	2E+3	2E+2	1E-7	-	-	-
			LLI wall (3E+3)	Bone surf (3E+2)	-	5E-10	4E-5	4E-4
		Y, see <sup>169</sup> Lu	-	2E+2	9E-8	3E-10	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI ( $\mu\text{Ci}$ )		DAC ( $\mu\text{Ci/ml}$ )	Air ( $\mu\text{Ci/ml}$ )	
71	Lutetium-176	W, see <sup>169</sup> Lu	7E+2	5E+0	2E-9	-	1E-5	1E-4
				Bone surf				
			-	(1E+1)	-	2E-11	-	-
		Y, see <sup>169</sup> Lu	-	8E+0	3E-9	1E-11	-	-
71	Lutetium-177m	W, see <sup>169</sup> Lu	7E+2	1E+2	5E-8	-	1E-5	1E-4
				Bone surf				
			-	(1E+2)	-	2E-10	-	-
		Y, see <sup>169</sup> Lu	-	8E+1	3E-8	1E-10	-	-
71	Lutetium-177	W, see <sup>169</sup> Lu	2E+3	2E+3	9E-7	3E-9	-	-
				LLI wall				
			(3E+3)	-	-	-	4E-5	4E-4
		Y, see <sup>169</sup> Lu	-	2E+3	9E-7	3E-9	-	-
71	Lutetium-178m <sup>b/</sup>	W, see <sup>169</sup> Lu	5E+4	2E+5	8E-5	3E-7	-	-
				St wall				
			(6E+4)	-	-	-	8E-4	8E-3
		Y, see <sup>169</sup> Lu	-	2E+5	7E-5	2E-7	-	-
71	Lutetium-178 <sup>b/</sup>	W, see <sup>169</sup> Lu	4E+4	1E+5	5E-5	2E-7	-	-
				St wall				
			(4E+4)	-	-	-	6E-4	6E-3
		Y, see <sup>169</sup> Lu	-	1E+5	5E-5	2E-7	-	-
71	Lutetium-179	W, see <sup>169</sup> Lu	6E+3	2E+4	8E-6	3E-8	9E-5	9E-4
		Y, see <sup>169</sup> Lu	-	2E+4	6E-6	3E-8	-	-
72	Hafnium-170	D, all compounds except those given for W	3E+3	6E+3	2E-6	8E-9	4E-5	4E-4
		W, oxides, hydroxides, carbides, and nitrates	-	5E+3	2E-6	6E-9	-	-
72	Hafnium-172	D, see <sup>170</sup> Hf	1E+3	9E+0	4E-9	-	2E-5	2E-4
				Bone surf				
			-	(2E+1)	-	3E-11	-	-
		W, see <sup>170</sup> Hf	-	4E+1	2E-8	-	-	-
				Bone surf				
			-	(6E+1)	-	8E-11	-	-
72	Hafnium-173	D, see <sup>170</sup> Hf	5E+3	1E+4	5E-6	2E-8	7E-5	7E-4
		W, see <sup>170</sup> Hf	-	1E+4	5E-6	2E-8	-	-
72	Hafnium-175	D, see <sup>170</sup> Hf	3E+3	9E+2	4E-7	-	4E-5	4E-4
				Bone surf				
			-	(1E+3)	-	1E-9	-	-
		W, see <sup>170</sup> Hf	-	1E+3	5E-7	2E-9	-	-
72	Hafnium-177m <sup>b/</sup>	D, see <sup>170</sup> Hf	2E+4	6E+4	2E-5	8E-8	3E-4	3E-3
		W, see <sup>170</sup> Hf	-	9E+4	4E-5	1E-7	-	-
72	Hafnium-178m	D, see <sup>170</sup> Hf	3E+2	1E+0	5E-10	-	3E-6	3E-5
				Bone surf				
			-	(2E+0)	-	3E-12	-	-
		W, see <sup>170</sup> Hf	-	5E+0	2E-9	-	-	-
				Bone surf				
			-	(9E+0)	-	1E-11	-	-
72	Hafnium-179m	D, see <sup>170</sup> Hf	1E+3	3E+2	1E-7	-	1E-5	1E-4
				Bone surf				
			-	(6E+2)	-	8E-10	-	-
		W, see <sup>170</sup> Hf	-	6E+2	3E-7	8E-10	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )							
72	Hafnium-180m	D, see <sup>170</sup> Hf	7E+3	2E+4	9E-6	3E-8	1E-4	1E-3
		W, see <sup>170</sup> Hf	-	3E+4	1E-5	4E-8	-	-
72	Hafnium-181	D, see <sup>170</sup> Hf	1E+3	2E+2	7E-8	-	2E-5	2E-4
				Bone surf				
			-	(4E+2)	-	6E-10	-	-
		W, see <sup>170</sup> Hf	-	4E+2	2E-7	6E-10	-	-
72	Hafnium-182m <sup>b/</sup>	D, see <sup>170</sup> Hf	4E+4	9E+4	4E-5	1E-7	5E-4	5E-3
		W, see <sup>170</sup> Hf	-	1E+5	6E-5	2E-7	-	-
72	Hafnium-182	D, see <sup>170</sup> Hf	2E+2	8E-1	3E-10	-	-	-
				Bone surf				
			(4E+2)	(2E+0)	-	2E-12	5E-6	5E-5
		W, see <sup>170</sup> Hf	-	3E+0	1E-9	-	-	-
				Bone surf				
			-	(7E+0)	-	1E-11	-	-
72	Hafnium-183 <sup>b/</sup>	D, see <sup>170</sup> Hf	2E+4	5E+4	2E-5	6E-8	3E-4	3E-3
		W, see <sup>170</sup> Hf	-	6E+4	2E-5	8E-8	-	-
72	Hafnium-184	D, see <sup>170</sup> Hf	2E+3	8E+3	3E-6	1E-8	3E-5	3E-4
		W, see <sup>170</sup> Hf	-	6E+3	3E-6	9E-9	-	-
73	Tantalum-172 <sup>b/</sup>	W, all compounds except those given for Y	4E+4	1E+5	5E-5	2E-7	5E-4	5E-3
		Y, elemental Ta, oxides, hydroxides, halides, carbides, nitrates, and nitrides	-	1E+5	4E-5	1E-7	-	-
71	Lutetium-174	W, see <sup>169</sup> Lu	5E+3	1E+2	5E-8	-	7E-5	7E-4
				Bone surf				
			-	(2E+2)	-	3E-10	-	-
		Y, see <sup>169</sup> Lu	-	2E+2	6E-8	2E-10	-	-
71	Lutetium-176m	W, see <sup>169</sup> Lu	8E+3	3E+4	1E-5	3E-8	1E-4	1E-3
		Y, see <sup>169</sup> Lu	-	2E+4	9E-6	3E-8	-	-
73	Tantalum-173	W, see <sup>172</sup> Ta	7E+3	2E+4	8E-6	3E-8	9E-5	9E-4
		Y, see <sup>172</sup> Ta	-	2E+4	7E-6	2E-8	-	-
73	Tantalum-174 <sup>b/</sup>	W, see <sup>172</sup> Ta	3E+4	1E+5	4E-5	1E-7	4E-4	4E-3
		Y, see <sup>172</sup> Ta	-	9E+4	4E-5	1E-7	-	-
73	Tantalum-175	W, see <sup>172</sup> Ta	6E+3	2E+4	7E-6	2E-8	8E-5	8E-4
		Y, see <sup>172</sup> Ta	-	1E+4	6E-6	2E-8	-	-
73	Tantalum-176	W, see <sup>172</sup> Ta	4E+3	1E+4	5E-6	2E-8	5E-5	5E-4
		Y, see <sup>172</sup> Ta	-	1E+4	5E-6	2E-8	-	-
73	Tantalum-177	W, see <sup>172</sup> Ta	1E+4	2E+4	8E-6	3E-8	2E-4	2E-3
		Y, see <sup>172</sup> Ta	-	2E+4	7E-6	2E-8	-	-
73	Tantalum-178	W, see <sup>172</sup> Ta	2E+4	9E+4	4E-5	1E-7	2E-4	2E-3
		Y, see <sup>172</sup> Ta	-	7E+4	3E-5	1E-7	-	-
73	Tantalum-179	W, see <sup>172</sup> Ta	2E+4	5E+3	2E-6	8E-9	3E-4	3E-3
		Y, see <sup>172</sup> Ta	-	9E+2	4E-7	1E-9	-	-
73	Tantalum-180m	W, see <sup>172</sup> Ta	2E+4	7E+4	3E-5	9E-8	3E-4	3E-3
		Y, see <sup>172</sup> Ta	-	6E+4	2E-5	8E-8	-	-
73	Tantalum-180	W, see <sup>172</sup> Ta	1E+3	4E+2	2E-7	6E-10	2E-5	2E-4
		Y, see <sup>172</sup> Ta	-	2E+1	1E-8	3E-11	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI      DAC ( $\mu\text{Ci/ml}$ )    ( $\mu\text{Ci/ml}$ )		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
73	Tantalum-182m <sup>b/</sup>	W, see <sup>172</sup> Ta	2E+5	5E+5	2E-4	8E-7	-	-
			St wall (2E+5)	-	-	-	3E-3	3E-2
		Y, see <sup>172</sup> Ta	-	4E+5	2E-4	6E-7	-	-
73	Tantalum-182	W, see <sup>172</sup> Ta	8E+2	3E+2	1E-7	5E-10	1E-5	1E-4
		Y, see <sup>172</sup> Ta	-	1E+2	6E-8	2E-10	-	-
73	Tantalum-183	W, see <sup>172</sup> Ta	9E+2	1E+3	5E-7	2E-9	-	-
			LLI wall (1E+3)	-	-	-	2E-5	2E-4
		Y, see <sup>172</sup> Ta	-	1E+3	4E-7	1E-9	-	-
73	Tantalum-184	W, see <sup>172</sup> Ta	2E+3	5E+3	2E-6	8E-9	3E-5	3E-4
		Y, see <sup>172</sup> Ta	-	5E+3	2E-6	7E-9	-	-
73	Tantalum-185 <sup>b/</sup>	W, see <sup>172</sup> Ta	3E+4	7E+4	3E-5	1E-7	4E-4	4E-3
		Y, see <sup>172</sup> Ta	-	6E+4	3E-5	9E-8	-	-
73	Tantalum-186 <sup>b/</sup>	W, see <sup>172</sup> Ta	5E+4	2E+5	1E-4	3E-7	-	-
			St wall (7E+4)	-	-	-	1E-3	1E-2
		Y, see <sup>172</sup> Ta	-	2E+5	9E-5	3E-7	-	-
74	Tungsten-176	D, all compounds	1E+4	5E+4	2E-5	7E-8	1E-4	1E-3
74	Tungsten-177	D, all compounds	2E+4	9E+4	4E-5	1E-7	3E-4	3E-3
74	Tungsten-178	D, all compounds	5E+3	2E+4	8E-6	3E-8	7E-5	7E-4
74	Tungsten-179 <sup>b/</sup>	D, all compounds	5E+5	2E+6	7E-4	2E-6	7E-3	7E-2
74	Tungsten-181	D, all compounds	2E+4	3E+4	1E-5	5E-8	2E-4	2E-3
74	Tungsten-185	D, all compounds	2E+3	7E+3	3E-6	9E-9	-	-
			LLI wall (3E+3)	-	-	-	4E-5	4E-4
74	Tungsten-187	D, all compounds	2E+3	9E+3	4E-6	1E-8	3E-5	3E-4
74	Tungsten-188	D, all compounds	4E+2	1E+3	5E-7	2E-9	-	-
			LLI wall (5E+2)	-	-	-	7E-6	7E-5
75	Rhenium-177 <sup>b/</sup>	D, all compounds except those given for W	9E+4	3E+5	1E-4	4E-7	-	-
			St wall (1E+5)	-	-	-	2E-3	2E-2
		W, oxides, hydroxides, and nitrates	-	4E+5	1E-4	5E-7	-	-
75	Rhenium-178 <sup>b/</sup>	D, see <sup>177</sup> Re	7E+4	3E+5	1E-4	4E-7	-	-
			St wall (1E+5)	-	-	-	1E-3	1E-2
		W, see <sup>177</sup> Re	-	3E+5	1E-4	4E-7	-	-
75	Rhenium-181	D, see <sup>177</sup> Re	5E+3	9E+3	4E-6	1E-8	7E-5	7E-4
		W, see <sup>177</sup> Re	-	9E+3	4E-6	1E-8	-	-
75	Rhenium-182 (12.7 h)	D, see <sup>177</sup> Re	7E+3	1E+4	5E-6	2E-8	9E-5	9E-4
		W, see <sup>177</sup> Re	-	2E+4	6E-6	2E-8	-	-
75	Rhenium-182 (64.0 h)	D, see <sup>177</sup> Re	1E+3	2E+3	1E-6	3E-9	2E-5	2E-4
		W, see <sup>177</sup> Re	-	2E+3	9E-7	3E-9	-	-
75	Rhenium-184m	D, see <sup>177</sup> Re	2E+3	3E+3	1E-6	4E-9	3E-5	3E-4
		W, see <sup>177</sup> Re	-	4E+2	2E-7	6E-10	-	-
75	Rhenium-184	D, see <sup>177</sup> Re	2E+3	4E+3	1E-6	5E-9	3E-5	3E-4
		W, see <sup>177</sup> Re	-	1E+3	6E-7	2E-9	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI ( $\mu\text{Ci}$ )		DAC ( $\mu\text{Ci/ml}$ )	Air ( $\mu\text{Ci/ml}$ )	
75	Rhenium-186m	D, see <sup>177</sup> Re	1E+3 St wall (2E+3)	2E+3 St wall (2E+3)	7E-7 -	- 3E-9	- 2E-5	- 2E-4
		W, see <sup>177</sup> Re	-	2E+2	6E-8	2E-10	-	-
75	Rhenium-186	D, see <sup>177</sup> Re	2E+3	3E+3	1E-6	4E-9	3E-5	3E-4
		W, see <sup>177</sup> Re	-	2E+3	7E-7	2E-9	-	-
75	Rhenium-187	D, see <sup>177</sup> Re	6E+5	8E+5	4E-4	-	8E-3	8E-2
			-	St wall (9E+5)	-	1E-6	-	-
		W, see <sup>177</sup> Re	-	1E+5	4E-5	1E-7	-	-
75	Rhenium-188m <sup>b/</sup>	D, see <sup>177</sup> Re	8E+4	1E+5	6E-5	2E-7	1E-3	1E-2
		W, see <sup>177</sup> Re	-	1E+5	6E-5	2E-7	-	-
75	Rhenium-188	D, see <sup>177</sup> Re	2E+3	3E+3	1E-6	4E-9	2E-5	2E-4
		W, see <sup>177</sup> Re	-	3E+3	1E-6	4E-9	-	-
75	Rhenium-189	D, see <sup>177</sup> Re	3E+3	5E+3	2E-6	7E-9	4E-5	4E-4
		W, see <sup>177</sup> Re	-	4E+3	2E-6	6E-9	-	-
76	Osmium-180 <sup>b/</sup>	D, all compounds except those given for W and Y	1E+5	4E+5	2E-4	5E-7	1E-3	1E-2
		W, halides and nitrates	-	5E+5	2E-4	7E-7	-	-
		Y, oxides and hydroxides	-	5E+5	2E-4	6E-7	-	-
76	Osmium-181 <sup>b/</sup>	D, see <sup>180</sup> Os	1E+4	4E+4	2E-5	6E-8	2E-4	2E-3
		W, see <sup>180</sup> Os	-	5E+4	2E-5	6E-8	-	-
		Y, see <sup>180</sup> Os	-	4E+4	2E-5	6E-8	-	-
76	Osmium-182	D, see <sup>180</sup> Os	2E+3	6E+3	2E-6	8E-9	3E-5	3E-4
		W, see <sup>180</sup> Os	-	4E+3	2E-6	6E-9	-	-
		Y, see <sup>180</sup> Os	-	4E+3	2E-6	6E-9	-	-
76	Osmium-185	D, see <sup>180</sup> Os	2E+3	5E+2	2E-7	7E-10	3E-5	3E-4
		W, see <sup>180</sup> Os	-	8E+2	3E-7	1E-9	-	-
		Y, see <sup>180</sup> Os	-	8E+2	3E-7	1E-9	-	-
76	Osmium-189m	D, see <sup>180</sup> Os	8E+4	2E+5	1E-4	3E-7	1E-3	1E-2
		W, see <sup>180</sup> Os	-	2E+5	9E-5	3E-7	-	-
		Y, see <sup>180</sup> Os	-	2E+5	7E-5	2E-7	-	-
76	Osmium-191m	D, see <sup>180</sup> Os	1E+4	3E+4	1E-5	4E-8	2E-4	2E-3
		W, see <sup>180</sup> Os	-	2E+4	8E-6	3E-8	-	-
		Y, see <sup>180</sup> Os	-	2E+4	7E-6	2E-8	-	-
76	Osmium-191	D, see <sup>180</sup> Os	2E+3	2E+3	9E-7	3E-9	-	-
			LLI wall (3E+3)	-	-	-	3E-5	3E-4
		W, see <sup>180</sup> Os	-	2E+3	7E-7	2E-9	-	-
		Y, see <sup>180</sup> Os	-	1E+3	6E-7	2E-9	-	-
76	Osmium-193	D, see <sup>180</sup> Os	2E+3	5E+3	2E-6	6E-9	-	-
			LLI wall (2E+3)	-	-	-	2E-5	2E-4
		W, see <sup>180</sup> Os	-	3E+3	1E-6	4E-9	-	-
		Y, see <sup>180</sup> Os	-	3E+3	1E-6	4E-9	-	-
76	Osmium-194	D, see <sup>180</sup> Os	4E+2	4E+1	2E-8	6E-11	-	-
			LLI wall (6E+2)	-	-	8E-6	8E-5	-
		W, see <sup>180</sup> Os	-	6E+1	2E-8	8E-11	-	-
		Y, see <sup>180</sup> Os	-	8E+0	3E-9	1E-11	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )							
77	Iridium-182 <sup>b/</sup>	D, all compounds except those given for W and Y	4E+4	1E+5	6E-5	2E-7	-	-
		St wall (4E+4)	-	-	-	-	6E-4	6E-3
		W, halides, nitrates, and metallic iridium	-	2E+5	6E-5	2E-7	-	-
		Y, oxides and hydroxides	-	1E+5	5E-5	2E-7	-	-
77	Iridium-184	D, see <sup>182</sup> Ir	8E+3	2E+4	1E-5	3E-8	1E-4	1E-3
		W, see <sup>182</sup> Ir	-	3E+4	1E-5	5E-8	-	-
		Y, see <sup>182</sup> Ir	-	3E+4	1E-5	4E-8	-	-
77	Iridium-185	D, see <sup>182</sup> Ir	5E+3	1E+4	5E-6	2E-8	7E-5	7E-4
		W, see <sup>182</sup> Ir	-	1E+4	5E-6	2E-8	-	-
		Y, see <sup>182</sup> Ir	-	1E+4	4E-6	1E-8	-	-
77	Iridium-186	D, see <sup>182</sup> Ir	2E+3	8E+3	3E-6	1E-8	3E-5	3E-4
		W, see <sup>182</sup> Ir	-	6E+3	3E-6	9E-9	-	-
		Y, see <sup>182</sup> Ir	-	6E+3	2E-6	8E-9	-	-
77	Iridium-187	D, see <sup>182</sup> Ir	1E+4	3E+4	1E-5	5E-8	1E-4	1E-3
		W, see <sup>182</sup> Ir	-	3E+4	1E-5	4E-8	-	-
		Y, see <sup>182</sup> Ir	-	3E+4	1E-5	4E-8	-	-
77	Iridium-188	D, see <sup>182</sup> Ir	2E+3	5E+3	2E-6	6E-9	3E-5	3E-4
		W, see <sup>182</sup> Ir	-	4E+3	1E-6	5E-9	-	-
		Y, see <sup>182</sup> Ir	-	3E+3	1E-6	5E-9	-	-
77	Iridium-189	D, see <sup>182</sup> Ir	5E+3	5E+3	2E-6	7E-9	-	-
		LLI wall (5E+3)	-	-	-	-	7E-5	7E-4
		W, see <sup>182</sup> Ir	-	4E+3	2E-6	5E-9	-	-
		Y, see <sup>182</sup> Ir	-	4E+3	1E-6	5E-9	-	-
77	Iridium-190m <sup>b/</sup>	D, see <sup>182</sup> Ir	2E+5	2E+5	8E-5	3E-7	2E-3	2E-2
		W, see <sup>182</sup> Ir	-	2E+5	9E-5	3E-7	-	-
		Y, see <sup>182</sup> Ir	-	2E+5	8E-5	3E-7	-	-
77	Iridium-190	D, see <sup>182</sup> Ir	1E+3	9E+2	4E-7	1E-9	1E-5	1E-4
		W, see <sup>182</sup> Ir	-	1E+3	4E-7	1E-9	-	-
		Y, see <sup>182</sup> Ir	-	9E+2	4E-7	1E-9	-	-
77	Iridium-192m	D, see <sup>182</sup> Ir	3E+3	9E+1	4E-8	1E-10	4E-5	4E-4
		W, see <sup>182</sup> Ir	-	2E+2	9E-8	3E-10	-	-
		Y, see <sup>182</sup> Ir	-	2E+1	6E-9	2E-11	-	-
77	Iridium-192	D, see <sup>182</sup> Ir	9E+2	3E+2	1E-7	4E-10	1E-5	1E-4
		W, see <sup>182</sup> Ir	-	4E+2	2E-7	6E-10	-	-
		Y, see <sup>182</sup> Ir	-	2E+2	9E-8	3E-10	-	-
77	Iridium-194m	D, see <sup>182</sup> Ir	6E+2	9E+1	4E-8	1E-10	9E-6	9E-5
		W, see <sup>182</sup> Ir	-	2E+2	7E-8	2E-10	-	-
		Y, see <sup>182</sup> Ir	-	1E+2	4E-8	1E-10	-	-
77	Iridium-194	D, see <sup>182</sup> Ir	1E+3	3E+3	1E-6	4E-9	1E-5	1E-4
		W, see <sup>182</sup> Ir	-	2E+3	9E-7	3E-9	-	-
		Y, see <sup>182</sup> Ir	-	2E+3	8E-7	3E-9	-	-
77	Iridium-195m	D, see <sup>182</sup> Ir	8E+3	2E+4	1E-5	3E-8	1E-4	1E-3
		W, see <sup>182</sup> Ir	-	3E+4	1E-5	4E-8	-	-
		Y, see <sup>182</sup> Ir	-	2E+4	9E-6	3E-8	-	-



**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
				ALI ( $\mu\text{Ci}$ )	ALI ( $\mu\text{Ci}$ )			
77	Iridium-195	D, see <sup>182</sup> Ir	1E+4	4E+4	2E-5	6E-8	2E-4	2E-3
		W, see <sup>182</sup> Ir	-	5E+4	2E-5	7E-8	-	-
		Y, see <sup>182</sup> Ir	-	4E+4	2E-5	6E-8	-	-
78	Platinum-186	D, all compounds	1E+4	4E+4	2E-5	5E-8	2E-4	2E-3
78	Platinum-188	D, all compounds	2E+3	2E+3	7E-7	2E-9	2E-5	2E-4
78	Platinum-189	D, all compounds	1E+4	3E+4	1E-5	4E-8	1E-4	1E-3
78	Platinum-191	D, all compounds	4E+3	8E+3	4E-6	1E-8	5E-5	5E-4
78	Platinum-193m	D, all compounds	3E+3	6E+3	3E-6	8E-9	-	-
		LLI wall (3E+4)	-	-	-	-	4E-5	4E-4
78	Platinum-193	D, all compounds	4E+4	2E+4	1E-5	3E-8	-	-
		LLI wall (5E+4)	-	-	-	-	6E-4	6E-3
78	Platinum-195m	D, all compounds	2E+3	4E+3	2E-6	6E-9	-	-
		LLI wall (2E+3)	-	-	-	-	3E-5	3E-4
78	Platinum-197m <sup>b/</sup>	D, all compounds	2E+4	4E+4	2E-5	6E-8	2E-4	2E-3
78	Platinum-197	D, all compounds	3E+3	1E+4	4E-6	1E-8	4E-5	4E-4
78	Platinum-199 <sup>b/</sup>	D, all compounds	5E+4	1E+5	6E-5	2E-7	7E-4	7E-3
78	Platinum-200	D, all compounds	1E+3	3E+3	1E-6	5E-9	2E-5	2E-4
79	Gold-193	D, all compounds except those given for W and Y	9E+3	3E+4	1E-5	4E-8	1E-4	1E-3
		W, halides and nitrates	-	2E+4	9E-6	3E-8	-	-
		Y, oxides and hydroxides	-	2E+4	8E-6	3E-8	-	-
79	Gold-194	D, see <sup>193</sup> Au	3E+3	8E+3	3E-6	1E-8	4E-5	4E-4
		W, see <sup>193</sup> Au	-	5E+3	2E-6	8E-9	-	-
		Y, see <sup>193</sup> Au	-	5E+3	2E-6	7E-9	-	-
79	Gold-195	D, see <sup>193</sup> Au	5E+3	1E+4	5E-6	2E-8	7E-5	7E-4
		W, see <sup>193</sup> Au	-	1E+3	6E-7	2E-9	-	-
		Y, see <sup>193</sup> Au	-	4E+2	2E-7	6E-10	-	-
79	Gold-198m	D, see <sup>193</sup> Au	1E+3	3E+3	1E-6	4E-9	1E-5	1E-4
		W, see <sup>193</sup> Au	-	1E+3	5E-7	2E-9	-	-
		Y, see <sup>193</sup> Au	-	1E+3	5E-7	2E-9	-	-
79	Gold-198	D, see <sup>193</sup> Au	1E+3	4E+3	2E-6	5E-9	2E-5	2E-4
		W, see <sup>193</sup> Au	-	2E+3	8E-7	3E-9	-	-
		Y, see <sup>193</sup> Au	-	2E+3	7E-7	2E-9	-	-
79	Gold-199	D, see <sup>193</sup> Au	3E+3	9E+3	4E-6	1E-8	-	-
		LLI wall (3E+3)	-	-	-	-	4E-5	4E-4
		W, see <sup>193</sup> Au	-	4E+3	2E-6	6E-9	-	-
		Y, see <sup>193</sup> Au	-	4E+3	2E-6	5E-9	-	-
79	Gold-200m	D, see <sup>193</sup> Au	1E+3	4E+3	1E-6	5E-9	2E-5	2E-4
		W, see <sup>193</sup> Au	-	3E+3	1E-6	4E-9	-	-
		Y, see <sup>193</sup> Au	-	2E+4	1E-6	3E-9	-	-
79	Gold-200 <sup>b/</sup>	D, see <sup>193</sup> Au	3E+4	6E+4	3E-5	9E-8	4E-4	4E-3
		W, see <sup>193</sup> Au	-	8E+4	3E-5	1E-7	-	-
		Y, see <sup>193</sup> Au	-	7E+4	3E-5	1E-7	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI      DAC ( $\mu\text{Ci/ml}$ )    ( $\mu\text{Ci/ml}$ )		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
79	Gold-201 <sup>b/</sup>	D, see <sup>193</sup> Au	7E+4	2E+5	9E-5	3E-7	-	-
			St wall (9E+4)	-	-	-	1E-3	1E-2
		W, see <sup>193</sup> Au	-	2E+5	1E-4	3E-7	-	-
		Y, see <sup>193</sup> Au	-	2E+5	9E-5	3E-7	-	-
80	Mercury-193m	Vapor	-	8E+3	4E-6	1E-8	-	-
		Organic D	4E+3	1E+4	5E-6	2E-8	6E-5	6E-4
		D, sulfates	3E+3	9E+3	4E-6	1E-8	4E-5	4E-4
		W, oxides, hydroxides, halides, nitrates, and sulfides	-	8E+3	3E-6	1E-8	-	-
80	Mercury-193	Vapor	-	3E+4	1E-5	4E-8	-	-
		Organic D	2E+4	6E+4	3E-5	9E-8	3E-4	3E-3
		D, see <sup>193m</sup> Hg	2E+4	4E+4	2E-5	6E-8	2E-4	2E-3
		W, see <sup>193m</sup> Hg	-	4E+4	2E-5	6E-8	-	-
80	Mercury-194	Vapor	-	3E+1	1E-8	4E-11	-	-
		Organic D	2E+1	3E+1	1E-8	4E-11	2E-7	2E-6
		D, see <sup>193m</sup> Hg	8E+2	4E+1	2E-8	6E-11	1E-5	1E-4
		W, see <sup>193m</sup> Hg	-	1E+2	5E-8	2E-10	-	-
80	Mercury-195m	Vapor	-	4E+3	2E-6	6E-9	-	-
		Organic D	3E+3	6E+3	3E-6	8E-9	4E-5	4E-4
		D, see <sup>193m</sup> Hg	2E+3	5E+3	2E-6	7E-9	3E-5	3E-4
		W, see <sup>193m</sup> Hg	-	4E+3	2E-6	5E-9	-	-
80	Mercury-195	Vapor	-	3E+4	1E-5	4E-8	-	-
		Organic D	2E+4	5E+4	2E-5	6E-8	2E-4	2E-3
		D, see <sup>193m</sup> Hg	1E+4	4E+4	1E-5	5E-8	2E-4	2E-3
		W, see <sup>193m</sup> Hg	-	3E+4	1E-5	5E-8	-	-
80	Mercury-197m	Vapor	-	5E+3	2E-6	7E-9	-	-
		Organic D	4E+3	9E+3	4E-6	1E-8	5E-5	5E-4
		D, see <sup>193m</sup> Hg	3E+3	7E+3	3E-6	1E-8	4E-5	4E-4
		W, see <sup>193m</sup> Hg	-	5E+3	2E-6	7E-9	-	-
80	Mercury-197	Vapor	-	8E+3	4E-6	1E-8	-	-
		Organic D	7E+3	1E+4	6E-6	2E-8	9E-5	9E-4
		D, see <sup>193m</sup> Hg	6E+3	1E+4	5E-6	2E-8	8E-5	8E-4
		W, see <sup>193m</sup> Hg	-	9E+3	4E-6	1E-8	-	-
80	Mercury-199m <sup>b/</sup>	Vapor	-	8E+4	3E-5	1E-7	-	-
		Organic D	6E+4	2E+5	7E-5	2E-7	-	-
			St wall (1E+5)	-	-	-	1E-3	1E-2
		D, see <sup>193m</sup> Hg	6E+4	1E+5	6E-5	2E-7	8E-4	8E-3
		W, see <sup>193m</sup> Hg	-	2E+5	7E-5	2E-7	-	-
80	Mercury-203	Vapor	-	8E+2	4E-7	1E-9	-	-
		Organic D	5E+2	8E+2	3E-7	1E-9	7E-6	7E-5
		D, see <sup>193m</sup> Hg	2E+3	1E+3	5E-7	2E-9	3E-5	3E-4
		W, see <sup>193m</sup> Hg	-	1E+3	5E-7	2E-9	-	-
81	Thallium-194m <sup>b/</sup>	D, all compounds	5E+4	2E+5	6E-5	2E-7	-	-
			St wall (7E+4)	-	-	-	1E-3	1E-2

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )							
81	Thallium-194 <sup>b/</sup>	D, all compounds	3E+5	6E+5	2E-4	8E-7	-	-
			St wall (3E+5)	-	-	-	4E-3	4E-2
81	Thallium-195 <sup>b/</sup>	D, all compounds	6E+4	1E+5	5E-5	2E-7	9E-4	9E-3
81	Thallium-197	D, all compounds	7E+4	1E+5	5E-5	2E-7	1E-3	1E-2
81	Thallium-198 <sup>m<sup>b/</sup></sup>	D, all compounds	3E+4	5E+4	2E-5	8E-8	4E-4	4E-3
81	Thallium-198	D, all compounds	2E+4	3E+4	1E-5	5E-8	3E-4	3E-3
81	Thallium-199	D, all compounds	6E+4	8E+4	4E-5	1E-7	9E-4	9E-3
81	Thallium-200	D, all compounds	8E+3	1E+4	5E-6	2E-8	1E-4	1E-3
81	Thallium-201	D, all compounds	2E+4	2E+4	9E-6	3E-8	2E-4	2E-3
81	Thallium-202	D, all compounds	4E+3	5E+3	2E-6	7E-9	5E-5	5E-4
81	Thallium-204	D, all compounds	2E+3	2E+3	9E-7	3E-9	2E-5	2E-4
82	Lead-195 <sup>m<sup>b/</sup></sup>	D, all compounds	6E+4	2E+5	8E-5	3E-7	8E-4	8E-3
82	Lead-198	D, all compounds	3E+4	6E+4	3E-5	9E-8	4E-4	4E-3
82	Lead-199 <sup>b/</sup>	D, all compounds	2E+4	7E+4	3E-5	1E-7	3E-4	3E-3
82	Lead-200	D, all compounds	3E+3	6E+3	3E-6	9E-9	4E-5	4E-4
82	Lead-201	D, all compounds	7E+3	2E+4	8E-6	3E-8	1E-4	1E-3
82	Lead-202 <sup>m</sup>	D, all compounds	9E+3	3E+4	1E-5	4E-8	1E-4	1E-3
82	Lead-202	D, all compounds	1E+2	5E+1	2E-8	7E-11	2E-6	2E-5
82	Lead-203	D, all compounds	5E+3	9E+3	4E-6	1E-8	7E-5	7E-4
82	Lead-205	D, all compounds	4E+3	1E+3	6E-7	2E-9	5E-5	5E-4
82	Lead-209	D, all compounds	2E+4	6E+4	2E-5	8E-8	3E-4	3E-3
82	Lead-210	D, all compounds	6E-1	2E-1	1E-10	-	-	-
			Bone surf (1E+0)	Bone surf (4E-1)	-	6E-13	1E-8	1E-7
82	Lead-211 <sup>b/</sup>	D, all compounds	1E+4	6E+2	3E-7	9E-10	2E-4	2E-3
82	Lead-212	D, all compounds	8E+1	3E+1	1E-8	5E-11	-	-
			Bone surf (1E+2)	-	-	-	2E-6	2E-5
82	Lead-214 <sup>b/</sup>	D, all compounds	9E+3	8E+2	3E-7	1E-9	1E-4	1E-3
83	Bismuth-200 <sup>b/</sup>	D, nitrates	3E+4	8E+4	4E-5	1E-7	4E-4	4E-3
		W, all other compounds	-	1E+5	4E-5	1E-7	-	-
83	Bismuth-201 <sup>b/</sup>	D, see <sup>200</sup> Bi	1E+4	3E+4	1E-5	4E-8	2E-4	2E-3
		W, see <sup>200</sup> Bi	-	4E+4	2E-5	5E-8	-	-
83	Bismuth-202 <sup>b/</sup>	D, see <sup>200</sup> Bi	1E+4	4E+4	2E-5	6E-8	2E-4	2E-3
		W, see <sup>200</sup> Bi	-	8E+4	3E-5	1E-7	-	-
83	Bismuth-203	D, see <sup>200</sup> Bi	2E+3	7E+3	3E-6	9E-9	3E-5	3E-4
		W, see <sup>200</sup> Bi	-	6E+3	3E-6	9E-9	-	-
83	Bismuth-205	D, see <sup>200</sup> Bi	1E+3	3E+3	1E-6	3E-9	2E-5	2E-4
		W, see <sup>200</sup> Bi	-	1E+3	5E-7	2E-9	-	-
83	Bismuth-206	D, see <sup>200</sup> Bi	6E+2	1E+3	6E-7	2E-9	9E-6	9E-5
		W, see <sup>200</sup> Bi	-	9E+2	4E-7	1E-9	-	-
83	Bismuth-207	D, see <sup>200</sup> Bi	1E+3	2E+3	7E-7	2E-9	1E-5	1E-4
		W, see <sup>200</sup> Bi	-	4E+2	1E-7	5E-10	-	-
83	Bismuth-210 <sup>m</sup>	D, see <sup>200</sup> Bi	4E+1	5E+0	2E-9	-	-	-
			Kidneys (6E+1)	Kidneys (6E+0)	-	9E-12	8E-7	8E-6
		W, see <sup>200</sup> Bi	-	7E-1	3E-10	9E-13	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )							
83	Bismuth-210	D, see <sup>200</sup> Bi	8E+2	2E+2	1E-7	-	1E-5	1E-4
			-	Kidneys (4E+2)	-	5E-10	-	-
83	Bismuth-212 <sup>b/</sup>	W, see <sup>200</sup> Bi D, see <sup>200</sup> Bi	- 5E+3	3E+1 2E+2	1E-8 1E-7	4E-11 3E-10	- 7E-5	- 7E-4
83	Bismuth-213 <sup>b/</sup>	W, see <sup>200</sup> Bi D, see <sup>200</sup> Bi	- 7E+3	3E+2 3E+2	1E-7 1E-7	4E-10 4E-10	- 1E-4	- 1E-3
83	Bismuth-214 <sup>b/</sup>	W, see <sup>200</sup> Bi D, see <sup>200</sup> Bi	- 2E+4	4E+2 8E+2	1E-7 3E-7	5E-10 1E-9	- -	- -
			St wall (2E+4)	-	-	-	3E-4	3E-3
84	Polonium-203 <sup>b/</sup>	W, see <sup>200</sup> Bi D, all compounds except those given for W	- 3E+4	9E-2 6E+4	4E-7 3E-5	1E-9 9E-8	- 3E-4	- 3E-3
		W, oxides, hydroxides, and nitrates	-	9E+4	4E-5	1E-7	-	-
84	Polonium-205 <sup>b/</sup>	D, see <sup>203</sup> Po	2E+4	4E+4	2E-5	5E-8	3E-4	3E-3
		W, see <sup>203</sup> Po	-	7E+4	3E-5	1E-7	-	-
84	Polonium-207	D, see <sup>203</sup> Po	8E+3	3E+4	1E-5	3E-8	1E-4	1E-3
		W, see <sup>203</sup> Po	-	3E+4	1E-5	4E-8	-	-
84	Polonium-210	D, see <sup>203</sup> Po	3E+0	6E-1	3E-10	9E-13	4E-8	4E-7
		W, see <sup>203</sup> Po	-	6E-1	3E-10	9E-13	-	-
85	Astatine-207 <sup>b/</sup>	D, halides	6E+3	3E+3	1E-6	4E-9	8E-5	8E-4
		W	-	2E+3	9E-7	3E-9	-	-
85	Astatine-211	D, halides	1E+2	8E+1	3E-8	1E-10	2E-6	2E-5
		W	-	5E+1	2E-8	8E-11	-	-
86	Radon-220	With daughters removed	-	2E+4	7E-6	2E-8	-	-
		With daughters present	-	2E+1	9E-9	3E-11	-	-
				(or 12 WLM)	(or 1.0 WL)			
86	Radon-222	With daughters removed	-	1E+4	4E-6	1E-8	-	-
		With daughters present	-	1E+2	3E-8	1E-10	-	-
				(or 4 WLM)	(or 0.33 WL)			
87	Francium-222 <sup>b/</sup>	D, all compounds	2E+3	5E+2	2E-7	6E-10	3E-5	3E-4
87	Francium-223 <sup>b/</sup>	D, all compounds	6E+2	8E+2	3E-7	1E-9	8E-6	8E-5
88	Radium-223	W, all compounds	5E+0	7E-1	3E-10	9E-13	-	-
			Bone surf (9E+0)	-	-	-	1E-7	1E-6
88	Radium-224	W, all compounds	8E+0	2E+0	7E-10	2E-12	-	-
			Bone surf (2E+1)	-	-	-	2E-7	2E-6
88	Radium-225	W, all compounds	8E+0	7E-1	3E-10	9E-13	-	-
			Bone surf (2E+1)	-	-	-	2E-7	2E-6
88	Radium-226	W, all compounds	2E+0	6E-1	3E-10	9E-13	-	-
			Bone surf (5E+0)	-	-	-	6E-8	6E-7

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ( $\mu\text{Ci}$ )	Inhalation ( $\mu\text{Ci}$ ) (DAC)		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
88	Radium-227 <sup>b/</sup>	W, all compounds	2E+4	1E+4	6E-6	-	-	-
			Bone surf (2E+4)	Bone surf (2E+4)	-	3E-8	3E-4	3E-3
88	Radium-228	W, all compounds	2E+0	1E+0	5E-10	2E-12	-	-
			Bone surf (4E+0)	-	-	-	6E-8	6E-7
89	Actinium-224	D, all compounds except those given for W and Y	2E+3	3E+1	1E-8	-	-	-
			LLI wall (2E+3)	Bone surf (4E+1)	-	5E-11	3E-5	3E-4
		W, halides and nitrates	-	5E+1	2E-8	7E-11	-	-
		Y, oxides and hydroxides	-	5E+1	2E-8	6E-11	-	-
89	Actinium-225	D, see <sup>224</sup> Ac	5E+1	3E-1	1E-10	-	-	-
			LLI wall (5E+1)	Bone surf (5E-1)	-	7E-13	7E-7	7E-6
		W, see <sup>224</sup> Ac	-	6E-1	3E-10	9E-13	-	-
		Y, see <sup>224</sup> Ac	-	6E-1	3E-10	9E-13	-	-
89	Actinium-226	D, see <sup>224</sup> Ac	1E+2	3E+0	1E-9	-	-	-
			LLI wall (1E+2)	Bone surf (4E+0)	-	5E-12	2E-6	2E-5
		W, see <sup>224</sup> Ac	-	5E+0	2E-9	7E-12	-	-
		Y, see <sup>224</sup> Ac	-	5E+0	2E-9	6E-12	-	-
89	Actinium-227	D, see <sup>224</sup> Ac	2E-1	4E-4	2E-13	-	-	-
			Bone surf (4E-1)	Bone surf (8E-4)	-	1E-15	5E-9	5E-8
		W, see <sup>224</sup> Ac	-	2E-3	7E-13	-	-	-
			Bone surf (3E-3)	-	-	4E-15	-	-
		Y, see <sup>224</sup> Ac	-	4E-3	2E-12	6E-15	-	-
89	Actinium-228	D, see <sup>224</sup> Ac	2E+3	9E+0	4E-9	-	3E-5	3E-4
			Bone surf (2E+1)	-	-	2E-11	-	-
		W, see <sup>224</sup> Ac	-	4E+1	2E-8	-	-	-
			Bone surf (6E+1)	-	-	8E-11	-	-
		Y, see <sup>224</sup> Ac	-	4E+1	2E-8	6E-11	-	-
90	Thorium-226 <sup>b/</sup>	W, all compounds except those given for Y	5E+3	2E+2	6E-8	2E-10	-	-
			St wall (5E+3)	-	-	-	7E-5	7E-4
		Y, oxides and hydroxides	-	1E+2	6E-8	2E-10	-	-
90	Thorium-227	W, see <sup>226</sup> Th	1E+2	3E-1	1E-10	5E-13	2E-6	2E-5
		Y, see <sup>226</sup> Th	-	3E-1	1E-10	5E-13	-	-
90	Thorium-228	W, see <sup>226</sup> Th	6E+0	1E-2	4E-12	-	-	-
			Bone surf (1E+1)	Bone surf (2E-2)	-	3E-14	2E-7	2E-6
		Y, see <sup>226</sup> Th	-	2E-2	7E-12	2E-14	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
ALI ( $\mu\text{Ci}$ )	ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )						
90	Thorium-229	W, see <sup>226</sup> Th	6E-1 Bone surf (1E+0)	9E-4 Bone surf (2E-3)	4E-13	-	-	-
		Y, see <sup>226</sup> Th	-	2E-3 Bone surf (3E-3)	1E-12	-	-	2E-7
90	Thorium-230	W, see <sup>226</sup> Th	4E+0 Bone surf (9E+0)	6E-3 Bone surf (2E-2)	3E-12	-	-	-
		Y, see <sup>226</sup> Th	-	2E-2 Bone surf (2E-2)	6E-12	-	-	1E-6
90	Thorium-231	W, see <sup>226</sup> Th	4E+3	6E+3	3E-6	9E-9	5E-5	5E-4
		Y, see <sup>226</sup> Th	-	6E+3	3E-6	9E-9	-	-
90	Thorium-232	W, see <sup>226</sup> Th	7E-1 Bone surf (2E+0)	1E-3 Bone surf (3E-3)	5E-13	-	-	-
		Y, see <sup>226</sup> Th	-	3E-3 Bone surf (4E-3)	1E-12	-	-	3E-7
90	Thorium-234	W, see <sup>226</sup> Th	3E+2 LLI wall (4E+2)	2E+2	8E-8	3E-10	-	-
		Y, see <sup>226</sup> Th	-	2E+2	6E-8	2E-10	5E-6	5E-5
91	Protactinium-227 <sup>b/</sup>	W, all compounds except those given for Y	4E+3	1E+2	5E-8	2E-10	5E-5	5E-4
		Y, oxides and hydroxides	-	1E+2	4E-8	1E-10	-	-
91	Protactinium-228	W, see <sup>227</sup> Pa	1E+3	1E+1	5E-9	-	2E-5	2E-4
		Y, see <sup>227</sup> Pa	-	(2E+1) Bone surf	-	3E-11	-	-
91	Protactinium-230	W, see <sup>227</sup> Pa	6E+2 Bone surf (9E+2)	5E+0 Bone surf	2E-9	7E-12	-	-
		Y, see <sup>227</sup> Pa	-	4E+0	1E-9	5E-12	1E-5	1E-4
91	Protactinium-231	W, see <sup>227</sup> Pa	2E-1 Bone surf (5E-1)	2E-3 Bone surf	6E-13	-	-	-
		Y, see <sup>227</sup> Pa	-	(4E-3) Bone surf	2E-12	6E-15	6E-9	6E-8
91	Protactinium-232	W, see <sup>227</sup> Pa	1E+3	2E+1 Bone surf	9E-9	-	2E-5	2E-4
		Y, see <sup>227</sup> Pa	-	(6E-3) Bone surf	-	8E-15	-	-
			-	(6E+1) Bone surf	2E-8	8E-11	-	-
			-	(7E+1) Bone surf	-	1E-10	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI ( $\mu\text{Ci}$ )		DAC ( $\mu\text{Ci/ml}$ )	Air ( $\mu\text{Ci/ml}$ )	
91	Protactinium-233	W, see <sup>227</sup> Pa	1E+3 LLI wall (2E+3)	7E+2	3E-7	1E-9	-	-
91	Protactinium-234	Y, see <sup>227</sup> Pa W, see <sup>227</sup> Pa Y, see <sup>227</sup> Pa	- 2E+3 -	6E+2 8E+3 7E+3	2E-7 3E-6 3E-6	8E-10 1E-8 9E-9	- 3E-5 -	- 3E-4 -
92	Uranium-230	D, UF <sub>6</sub> , UO <sub>2</sub> F <sub>2</sub> , UO <sub>2</sub> (NO <sub>3</sub> ) <sub>2</sub>  (6E+0) W, UO <sub>3</sub> , UF <sub>4</sub> , UCl <sub>4</sub> Y, UO <sub>2</sub> , U <sub>3</sub> O <sub>8</sub>	4E+0 Bone surf (6E-1) -	4E-1 Bone surf -	2E-10 8E-13 1E-10	- 8E-8 5E-13	- 8E-7 -	- -
92	Uranium-231	D, see <sup>230</sup> U  W, see <sup>230</sup> U Y, see <sup>230</sup> U	5E+3 LLI wall (4E+3) -	8E+3 -	3E-6 -	1E-8 -	- 6E-5 -	- 6E-4 -
92	Uranium-232	D, see <sup>230</sup> U  W, see <sup>230</sup> U Y, see <sup>230</sup> U	2E+0 Bone surf (4E+0) -	2E-1 Bone surf (4E-1) -	9E-11 -	- 6E-13 5E-13	- 6E-8 -	- 6E-7 -
92	Uranium-233	D, see <sup>230</sup> U  W, see <sup>230</sup> U Y, see <sup>230</sup> U	1E+1 Bone surf (2E+1) -	1E+0 Bone surf (2E+0) -	5E-10 -	- 3E-12 1E-12	- 3E-7 -	- 3E-6 -
92	Uranium-234 <sup>c/</sup>	D, see <sup>230</sup> U  W, see <sup>230</sup> U Y, see <sup>230</sup> U	1E+1 Bone surf (2E+1) -	1E+0 Bone surf (2E+0) -	5E-10 -	- 3E-12 1E-12	- 3E-7 -	- 3E-6 -
92	Uranium-235 <sup>c/</sup>	D, see <sup>230</sup> U  W, see <sup>230</sup> U Y, see <sup>230</sup> U	1E+1 Bone surf (2E+1) -	1E+0 Bone surf (2E+0) -	6E-10 -	- 3E-12 1E-12	- 3E-7 -	- 3E-6 -
92	Uranium-236	D, see <sup>230</sup> U  W, see <sup>230</sup> U Y, see <sup>230</sup> U	1E+1 Bone surf (2E+1) -	1E+0 Bone surf (2E+0) -	5E-10 -	- 3E-12 1E-12	- 3E-7 -	- 3E-6 -
92	Uranium-237	D, see <sup>230</sup> U  W, see <sup>230</sup> U Y, see <sup>230</sup> U	2E+3 LLI wall (2E+3) -	3E+3 -	1E-6 -	4E-9 -	- 3E-5 -	- 3E-4 -

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI ( $\mu\text{Ci}$ )		DAC ( $\mu\text{Ci/ml}$ )	Air ( $\mu\text{Ci/ml}$ )	
92	Uranium-238 <sup>c/</sup>	D, see <sup>230</sup> U	1E+1	1E+0	6E-10	-	-	-
			Bone surf (2E+1)	Bone surf (2E+0)	-	3E-12	3E-7	3E-6
		W, see <sup>230</sup> U	-	8E-1	3E-10	1E-12	-	-
		Y, see <sup>230</sup> U	-	4E-2	2E-11	6E-14	-	-
92	Uranium-239 <sup>b/</sup>	D, see <sup>230</sup> U	7E+4	2E+5	8E-5	3E-7	9E-4	9E-3
		W, see <sup>230</sup> U	-	2E+5	7E-5	2E-7	-	-
		Y, see <sup>230</sup> U	-	2E+5	6E-5	2E-7	-	-
92	Uranium-240	D, see <sup>230</sup> U	1E+3	4E+3	2E-6	5E-9	2E-5	2E-4
		W, see <sup>230</sup> U	-	3E+3	1E-6	4E-9	-	-
		Y, see <sup>230</sup> U	-	2E+3	1E-6	3E-9	-	-
92	Uranium-natural <sup>c/</sup>	D, see <sup>230</sup> U	1E+1	1E+0	5E-10	-	-	-
			Bone surf (2E+1)	Bone surf (2E+0)	-	3E-12	3E-7	3E-6
		W, see <sup>230</sup> U	-	8E-1	3E-10	9E-13	-	-
		Y, see <sup>230</sup> U	-	5E-2	2E-11	9E-14	-	-
93	Neptunium-232 <sup>b/</sup>	W, all compounds	1E+5	2E+3	7E-7	-	2E-3	2E-2
			Bone surf -	(5E+2)	-	6E-9	-	-
93	Neptunium-233 <sup>b/</sup>	W, all compounds	8E+5	3E+6	1E-3	4E-6	1E-2	1E-1
93	Neptunium-234	W, all compounds	2E+3	3E+3	1E-6	4E-9	3E-5	3E-4
93	Neptunium-235	W, all compounds	2E+4	8E+2	3E-7	-	-	-
			LLI wall (2E+4)	Bone surf (1E+3)	-	2E-9	3E-4	3E-3
93	Neptunium-236 (1.15E+5 y)	W, all compounds	3E+0	2E-2	9E-12	-	-	-
			Bone surf (6E+0)	Bone surf (5E-2)	-	8E-14	9E-8	9E-7
93	Neptunium-236 (22.5 h)	W, all compounds	3E+3	3E+1	1E-8	-	-	-
			Bone surf (4E+3)	Bone surf (7E+1)	-	1E-10	5E-5	5E-4
93	Neptunium-237	W, all compounds	5E-1	4E-3	2E-12	-	-	-
			Bone surf (1E+0)	Bone surf (1E-2)	-	1E-14	2E-8	2E-7
93	Neptunium-238	W, all compounds	1E+3	6E+1	3E-8	-	2E-5	2E-4
			Bone surf -	(2E+2)	-	2E-10	-	-
93	Neptunium-239	W, all compounds	2E+3	2E+3	9E-7	3E-9	-	-
			LLI wall (2E+3)	-	-	-	2E-5	2E-4
93	Neptunium-240 <sup>b/</sup>	W, all compounds	2E+4	8E+4	3E-5	1E-7	3E-4	3E-3
94	Plutonium-234	W, all compounds except PuO <sub>2</sub>	8E+3	2E+2	9E-8	3E-10	1E-4	1E-3
		Y, PuO <sub>2</sub>	-	2E+2	8E-8	3E-10	-	-
94	Plutonium-235 <sup>b/</sup>	W, see <sup>234</sup> Pu	9E+5	3E+6	1E-3	4E-6	1E-2	1E-1
		Y, see <sup>234</sup> Pu	-	3E+6	1E-3	3E-6	-	-
94	Plutonium-236	W, see <sup>234</sup> Pu	2E+0	2E-2	8E-12	-	-	-
			Bone surf (4E+0)	Bone surf (4E-2)	-	5E-14	6E-8	6E-7
		Y, see <sup>234</sup> Pu	-	4E-2	2E-11	6E-14	-	-



**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI      DAC ( $\mu\text{Ci}$ )    ( $\mu\text{Ci/ml}$ )		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
94	Plutonium-237	W, see <sup>234</sup> Pu Y, see <sup>234</sup> Pu	1E+4 -	3E+3 3E+3	1E-6 1E-6	5E-9 4E-9	2E-4 -	2E-3 -
94	Plutonium-238	W, see <sup>234</sup> Pu	9E-1	7E-3	3E-12	-	-	-
94	Plutonium-239	Y, see <sup>234</sup> Pu	-	2E-2	8E-12	2E-14	2E-8	-
		W, see <sup>234</sup> Pu	8E-1	6E-3	3E-12	-	-	-
94	Plutonium-240	Y, see <sup>234</sup> Pu	-	2E-2	7E-12	-	-	-
		W, see <sup>234</sup> Pu	8E-1	6E-3	3E-12	-	-	-
94	Plutonium-241	Y, see <sup>234</sup> Pu	-	2E-2	7E-12	-	-	-
		W, see <sup>234</sup> Pu	4E+1	3E-1	1E-10	-	-	-
94	Plutonium-242	Y, see <sup>234</sup> Pu	-	2E-2	7E-12	-	-	-
		W, see <sup>234</sup> Pu	8E-1	7E-3	3E-12	-	-	-
94	Plutonium-243	W, see <sup>234</sup> Pu Y, see <sup>234</sup> Pu	2E+4 -	4E+4 4E+4	2E-5 2E-5	5E-8 5E-8	2E-4 -	2E-3 -
94	Plutonium-244	Y, see <sup>234</sup> Pu	-	2E-2	7E-12	-	-	-
		W, see <sup>234</sup> Pu	8E-1	7E-3	3E-12	-	-	-
94	Plutonium-245	Y, see <sup>234</sup> Pu	-	2E-2	7E-12	-	-	-
		W, see <sup>234</sup> Pu	2E+3	5E+3	2E-6	6E-9	3E-5	3E-4
94	Plutonium-246	W, see <sup>234</sup> Pu	4E+2	3E+2	1E-7	4E-10	-	-
95	Americium-237 <sup>b/</sup>	Y, see <sup>234</sup> Pu	-	3E+2	1E-7	4E-10	6E-6	6E-5
		W, all compounds	8E+4	3E+5	1E-4	4E-7	1E-3	1E-2
95	Americium-238 <sup>b/</sup>	Y, see <sup>234</sup> Pu	-	3E+2	1E-7	4E-10	6E-6	6E-5
		W, all compounds	4E+4	3E+3	1E-6	-	5E-4	5E-3
95	Americium-239	W, all compounds	5E+3	1E+4	5E-6	2E-8	7E-5	7E-4
95	Americium-240	W, all compounds	2E+3	3E+3	1E-6	4E-9	3E-5	3E-4

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI      DAC ( $\mu\text{Ci/ml}$ )    ( $\mu\text{Ci/ml}$ )		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
95	Americium-241	W, all compounds	8E-1 Bone surf (1E+0)	6E-3 Bone surf (1E-2)	3E-12 - -	- 2E-14	- 2E-8	- 2E-7
95	Americium-242m	W, all compounds	8E-1 Bone surf (1E+0)	6E-3 Bone surf (1E-2)	3E-12 - -	- 2E-14	- 2E-8	- 2E-7
95	Americium-242	W, all compounds	4E+3	8E+1 Bone surf	4E-8 -	-	5E-5	5E-4
95	Americium-243	W, all compounds	- 8E-1 Bone surf (1E+0)	(9E+1) 6E-3 Bone surf (1E-2)	- 3E-12 -	1E-10 -	-	- 2E-7
95	Americium-244m <sup>b/</sup>	W, all compounds	6E+4 St wall (8E+4)	4E+3 Bone surf (7E+3)	2E-6 -	- 1E-8	- 1E-3	- 1E-2
95	Americium-244	W, all compounds	3E+3	2E+2 Bone surf (3E+2)	8E-8 -	- 4E-10	4E-5	4E-4
95	Americium-245	W, all compounds	3E+4	8E+4	3E-5	1E-7	4E-4	4E-3
95	Americium-246m <sup>b/</sup>	W, all compounds	5E+4 St wall (6E+4)	2E+5 -	8E-5 -	3E-7 -	- 8E-4	- 8E-3
95	Americium-246 <sup>b/</sup>	W, all compounds	3E+4	1E+5	4E-5	1E-7	4E-4	4E-3
96	Curium-238	W, all compounds	2E+4	1E+3	5E-7	2E-9	2E-4	2E-3
96	Curium-240	W, all compounds	6E+1 Bone surf (8E+1)	6E-1 Bone surf (6E-1)	2E-10 -	- 9E-13	- 1E-6	- 1E-5
96	Curium-241	W, all compounds	1E+3	3E+1 Bone surf (4E+1)	1E-8 -	- 5E-11	2E-5	2E-4
96	Curium-242	W, all compounds	- 3E+1 Bone surf (5E+1)	(4E+1) 3E-1 Bone surf (3E-1)	- 1E-10 -	5E-11 -	-	- 7E-6
96	Curium-243	W, all compounds	1E+0 Bone surf (2E+0)	9E-3 Bone surf (2E-2)	4E-12 -	- 2E-14	- 3E-8	- 3E-7
96	Curium-244	W, all compounds	1E+0 Bone surf (3E+0)	1E-2 Bone surf (2E-2)	5E-12 -	- 3E-14	- 3E-8	- 3E-7
96	Curium-245	W, all compounds	7E-1 Bone surf (1E+0)	6E-3 Bone surf (1E-2)	3E-12 -	- 2E-14	- 2E-8	- 2E-7
96	Curium-246	W, all compounds	7E-1 Bone surf (1E+0)	6E-3 Bone surf (1E-2)	3E-12 -	- 2E-14	- 2E-8	- 2E-7
96	Curium-247	W, all compounds	8E-1 Bone surf (1E+0)	6E-3 Bone surf (1E-2)	3E-12 -	- 2E-14	- 2E-8	- 2E-7

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers	
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )	
			Oral Ingestion	Inhalation		Air	Water		
				ALI ( $\mu\text{Ci}$ )	ALI ( $\mu\text{Ci}$ )				DAC ( $\mu\text{Ci/ml}$ )
96	Curium-248	W, all compounds	2E-1 Bone surf (4E-1)	2E-3 Bone surf (3E-3)	7E-13	-	-	-	
96	Curium-249 <sup>b/</sup>	W, all compounds	5E+4	2E+4 Bone surf (3E+4)	7E-6	-	4E-15	5E-9	5E-8
96	Curium-250	W, all compounds	4E-2 Bone surf (6E-2)	3E-4 Bone surf (5E-4)	1E-13	-	8E-16	9E-10	9E-9
97	Berkelium-245	W, all compounds	2E+3	1E+3	5E-7	-	2E-9	3E-5	3E-4
97	Berkelium-246	W, all compounds	3E+3	3E+3	1E-6	-	4E-9	4E-5	4E-4
97	Berkelium-247	W, all compounds	5E-1 Bone surf (1E+0)	4E-3 Bone surf (9E-3)	2E-12	-	1E-14	2E-8	2E-7
97	Berkelium-249	W, all compounds	2E+2 Bone surf (5E+2)	2E+0 Bone surf (4E+0)	7E-10	-	5E-12	6E-6	6E-5
97	Berkelium-250	W, all compounds	9E+3	3E+2 Bone surf (7E+2)	1E-7	-	1E-9	1E-4	1E-3
98	Californium-244 <sup>b/</sup>	W, all compounds except those given for Y	3E+4 St wall (3E+4)	6E+2	2E-7	-	8E-10	-	-
98	Californium-246	Y, oxides and hydroxides W, see <sup>244</sup> Cf	-	6E+2	2E-7	-	8E-10	4E-4	4E-3
98	Californium-248	W, see <sup>244</sup> Cf	4E+2	9E+0	4E-9	-	1E-11	5E-6	5E-5
98	Californium-249	Y, see <sup>244</sup> Cf W, see <sup>244</sup> Cf	-	9E+0	4E-9	-	1E-11	-	-
98	Californium-249	Y, see <sup>244</sup> Cf W, see <sup>244</sup> Cf	8E+0 Bone surf (2E+1)	6E-2 Bone surf (1E-1)	3E-11	-	2E-13	2E-7	2E-6
98	Californium-249	Y, see <sup>244</sup> Cf W, see <sup>244</sup> Cf	-	1E-1	4E-11	-	1E-13	-	-
98	Californium-249	Y, see <sup>244</sup> Cf W, see <sup>244</sup> Cf	5E-1 Bone surf (1E+0)	4E-3 Bone surf (9E-3)	2E-12	-	1E-14	2E-8	2E-7
98	Californium-249	Y, see <sup>244</sup> Cf W, see <sup>244</sup> Cf	-	1E-2	4E-12	-	-	-	-
98	Californium-250	W, see <sup>244</sup> Cf	-	1E-2	4E-12	-	2E-14	-	-
98	Californium-250	W, see <sup>244</sup> Cf	1E+0 Bone surf (2E+0)	9E-3 Bone surf (2E-2)	4E-12	-	3E-14	3E-8	3E-7
98	Californium-251	Y, see <sup>244</sup> Cf W, see <sup>244</sup> Cf	-	3E-2	1E-11	-	4E-14	-	-
98	Californium-251	Y, see <sup>244</sup> Cf W, see <sup>244</sup> Cf	5E-1 Bone surf (1E+0)	4E-3 Bone surf (9E-3)	2E-12	-	1E-14	2E-8	2E-7
98	Californium-251	Y, see <sup>244</sup> Cf W, see <sup>244</sup> Cf	-	1E-2	4E-12	-	-	-	-
98	Californium-251	Y, see <sup>244</sup> Cf W, see <sup>244</sup> Cf	-	1E-2	4E-12	-	2E-14	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
			Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation ALI      DAC ( $\mu\text{Ci}$ )    ( $\mu\text{Ci/ml}$ )		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
98	Californium-252	W, see <sup>244</sup> Cf	2E+0	2E-2	8E-12	-	-	-
			Bone surf (5E+0)	Bone surf (4E-2)	-	5E-14	7E-8	7E-7
98	Californium-253	Y, see <sup>244</sup> Cf W, see <sup>244</sup> Cf	-	3E-2	1E-11	5E-14	-	-
			2E+2	2E+0	8E-10	3E-12	-	-
			Bone surf (4E+2)	-	-	-	5E-6	5E-5
98	Californium-254	Y, see <sup>244</sup> Cf W, see <sup>244</sup> Cf	-	2E+0	7E-10	2E-12	-	-
			2E+0	2E-2	9E-12	3E-14	3E-8	3E-7
99	Einsteinium-250	W, all compounds	-	2E-2	7E-12	2E-14	-	-
			4E+4	5E+2	2E-7	-	6E-4	6E-3
			-	Bone surf (1E+3)	-	2E-9	-	-
99	Einsteinium-251	W, all compounds	7E+3	9E+2	4E-7	-	1E-4	1E-3
			-	Bone surf (1E+3)	-	2E-9	-	-
99	Einsteinium-253	W, all compounds	2E+2	1E+0	6E-10	2E-12	2E-6	2E-5
99	Einsteinium-254m	W, all compounds	3E+2	1E+1	4E-9	1E-11	-	-
			LLI wall (3E+2)	-	-	-	4E-6	4E-5
99	Einsteinium-254	W, all compounds	8E+0	7E-2	3E-11	-	-	-
			Bone surf (2E+1)	Bone surf (1E-1)	-	2E-13	2E-7	2E-6
100	Fermium-252	W, all compounds	5E+2	1E+1	5E-9	2E-11	6E-6	6E-5
100	Fermium-253	W, all compounds	1E+3	1E+1	4E-9	1E-11	1E-5	1E-4
100	Fermium-254	W, all compounds	3E+3	9E+1	4E-8	1E-10	4E-5	4E-4
100	Fermium-255	W, all compounds	5E+2	2E+1	9E-9	3E-11	7E-6	7E-5
100	Fermium-257	W, all compounds	2E+1	2E-1	7E-11	-	-	-
			Bone surf (4E+1)	Bone surf (2E-1)	-	3E-13	5E-7	5E-6
101	Mendelevium-257	W, all compounds	7E+3	8E+1	4E-8	-	1E-4	1E-3
			-	Bone surf (9E+1)	-	1E-10	-	-
101	Mendelevium-258	W, all compounds	3E+1	2E-1	1E-10	-	-	-
			Bone surf (5E+1)	Bone surf (3E-1)	-	5E-13	6E-7	6E-6
		-Any single radionuclide not listed above with decay mode other than alpha emission or spontaneous fission and with radioactive half-life less than 2 hours      Submersion <sup>a/</sup>	-	2E+2	1E-7	1E-9	-	-
		-Any single radionuclide not listed above with decay mode other than alpha emission or spontaneous fission and with radioactive half-life greater than 2 hours      . . . .	-	2E-1	1E-10	1E-12	1E-8	1E-7

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of Radionuclides for Occupational Exposure Effluent Concentrations Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration
			Oral Ingestion	Inhalation		Air	Water	
ALI (μCi)	ALI (μCi)	DAC (μCi/ml)	Air (μCi/ml)	Water (μCi/ml)	ALI (μCi/ml)			
	-Any single radionuclide not listed above that decays by alpha emission or spontaneous fission, or any mixture for which either the identity or the concentration of any radionuclide in the mixture is not known . . . .	-	4E-4	2E-13	1E-15	2E-9	2E-8	

Footnotes:

a/ "Submersion" means that values given are for submersion in a hemispherical semi-infinite cloud of airborne material.

b/ These radionuclides have radiological half-lives of less than 2 hours. The total effective dose equivalent received during operations with these radionuclides might include a significant contribution from external exposure. The DAC values for all radionuclides, other than those designated Class "Submersion," are based upon the committed effective dose equivalent due to the intake of the radionuclide into the body and do NOT include potentially significant contributions to dose equivalent from external exposures. The licensee may substitute 1E-7 μCi/ml for the listed DAC to account for the submersion dose prospectively, but should use individual monitoring devices or other radiation measuring instruments that measure external exposure to demonstrate compliance with the limits. (See s. DHS 157.22 (3))

c/ For soluble mixtures of U-238, U-234, and U-235 in air, chemical toxicity may be the limiting factor (see D.201e.). If the percent by weight enrichment of U-235 is not greater than 5, the concentration value for a 40-hour workweek is 0.2 milligrams uranium per cubic meter of air average. For any enrichment, the product of the average concentration and time of exposure during a 40-hour workweek may not exceed 8E-3 (SA) μCi-hr/ml, where SA is the specific activity of the uranium inhaled. The specific activity for natural uranium is 6.77E-7 curies per gram U. The specific activity for other mixtures of U-238, U-235, and U-234, if not known, shall be:

SA = 3.6E-7 curies/gram U U-depleted

SA = [0.4 + 0.38 enrichment + 0.0034 enrichment<sup>2</sup>] E-6, enrichment ≥ 0.72

where enrichment is the percentage by weight of U-235, expressed as percent.

**Note:**

1. If the identity of each radionuclide in a mixture is known but the concentration of one or more of the radionuclides in the mixture is not known, the DAC for the mixture shall be the most restrictive DAC of any radionuclide in the mixture.

2. If the identity of each radionuclide in the mixture is not known, but it is known that certain radionuclides specified in this appendix are not present in the mixture, the inhalation ALI, DAC, and effluent and sewage concentrations for the mixture are the lowest values specified in this appendix for any radionuclide that is not known to be absent from the mixture; or

If it is known that Ac-227-D and Cm-250-W are not present

-	7E-4	3E-13	-	-	-
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If, in addition, it is known that Ac-227-W,Y, Th-229-W,Y, Th-230-W, Th-232-W,Y, Pa-231-W,Y, Np-237-W, Pu-239-W, Pu-240-W, Pu-242-W, Am-241-W, Am-242m-W, Am-243-W, Cm-245-W, Cm-246-W, Cm-247-W, Cm-248-W, Bk-247-W, Cf-249-W, and Cf-251-W are not present

-	7E-3	3E-12	-	-	-
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**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of  
Radionuclides for Occupational Exposure Effluent Concentrations  
Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (µCi/ml)
			Oral Ingestion ALI (µCi)	Inhalation ALI      DAC (µCi)      (µCi/ml)		Air (µCi/ml)	Water (µCi/ml)	
	If, in addition, it is known that Sm-146-W, Sm-147-W, Gd-148-D,W, Gd-152-D,W, Th-228-W,Y, Th-230-Y, U-232-Y, U-233-Y, U-234-Y, U-235-Y, U-236-Y, U-238-Y, Np-236-W, Pu-236-W,Y, Pu-238-W,Y, Pu-239-Y, Pu-240-Y, Pu-242-Y, Pu-244-W,Y, Cm-243-W, Cm-244-W, Cf-248-W, Cf-249-Y, Cf-250-W,Y, Cf-251-Y, Cf-252-W,Y, and Cf-254-W,Y are not present		7E-2	3E-11	-	-	-	-
	If, in addition, it is known that Pb-210-D, Bi-210m-W, Po-210-D,W, Ra-223-W, Ra-225-W, Ra-226-W, Ac-225-D,W,Y, Th-227-W,Y, U-230-D,W,Y, U-232-D,W, Pu-241-W, Cm-240-W, Cm-242-W, Cf-248-Y, Es-254-W, Fm-257-W, and Md-258-W are not present		-	7E-1	3E-10	-	-	-
	If, in addition, it is known that Si-32-Y, Ti-44-Y, Fe-60-D, Sr-90-Y, Zr-93-D, Cd-113m-D, Cd-113-D, In-115-D,W, La-138-D, Lu-176-W, Hf-178m-D,W, Hf-182-D,W, Bi-210m-D, Ra-224-W, Ra-228-W, Ac-226-D,W,Y, Pa-230-W,Y, U-233-D,W, U-234-D,W, U-235-D,W, U-236-D,W, U-238-D,W, Pu-241-Y, Bk-249-W, Cf-253-W,Y, and Es-253-W are not present		-	7E+0	3E-9	-	-	-
	If it is known that Ac-227-D,W,Y, Th-229-W,Y, Th-232-W,Y, Pa-231-W,Y, Cm-248-W, and Cm-250-W are not present		-	-	-	1E-14	-	-
	If, in addition, it is known that Sm-146-W, Gd-148-D,W, Gd-152-D, Th-228-W,Y, Th-230-W,Y, U-232-Y, U-233-Y, U-234-Y, U-235-Y, U-236-Y, U-238-Y, U-Nat-Y, Np-236-W, Np-237-W, Pu-236-W,Y, Pu-238-W,Y, Pu-239-W,Y, Pu-240-W,Y, Pu-242-W,Y, Pu-244-W,Y, Am-241-W, Am-242m-W, Am-243-W, Cm-243-W, Cm-244-W, Cm-245-W, Cm-246-W, Cm-247-W, Bk-247-W, Cf-249-W,Y, Cf-250-W,Y, Cf-251-W,Y, Cf-252-W,Y, and Cf-254-W,Y are not present		-	-	-	1E-13	-	-
	If, in addition, it is known that Sm-147-W, Gd-152-W, Pb-210-D, Bi-210m-W, Po-210-D,W, Ra-223-W, Ra-225-W, Ra-226-W, Ac-225-D,W,Y, Th-227-W,Y, U-230-D,W,Y, U-232-D,W, U-Nat-W, Pu-241-W, Cm-240-W, Cm-242-W, Cf-248-W,Y, Es-254-W, Fm-257-W, and Md-258-W are not present		-	-	1E-12	-	-	-

**Annual Limits on Intake (ALI) & Derived Air Concentrations (DAC) of Radionuclides for Occupational Exposure Effluent Concentrations Concentrations for Release to Sanitary Sewerage (Continued)**

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral Ingestion ALI (μCi)	Inhalation ALI      DAC (μCi)    (μCi/ml)		Air (μCi/ml)	Water (μCi/ml)	

If, in addition it is known that Fe-60, Sr-90, Cd-113m, Cd-113, In-115, I-129, Cs-134, Sm-145, Sm-147, Gd-148, Gd-152, Hg-194 (organic), Bi-210m, Ra-223, Ra-224, Ra-225, Ac-225, Th-228, Th-230, U-233, U-234, U-235, U-236, U-238, U-Nat, Cm-242, Cf-248, Es-254, Fm-257, and Md-258 are not present			-	-	-	-	1E-6	1E-5
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3. If a mixture of radionuclides consists of uranium and its daughters in ore dust (10 μm AMAD particle distribution assumed) prior to chemical separation of the uranium from the ore, the following values may be used for the DAC of the mixture: 6E-11 μCi of gross alpha activity from uranium-238, uranium-234, thorium-230, and radium-226 per milliliter of air; 3E-11 μCi of natural uranium per milliliter of air; or 45 micrograms of natural uranium per cubic meter of air.

4. If the identity and concentration of each radionuclide in a mixture are known, the limiting values should be derived as follows: determine, for each radionuclide in the mixture, the ratio between the concentration present in the mixture and the concentration otherwise established in Appendix E for the specific radionuclide when not in a mixture. The sum of such ratios for all of the radionuclides in the mixture may not exceed "1," which is "unity".

Example: If radionuclides "A," "B," and "C" are present in concentrations C<sub>A</sub>, C<sub>B</sub>, and C<sub>C</sub>, and if the applicable DACs are DAC<sub>A</sub>, DAC<sub>B</sub>, and DAC<sub>C</sub>, respectively, then the concentrations shall be limited so that the following relationship exists:

$$\frac{C_A}{DAC_A} + \frac{C_B}{DAC_B} + \frac{C_C}{DAC_C} \leq 1$$