

Appendix D. Reference Standards and Data for Water

Table D.1. Reference standards for radionuclides in water

Parameter ^a	National primary drinking water standard ^b	4% of DCG ^c	DCG ^d
²⁴¹ Am		1.2	30
²¹⁴ Bi		24,000	600,000
¹⁰⁹ Cd		400	10,000
¹⁴³ Ce		1,200	30,000
⁶⁰ Co		200	5,000
⁵¹ Cr		40,000	1,000,000
¹³⁷ Cs		120	3,000
¹⁵⁵ Eu		4,000	100,000
Gross alpha ^e	15		
Gross beta (mrem/year)	4 ^f		
³ H	20,000 ^g	80,000	2,000,000
¹³¹ I		120	3,000
⁴⁰ K		280	7,000
²³⁷ Np		1.2	30
^{234m} Pa		2,800	70,000
²³⁸ Pu		1.6	40
^{239/240} Pu		1.2	30
²²⁶ Ra	5 ^h	4	100
²²⁸ Ra	5 ^h	4	100
¹⁰⁶ Ru		240	6,000
⁹⁰ Sr	8 ^g	40	1,000
⁹⁹ Tc		4,000	100,000
²²⁸ Th		16	400
²³⁰ Th		12	300
²³² Th		2	50
²³⁴ Th		400	10,000
Thorium, natural		2	50
²³⁴ U		20	500
²³⁵ U		24	600
²³⁶ U		20	500
²³⁸ U		24	600
Uranium, natural		24	600
Uranium, total ⁱ (µg/L ^j)	30	20	500

^aOnly the radionuclides included in the Oak Ridge Reservation monitoring programs are listed. Unless labeled otherwise, units are pCi/L.

^b40 CFR Part 141, National Primary Drinking Water Regulations Subparts B and G. The drinking water standards are presented strictly for reference purposes and only have regulatory applicability for public water supplies.

^cFour percent of the derived concentration guide represents the DOE criterion of 4 mrem effective dose equivalent from ingestion of drinking water.

^dDOE Order 5400.5 Chap. III, "Derived Concentration Guides for Air and Water."

^eExcludes radon and uranium.

^fPer the discussion in 40 CFR 141.66(b), compliance with the 4-mrem/year standard can be assumed if the average annual gross beta particle activity is less than 50 pCi/L and if the average annual concentrations of ³H and ⁹⁰Sr are less than 20,000 pCi/L and 8 pCi/L, respectively, provided that, if both radionuclides are present, the sum of their annual dose equivalents to bone marrow is less than 4 mrem/year. In the text of this document, 50 pCi/L is referred to as the "screening level."

^gThese values are not maximum contaminant levels, but are concentrations that result in the effective dose equivalent of the maximum contaminant level for gross beta emissions, which is 4 mrem/year.

^hApplies to combined ²²⁶Ra and ²²⁸Ra.

ⁱMinimum of uranium isotopes.

^jEffective December 8, 2003.

Oak Ridge Reservation

Table D.2. Reference standards for chemicals and metals in water

Parameter	National drinking water standards		Tennessee water quality criteria ^c				
	Primary ^a	Secondary ^b	Domestic water supply	Fish and aquatic life		Recreation	
				CMC	CCC	Organisms	Water and organisms ^d
Anions (mg/L)							
Chloride		250					
Fluoride	4	4					
Nitrate	10	10					
Nitrite	1	1					
Sulfate, as SO ₄		250					
Base/neutral/acid extractable organics (µg/L)							
1,2-Dichlorobenzene (<i>ortho</i>)	60		600			1,300	420
1,2-Diphenylhydrazine						2.0	0.36
1,2,4-Trichlorobenzene	70		70			70	35
1,3-Dichlorobenzene (<i>meta</i>)						960	320
1,4-Dichlorobenzene (<i>para</i>)	75		75			190	63
2,4-Dichlorophenol						290	77
2,4-Dimethylphenol						850	380
2,4-Dinitrophenol						5,300	69
2,4-Dinitrotoluene						34	1.1
2,4,6-Trichlorophenol						24	14
2-Chlorophenol						150	81
2-Chloronaphthalene						1,600	1,000
2-Methyl-4,6-Dinitrophenol						280	13
3,3-Dichlorobenzidine						0.28	0.21
3,4-Benzo(b)fluoranthene						0.18	0.038
Benzo(k)fluoranthene						0.18	0.038
Acenaphthene						990	670
Anthracene						40,000	8,300
Benzidine						0.0020	0.00086
Benzo(a)anthracene						0.18	0.038
Benzo(a)pyrene	0.2		0.2			0.18	0.038
bis-(2-chloroethyl)ether						5.3	0.30
bis-(2-Chloro-isopropyl)ether						65,000	1,400
bis-(2-ethylhexyl)phthalate	6		6			22	12
Butylbenzyl phthalate						1,900	1,500
Chrysene						0.18	0.038
Di-n-butyl phthalate						4,500	2,000
Dibenz(a,h)anthracene						0.18	0.038
Diethyl phthalate						44,000	17,000
Dimethyl phthalate						1,100,000	270,000
Fluoranthene						140	130
Fluorene						5,300	1,100
Hexachlorobenzene	1		1			0.0029	0.0028
Hexachlorobutadiene						180	4.4
Hexachlorocyclopentadiene	50		50			1100	40

Table D.2 (continued)

Parameter	National drinking water standards		Tennessee water quality criteria ^c				
	Primary ^a	Secondary ^b	Domestic water supply	Fish and aquatic life		Recreation	
				CMC	CCC	Organisms	Water and organisms ^d
Hexachloroethane						33	14
Ideno(1,2,3-cd)pyrene						0.18	0.038
Isophorone						9,600	350
N-Nitrosodimethylamine						30	0.0069
N-Nitrosodi-n-propylamine						5.1	0.05
N-Nitrosodiphenylamine						60	33
Nitrobenzene						690	17
Pentachlorophenol (pH 7.8)	1		1			30	2.7
Phenol						1,700,000	21,000
Pyrene						4,000	830
Field measurements							
Chlorine (TRC), µg/L				19	11		
Dissolved oxygen, mg/L				5 (min)			
Temperature, µC			30.5	30.5		30.5	30.5
Turbidity, JTU ^e	1						
pH, standard units		(6.5, 8.5)	(6.0, 9.0)	(6.0, 9.0)		(6.0, 9.0)	(6.0, 9.0)
Metals (mg/L)							
Aluminum		0.05–0.2					
Antimony	0.006		0.006			0.64	0.0056
Arsenic	0.01 ^f		0.010	0.340 (III)	0.15	0.010	0.010
Barium	2		2				
Beryllium	0.004		0.004				
Cadmium	0.005		0.005	0.002 ^g	0.00025		
Chromium, total	0.1		0.1				
Chromium (hexavalent)				0.016	0.011		
Chromium (trivalent)						0.570	0.074
Copper	1.3 ^h	1		0.013 ^g	0.009		
Iron		0.3					
Lead	0.015 ^h		0.005	0.065 ^g	0.0025		
Manganese		0.05					
Mercury	0.002		0.002	0.0014	0.00077	0.000051	0.00005
Nickel			0.1	0.470 ^g	0.052	4.6	0.61
Selenium	0.05		0.050	0.02	0.005		
Silver		0.1		0.0032 ^g			
Thallium	0.002		0.002			0.00047	0.00024
Zinc		5		0.120 ^g	0.120		
Others							
Asbestos (fibers/L)	7,000,000						
Bromate (µg/L)	10						
Chloramine (mg/L)	40						
Chlorine (TRC)				0.019	0.011		
Color (color units)		15					
Cyanide (mg/L)	0.2		0.2	0.022	0.0052	0.140	0.140
<i>E. coli</i> (no./100 mL, geometric mean)			630	630		126	126
<i>E. coli</i> (no./100 mL, individual sample)				2,880		941	941

Table D.2 (continued)

Parameter	National drinking water standards		Tennessee water quality criteria ^c				
	Primary ^a	Secondary ^b	Domestic water supply	Fish and aquatic life		Recreation	
				CMC	CCC	Organisms	Water and organisms ^d
Odor (threshold odor number)		3					
Total dissolved solids (mg/L)		500	500				
	Pesticides/herbicides/PCBs (µg/L)						
2,3,7,8-TCDD (Dioxin)	0.00003		0.00003			0.000001	0.000001
2,4-D	70		70				
2,4,5-TP (Silvex)	50		50				
4,4'-DDT				1.1	0.001	0.0022	0.0022
4,4'-DDE						0.0022	0.0022
4,4'-DDD						0.0031	0.0031
a-BHC						0.049	0.026
b-BHC						0.17	0.091
Alachlor	2		2				
Aldrin				3.0		0.00050	0.00049
Atrazine	3		3				
Carbofuran	40		40				
Chlordane	2		2	2.4	0.0043	0.0081	0.0080
Dalapon	200		200				
1,2-Dibromo-3-chloropropane	0.2		0.2				
Di(ethylhexyl)adipate	400		400				
Dieldrin				0.24	0.056	0.00054	0.00052
Di(ethylhexyl)phthalate ⁱ							
Dinoseb	7		7				
Diquat	20		20				
a-Endosulfan				0.22	0.056	89	62
b-Endosulfan				0.22	0.056	89	62
Endosulfan sulfate						89	62
Endothall	100		100				
Endrin	2		2	0.086	0.036	0.06	0.059
Endrin aldehyde						0.30	0.29
Ethylene dibromide	0.05		0.05				
Glyphosate	700		700				
Heptachlor	0.4		0.4	0.52	0.0038	0.00079	0.00079
Heptachlor epoxide	0.2		0.2	0.52	0.0038	0.00039	0.00039
g-BHC (Lindane)	0.2		0.2	0.95		1.8	0.98
Methoxychlor	40		40				
Oxamyl (Vydate)	200		200				

Table D.2 (continued)

Parameter	National drinking water standards		Tennessee water quality criteria ^c				
	Primary ^a	Secondary ^b	Domestic water supply	Fish and aquatic life		Recreation	
				CMC	CCC	Organisms	Water and organisms ^d
PCB, total	0.5		0.5	0.014		0.00064	0.00064
Picloram	500		500				
Simazine	4		4				
Toxaphene	3		3	0.73	0.0002	0.0028	0.0028
Tributyltin				0.46	0.072		
1,1,1-Trichloroethane	200		200				
1,1-Dichloroethene	7		7			7,100	330
1,1,2-Trichloroethane	5		5			160	5.9
Volatile organics (µg/L)							
1,1,2,2-Tetrachloroethane						40	1.7
1,2-Dichloroethane	5		5			370	3.8
1,2-Dichloroethene ⁱ							
<i>cis</i> -1,2-Dichloroethene	70		70				
<i>trans</i> -1,2-Dichloroethene	100		100			10,000	140
1,2-Dichloropropane	5		5			150	5.0
<i>cis</i> -1,3-Dichloropropene						210	3.4
<i>trans</i> -1,3-Dichloropropene						210	3.4
Acrolein						290	190
Acrylonitrile						2.5	0.51
Benzene	5		5			510	22
Bromodichloromethane	80 ^k					170	5.5
Bromoform	80 ^k					1,400	43
Carbon tetrachloride	5		5			16	2.3
Chlorobenzene	100		100			1,600	130
Chloroform	80 ^k					4,700	57
Dibromochloromethane	80 ^k					130	4.0
Ethylbenzene	700		700			2,100	530
Methylbromide						1,500	47
Methylene chloride (Dichloromethane)	5		5			5,900	46
Styrene	100		100				
Tetrachloroethene	5		5			33	6.9
Toluene	1,000		1,000			15,000	1,300
Trichloroethene	5		5			300	25

Table D.2 (continued)

Parameter	National drinking water standards		Tennessee water quality criteria ^c				
	Primary ^a	Secondary ^b	Domestic water supply	Fish and aquatic life		Recreation	
				CMC	CCC	Organisms	Water and organisms ^d
Trihalomethanes, total	80 ^k						
Vinyl chloride	2		2			24	0.25
Xylenes, total	10,000		10,000				

^a40 CFR Part 141—National Primary Drinking Water Regulations, Subparts B and G, as amended. The drinking water standards are presented strictly for reference purposes and only have regulatory applicability for public water supplies.

^b40 CFR Part 143—National Secondary Drinking Water Regulations, as amended.

^cRules of Tennessee Department of Environment and Conservation, Division of Water Pollution Control, Chap. 1200-4-3, General Water Quality Criteria, as amended effective October 6, 2007. CMC = criterion maximum concentration; CCC= continuous concentration criteria.

^dThese criteria, for the protection of public health, pertain to the consumption of water and organisms. They apply only to waters designated for both recreation and domestic water supply.

^eJackson turbidity unit (JTU) and nephelometric turbidity unit (NTU) are roughly equivalent in the range of 25 to 1000 JTU.

^fAs of January 23, 2006.

^gThe standard is a function of total hardness. The values in this table correspond to a total-hardness value of 100 mg/L.

^h“Action level” for initiation of corrosion-control studies and treatment techniques, applicable to community water systems and nontransient, noncommunity water systems.

ⁱSee bis(2-ethylhexyl)phthalate.

^jSee cis-1,2-Dichloroethene and trans-1,2-Dichloroethene.

^kLimit for total trihalomethanes (bromodichloromethane + bromoform + chloroform + dibromochloromethane).