AMENDATORY SECTION (Amending WSR 20-02-091, filed 12/30/19, effective 1/30/20)

WAC 173-201A-240 Toxic substances. (1) Toxic substances shall not be introduced above natural background levels in waters of the state which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic toxicity to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department.

(2) The department shall employ or require chemical testing, acute and chronic toxicity testing, and biological assessments, as appropriate, to evaluate compliance with subsection (1) of this section and to ensure that aquatic communities and the existing and designated uses of waters are being fully protected.

(3) USEPA Quality Criteria for Water, 1986, as revised, shall be used in the use and interpretation of the values listed in subsection (5) of this section.

(4) Concentrations of toxic, and other substances with toxic propensities not listed in Table 240 of this section shall be determined in consideration of USEPA Quality Criteria for Water, 1986, and as revised, and other relevant information as appropriate.

(5) The following criteria, found in Table 240, shall be applied to all surface waters of the state of Washington. Values are µg/L for all substances except ammonia and chloride which are mg/L, tissue-based aquatic life criteria for selenium, perfluorooctane sulfonic acid (PFOS), and perfluorooctanoic acid (PFOA) which are mg/kg, and asbestos which is million fibers/L. The department shall formally adopt any appropriate revised criteria as part of this chapter in accordance with the provisions established in chapter 34.05 RCW, the Administrative Procedure Act. The department shall ensure there are early opportunities for public review and comment on proposals to develop revised criteria.

(a) **Aquatic life protection.** The department may revise the criteria in Table 240 for aquatic life on a statewide or water body-specific basis as needed to protect aquatic life occurring in waters of the state and to increase the technical accuracy of the criteria being applied. The department shall formally adopt any appropriate revised criteria as part of this chapter in accordance with the provisions established in chapter 34.05 RCW, the Administrative Procedure Act.

(b) **Human health protection.** The following provisions apply to the human health criteria in Table 240. All waters shall maintain a level of water quality when entering downstream waters that provides for the attainment and maintenance of the water quality standards of those downstream waters, including the waters of another state. The human health criteria in the tables were calculated using a fish consumption rate of 175 g/day. Criteria for carcinogenic substances were calculated using a cancer risk level equal to one-in-one-million, or as otherwise specified in this chapter. The human health criteria calculations and variables include chronic durations of exposure up to ((~~seventy~~)) 70 years. All human health criteria for metals are for total metal concentrations, unless otherwise noted. Dischargers have the obligation to reduce toxics in discharges through the use of AKART.

Table 240
Toxics Substances Criteria

((Compound/Chemical	Chemical Abstracts Service (CAS)#	Category	Aquatic Life Criteria - Freshwater		Aquatic Life Criteria - Marine Water		Human Health Criteria for Consumption of:	
			Acute	Chronic	Acute	Chronic	Water & Organisms	Organisms Only
Metals:								
Antimony	7440360	Metals, cyanide, and total phenols	-	-	-	-	12	180
Arsenic	7440382	Metals, cyanide, and total phenols	360.0 (e,dd)	190.0 (d,dd)	69.0 (e,ll,dd)	36.0 (d,ee,ll,dd)	10 (A)	10 (A)
Asbestos	1332214	Toxic pollutants and hazardous substances	-	-	-	-	7,000,000 fibers/L (C)	-
Beryllium	7440417	Metals, cyanide, and total phenols	-	-	-	-	-	-
Cadmium	7440439	Metals, cyanide, and total phenols	(i,e,dd)	(j,d,dd)	42.0 (e,dd)	9.3 (d,dd)	-	-
Chromium (III)	16065831	Metals, cyanide, and total phenols	(m,e,gg)	(n,d,gg)	-	-	-	-
Chromium (VI)	18540299	Metals, cyanide, and total phenols	15.0 (e,l,ii,dd)	10.0 (d,jj,dd)	1,100.0 (e,l,ll,dd)	50.0 (d,ll,dd)	-	-
Copper	7440508	Metals, cyanide, and total phenols	(o,e,dd)	(p,d,dd)	4.8 (e,ll,dd)	3.1 (d,ll,dd)	1,300 (C)	-
Lead	7439921	Metals, cyanide, and total phenols	(q,e,dd)	(r,d,dd)	210.0 (e,ll,dd)	8.1 (d,ll,dd)	-	-
Mercury	7439976	Metals, cyanide, and total phenols	2.1 (e,kk,dd)	0.012 (d,ff,s)	1.8 (e,ll,dd)	0.025 (d,ff,s)	(G)	(G)
Methylmercury	22967926	Nonconventional	-	-	-	-	-	-
Nickel	7440020	Metals, cyanide, and total phenols	(t,e,dd)	(u,d,dd)	74.0 (e,ll,dd)	8.2 (d,ll,dd)	150	190
Selenium	7782492	Metals, cyanide, and total phenols	20.0 (e,ff)	5.0 (d,ff)	290 (e,ll,dd)	71.0 (d,x,ll,dd)	120	480
Silver	7440224	Metals, cyanide, and total phenols	(y,a,dd)	-	1.9 (a,ll,dd)	-	-	-
Thallium	7440280	Metals, cyanide, and total phenols	-	-	-	-	0.24	0.27
Zinc	7440666	Metals, cyanide, and total phenols	(aa,e,dd)	(bb,d,dd)	90.0 (e,ll,dd)	81.0 (d,ll,dd)	2,300	2,900
Other chemicals:								
1,1,1-Trichloroethane	71556	Volatile	-	-	-	-	47,000	160,000
1,1,2,2-Tetrachloroethane	79345	Volatile	-	-	-	-	0.12 (B)	0.46 (B)
1,1,2-Trichloroethane	79005	Volatile	-	-	-	-	0.44 (B)	1.8 (B)
1,1-Dichloroethane	75343	Volatile	-	-	-	-	-	-
1,1-Dichloroethylene	75354	Volatile	-	-	-	-	1200	4100
1,2,4-Trichlorobenzene	120821	Base/neutral compounds	-	-	-	-	0.12 (B)	0.14 (B)
1,2-Dichlorobenzene	95501	Volatile	-	-	-	-	2000	2500
1,2-Dichloroethane	107062	Volatile	-	-	-	-	9.3 (B)	120 (B)
1,2-Dichloropropane	78875	Volatile	-	-	-	-	0.71 (B)	3.1 (B)
1,3-Dichloropropene	542756	Volatile	-	-	-	-	0.24 (B)	2 (B)
1,2-Diphenylhydrazine	122667	Base/neutral compounds	-	-	-	-	0.015 (B)	0.023 (B)
1,2-Trans-Dichloroethylene	156605	Volatile	-	-	-	-	600	5,800
1,3-Dichlorobenzene	541731	Volatile	-	-	-	-	13	16
1,4-Dichlorobenzene	106467	Volatile	-	-	-	-	460	580
2,3,7,8-TCDD (Dioxin)	1746016	Dioxin	-	-	-	-	0.000000064	0.000000064
2,4,6-Trichlorophenol	88062	Acid compounds	-	-	-	-	0.25 (B)	0.28 (B)
2,4-Dichlorophenol	120832	Acid compounds	-	-	-	-	25	34

((Compound/Chemical	Chemical Abstracts Service (CAS)#	Category	Aquatic Life Criteria - Freshwater		Aquatic Life Criteria – Marine Water		Human Health Criteria for Consumption of:	
			Acute	Chronic	Acute	Chronic	Water & Organisms	Organisms Only
2,4-Dimethylphenol	105679	Acid compounds	-	-	-	-	85	97
2,4-Dinitrophenol	51285	Acid compounds	-	-	-	-	60	610
2,4-Dinitrotoluene	121142	Base/neutral compounds	-	-	-	-	0.039 (B)	0.18 (B)
2,6-Dinitrotoluene	606202	Base/neutral compounds	-	-	-	-	-	-
2-Chloroethyvinyl Ether	110758	Volatile	-	-	-	-	-	-
2-Chloronaphthalene	91587	Base/neutral compounds	-	-	-	-	170	180
2-Chlorophenol	95578	Acid compounds	-	-	-	-	15	17
2-Methyl-4,6-Dinitrophenol (4,6-dinitro-o-cresol)	534521	Acid compounds	-	-	-	-	7.1	25
2-Nitrophenol	88755	Acid compounds	-	-	-	-	-	-
3,3'-Dichlorobenzidine	91941	Base/neutral compounds	-	-	-	-	0.0031 (B)	0.0033 (B)
3-Methyl-4-Chlorophenol (parachlorometa cresol)	59507	Acid compounds	-	-	-	-	36	36
4,4'-DDD	72548	Pesticides/PCBs	-	-	-	-	0.000036 (B)	0.000036 (B)
4,4'-DDE	72559	Pesticides/PCBs	-	-	-	-	0.000051 (B)	0.000051 (B)
4,4'-DDT	50293	Pesticides/PCBs	-	-	-	-	0.000025 (B)	0.000025 (B)
4,4'-DDT(and metabolites)		Pesticides/PCBs	1.1 (a)	0.001 (b)	0.13 (a)	0.001 (b)	-	-
4-Bromophenyl Phenyl Ether	101553	Base/neutral compounds	-	-	-	-	-	-
4-Chorophenyl Phenyl Ether	7005723	Base/neutral compounds	-	-	-	-	-	-
4-Nitrophenol	100027	Acid compounds	-	-	-	-	-	-
Acenaphthene	83329	Base/neutral compounds	-	-	-	-	110	110
Acenaphthylene	208968	Base/neutral compounds	-	-	-	-	-	-
Acrolein	107028	Volatile	-	-	-	-	1.0	1.1
Acrylonitrile	107131	Volatile	-	-	-	-	0.019 (B)	0.028 (B)
Aldrin	309002	Pesticides/PCBs	2.5 (a,e)	0.0019 (b,e)	0.71 (a,e)	0.0019 (b,e)	0.0000057 (B)	0.0000058 (B)
alpha-BHC	319846	Pesticides/PCBs	-	-	-	-	0.0005 (B)	0.00056 (B)
alpha-Endosulfan	959988	Pesticides/PCBs	-	-	-	-	9.7	10
Anthracene	120127	Base/neutral compounds	-	-	-	-	3,100	4,600
Benzene	71432	Volatile	-	-	-	-	0.44 (B)	1.6 (B)
Benzidine	92875	Base/neutral compounds	-	-	-	-	0.00002 (B)	0.000023 (B)
Benzo(a) Anthracene	56553	Base/neutral compounds	-	-	-	-	0.014 (B)	0.021 (B)
Benzo(a) Pyrene	50328	Base/neutral compounds	-	-	-	-	0.0014 (B)	0.0021 (B)
Benzo(b) Fluoranthene	205992	Base/neutral compounds	-	-	-	-	0.014 (B)	0.021 (B)
Benzo(hi) Propylene	191242	Base/neutral compounds	-	-	-	-	-	-
Benzo(k) Fluoranthene	207089	Base/neutral compounds	-	-	-	-	0.014 (B)	0.21 (B)
beta-THC	319857	Pesticides/PCBs	-	-	-	-	0.0018 (B)	0.002 (B)

((Compound/Chemical	Chemical Abstracts Service (CAS)#	Category	Aquatic Life Criteria - Freshwater		Aquatic Life Criteria - Marine Water		Human Health Criteria for Consumption of:	
			Acute	Chronic	Acute	Chronic	Water & Organisms	Organisms Only
alpha-Endosulfan	33213659	Pesticides/PCBs	-	-	-	-	9.7	10
Bis(2-Chloroethoxy) Methane	111911	Base/neutral compounds	-	-	-	-	-	-
Bis(2-Chloroethyl) Ether	111444	Base/neutral compounds	-	-	-	-	0.02 (B)	0.06 (B)
Bis(2-Chloroisopropyl) Ether	39638329	Base/neutral compounds	-	-	-	-	-	-
Bis(2-Ethylhexyl) Phthalate	117817	Base/neutral compounds	-	-	-	-	0.23 (B)	0.25 (B)
Bromoform	75252	Volatile	-	-	-	-	5.8 (B)	27 (B)
Butylbenzyl Phthalate	85687	Base/neutral compounds	-	-	-	-	0.56 (B)	0.58 (B)
Carbon Tetrachloride	56235	Volatile	-	-	-	-	0.2 (B)	0.35 (B)
Chlordane	57749	Pesticides/PCBs	2.4 (a)	0.0043 (b)	0.09 (a)	0.004 (b)	0.000093 (B)	0.000093 (B)
Chlorobenzene	108907	Volatile	-	-	-	-	380	890
Chlorodibromomethane	124481	Volatile	-	-	-	-	0.65 (B)	3 (B)
Chloroethane	75003	Volatile	-	-	-	-	-	-
Chloroform	67663	Volatile	-	-	-	-	260	1200
Chrysene	218019	Base/neutral compounds	-	-	-	-	1.4 (B)	2.1 (B)
Cyanide	57125	Metals, cyanide, and total phenols	22.0 (e,ee)	5.2 (d,ee)	1.0 (e,mm,ee)	(d,mm,ee)	19 (D)	270 (D)
delta-BHC	319868	Pesticides/PCBs	-	-	-	-	-	-
Dibenzo(a,h) Anthracene	53703	Base/neutral compounds	-	-	-	-	0.0014 (B)	0.0021 (B)
Dichlorobromomethane	75274	Volatile	-	-	-	-	0.77 (B)	3.6 (B)
Dieldrin	60571	Pesticides/PCBs	2.5 (a,e)	0.0019 (b,e)	0.71 (a,e)	0.0019 (b,e)	0.0000061 (B)	0.0000061 (B)
Diethyl Phthalate	84662	Base/neutral compounds	-	-	-	-	4,200	5,000
Dimethyl Phthalate	131113	Base/neutral compounds	-	-	-	-	92,000	130,000
Di-n-Butyl Phthalate	84742	Base/neutral compounds	-	-	-	-	450	510
Di-n-Octyl Phthalate	117840	Base/neutral compounds	-	-	-	-	-	-
Endosulfan		Pesticides/PCBs	0.22 (a)	0.056 (b)	0.034 (a)	0.0087 (b)	-	-
Endosulfan Sulfate	1031078	Pesticides/PCBs	-	-	-	-	9.7	10
Endrin	72208	Pesticides/PCBs	0.18 (a)	0.0023 (b)	0.037 (a)	0.0023 (b)	0.034	0.035
Endrin Aldehyde	7421934	Pesticides/PCBs	-	-	-	-	0.034	0.035
Ethylbenzene	100414	Volatile	-	-	-	-	200	270
Fluoranthene	206440	Base/neutral compounds	-	-	-	-	16	16
Fluorene	86737	Base/neutral compounds	-	-	-	-	420	610
Hexachlorocyclohexane (gamma-BHC; Lindane)	58899	Pesticides/PCBs	2.0 (a)	0.08 (b)	0.16 (a)	-	15	17
Heptachlor	76448	Pesticides/PCBs	0.52 (a)	0.0038 (b)	0.053 (a)	0.0036 (b)	0.0000099 (B)	0.00001 (B)
Heptachlor Epoxide	1024573	Pesticides/PCBs	-	-	-	-	0.0000074 (B)	0.0000074 (B)
Hexachlorobenzene	118741	Base/neutral compounds	-	-	-	-	0.000051 (B)	0.000052 (B)

((Compound/Chemical	Chemical Abstracts Service (CAS)#	Category	Aquatic Life Criteria - Freshwater		Aquatic Life Criteria - Marine Water		Human Health Criteria for Consumption of:	
			Acute	Chronic	Acute	Chronic	Water & Organisms	Organisms Only
Hexachlorobutadiene	87683	Base/neutral compounds	-	-	-	-	0.69 (B)	4.1 (B)
Hexachlorocyclopentadiene	77474	Base/neutral compounds	-	-	-	-	150	630
Hexachloroethane	67721	Base/neutral compounds	-	-	-	-	0.11 (B)	0.13 (B)
Indeno(1,2,3-cd) Pyrene	193395	Base/neutral compounds	-	-	-	-	0.014 (B)	0.021 (B)
Isophorone	78591	Base/neutral compounds	-	-	-	-	27 (B)	110 (B)
Methyl Bromide	74839	Volatile	-	-	-	-	520	2,400
Methyl Chloride	74873	Volatile	-	-	-	-	-	-
Methylene Chloride	75092	Volatile	-	-	-	-	16 (B)	250 (B)
Napthalene	91203	Base/neutral compounds	-	-	-	-	-	-
Nitrobenzene	98953	Base/neutral compounds	-	-	-	-	55	320
N-Nitrosodimethylamine	62759	Base/neutral compounds	-	-	-	-	0.00065 (B)	0.34 (B)
N-Nitrosodi-n-Propylamine	621647	Base/neutral compounds	-	-	-	-	0.0044 (B)	0.058 (B)
N-Nitrosodiphenylamine	86306	Base/neutral compounds	-	-	-	-	0.62 (B)	0.69 (B)
Pentachlorophenol (PCP)	87865	Acid compounds	(w,e)	(v,d)	13.0 (e)	7.9 (d)	0.046 (B)	0.1 (B)
Phenanthrene	85018	Base/neutral compounds	-	-	-	-	-	-
Phenol	108952	Acid compounds	-	-	-	-	18,000	200,000
Polychlorinated Biphenyls (PCBs)		Pesticides/PCBs	2.0 (b)	0.014 (b)	10.0 (b)	0.030 (b)	0.00017 (E)	0.00017 (E)
Pyrene	129000	Base/neutral compounds	-	-	-	-	310	460
Tetrachloroethylene	127184	Volatile	-	-	-	-	4.9 (B)	7.1 (B)
Toluene	108883	Volatile	-	-	-	-	180	410
Toxaphene	8001352	Pesticides/PCBs	0.73 (c,z)	0.0002 (d)	0.21 (c,z)	0.0002 (d)	0.000032 (B)	0.000032 (B)
Trichloroethylene	79016	Volatile	-	-	-	-	0.38 (B)	0.86 (B)
Vinyl Chloride	75014	Volatile	-	-	-	-	0.02 (B, F)	0.26 (B, F)
Ammonia (hh)		Nonconventional	(f,e)	(g,d)	0.233 (h,e)	0.035 (h,d)	-	-
Chloride (dissolved) (k)		Nonconventional	860.0 (h,e)	230.0 (h,d)	-	-	-	-
Chlorine (total residual)		Nonconventional	19.0 (e)	11.0 (d)	13.0 (e)	7.5 (d)	-	-
Chlorpyrifos		Toxic pollutants and hazardous substances	0.083 (e)	0.041 (d)	0.011 (e)	0.0056 (d)	-	-
Parathion		Toxic pollutants and hazardous substances	0.065 (e)	0.013 (d)	-	-	-	-

Footnotes for aquatic life criteria in Table 240:

a. An instantaneous concentration not to be exceeded at any time.
b. A 24-hour average not to be exceeded.
c. A 1-hour average concentration not to be exceeded more than once every three years on the average.
d. A 4-day average concentration not to be exceeded more than once every three years on the average.
e. Aldrin is metabolically converted to Dieldrin. Therefore, the sum of the Aldrin and Dieldrin concentrations are compared with the Dieldrin criteria.
f. Shall not exceed the numerical value in total ammonia nitrogen (mg N/L) given by:

For salmonids present: $\frac{0.275}{1+10^{7.204-pH}} + \frac{39.0}{1+10^{pH-7.204}}$

For salmonids absent: $\frac{0.411}{1+10^{7.204-pH}} + \frac{58.4}{1+10^{pH-7.204}}$

g. Shall not exceed the numerical concentration calculated as follows:
Unionized ammonia concentration for waters where salmonid habitat is an existing or designated use:

$$0.80 \div (FT)(FPH)(RATIO)$$

where:
- RATIO = 13.5; 7.7 ≤ pH ≤ 9
- RATIO = $(20.25 \times 10^{(7.7-pH)}) \div (1 + 10^{(7.4-pH)})$; 6.5 ≤ pH ≤ 7.7
- FT = 1.4; 15 ≤ T ≤ 30
- FT = $10^{[0.03(20-T)]}$; 0 ≤ T ≤ 15
- FPH = 1; 8 ≤ pH ≤ 9
- FPH = $(1 + 10^{(7.4-pH)}) \div 1.25$; 6.5 ≤ pH ≤ 8.0

Total ammonia concentrations for waters where salmonid habitat is not an existing or designated use and other fish early life stages are absent:

$$Chronic\ Criterion = \left(\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}}\right) \times \left(1.45 \times 10^{0.028(25-A)}\right)$$

where: A = the greater of either T (temperature in degrees Celsius) or 7.

Applied as a thirty-day average concentration of total ammonia nitrogen (in mg N/L) not to be exceeded more than once every three years on average. The highest four-day average within the thirty-day period should not exceed 2.5 times the chronic criterion.

Total ammonia concentration for waters where salmonid habitat is not an existing or designated use and other fish early life stages are present:

$$Chronic\ Criterion = \left(\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}}\right) \times B$$

where: B = the lower of either 2.85, or $1.45 \times 10^{0.028 \times (25-T)}$. T = temperature in degrees Celsius.

Applied as a thirty-day average concentration of total ammonia nitrogen (in mg N/L) not to be exceeded more than once every three years on the average. The highest four-day average within the thirty-day period should not exceed 2.5 times the chronic criterion.

h. Measured in milligrams per liter rather than micrograms per liter.
i. ≤ $(0.944)(e^{(1.128[\ln(\text{hardness})]-3.828)})$ at hardness = 100. Conversion factor (CF) of 0.944 is hardness dependent. CF is calculated for other hardnesses as follows: CF = 1.136672 - [(ln hardness)(0.041838)].
j. ≤ $(0.909)(e^{(0.7852[\ln(\text{hardness})]-3.490)})$ at hardness = 100. Conversions factor (CF) of 0.909 is hardness dependent. CF is calculated for other hardnesses as follows: CF = 1.101672 - [(ln hardness)(0.041838)].
k. Criterion based on dissolved chloride in association with sodium. This criterion probably will not be adequately protective when the chloride is associated with potassium, calcium, or magnesium, rather than sodium.
l. Salinity dependent effects. At low salinity the 1-hour average may not be sufficiently protective.
m. ≤ $(0.316)(e^{(0.8190[\ln(\text{hardness})] + 3.688)})$
n. ≤ $(0.860)(e^{(0.8190[\ln(\text{hardness})] + 1.561)})$
o. ≤ $(0.960)(e^{(0.9422[\ln(\text{hardness})] - 1.464)})$
p. ≤ $(0.960)(e^{(0.8545[\ln(\text{hardness})] - 1.465)})$
q. ≤ $(0.791)(e^{(1.273[\ln(\text{hardness})] - 1.460)})$ at hardness = 100. Conversion factor (CF) of 0.791 is hardness dependent. CF is calculated for other hardnesses as follows: CF = 1.46203 - [(ln hardness)(0.145712)].
r. ≤ $(0.791)(e^{(1.273[\ln(\text{hardness})] - 4.705)})$ at hardness = 100. Conversion factor (CF) of 0.791 is hardness dependent. CF is calculated for other hardnesses as follows: CF = 1.46203 - [(ln hardness)(0.145712)].
s. If the four-day average chronic concentration is exceeded more than once in a three-year period, the edible portion of the consumed species should be analyzed. Said edible tissue concentrations shall not be allowed to exceed 1.0 mg/kg of methylmercury.
t. ≤ $(0.998)(e^{(0.8460[\ln(\text{hardness})] + 3.3612)})$
u. ≤ $(0.997)(e^{(0.8460[\ln(\text{hardness})] + 1.1645)})$
v. ≤ $e^{[1.005(pH) - 5.290]}$
w. ≤ $e^{[1.005(pH) - 4.830]}$
x. The status of the fish community should be monitored whenever the concentration of selenium exceeds 5.0 ug/ l in salt water.
y. ≤ $(0.85)(e^{(1.72[\ln(\text{hardness})] - 6.52)})$
z. Channel Catfish may be more acutely sensitive.
aa. ≤ $(0.978)(e^{(0.8473[\ln(\text{hardness})] + 0.8604)})$
bb. ≤ $(0.986)(e^{(0.8473[\ln(\text{hardness})] + 0.7614)})$
cc. Nonlethal effects (growth, C-14 uptake, and chlorophyll production) to diatoms (*Thalassiosira aestivalis* and *Skeletonema costatum*) which are common to Washington's waters have been noted at levels below the established criteria. The importance of these effects to the diatom populations and the aquatic system is sufficiently in question to persuade the state to adopt the USEPA National Criteria value (36 µg/L) as the state threshold criteria, however, wherever practical the ambient concentrations should not be allowed to exceed a chronic marine concentration of 21 µg/L.

~~dd. These ambient criteria in the table are for the dissolved fraction. The cyanide criteria are based on the weak acid dissociable method. The metals criteria may not be used to calculate total recoverable effluent limits unless the seasonal partitioning of the dissolved to total metals in the ambient water are known. When this information is absent, these metals criteria shall be applied as total recoverable values, determined by back-calculation, using the conversion factors incorporated in the criterion equations. Metals criteria may be adjusted on a site-specific basis when data are made available to the department clearly demonstrating the effective use of the water effects ratio approach established by USEPA, as generally guided by the procedures in USEPA Water Quality Standards Handbook, December 1983, as supplemented or replaced by USEPA or ecology. The adjusted site specific criteria are not in effect until they have been incorporated into this chapter and approved by EPA. Information which is used to develop effluent limits based on applying metals partitioning studies or the water effects ratio approach shall be identified in the permit fact sheet developed pursuant to WAC 173-220-060 or 173-226-110, as appropriate, and shall be made available for the public comment period required pursuant to WAC 173-220-050 or 173-226-130(3), as appropriate. Ecology has developed supplemental guidance for conducting water effect ratio studies.~~

~~ee. The criteria for cyanide is based on the weak acid dissociable method in the 19th Ed. Standard Methods for the Examination of Water and Wastewater, 4500-CN I, and as revised (see footnote dd, above).~~

~~ff. These criteria are based on the total-recoverable fraction of the metal.~~

~~gg. Where methods to measure trivalent chromium are unavailable, these criteria are to be represented by total-recoverable chromium.~~

~~hh. The listed fresh water criteria are based on un-ionized or total ammonia concentrations, while those for marine water are based on un-ionized ammonia concentrations. Tables for the conversion of total ammonia to un-ionized ammonia for freshwater can be found in the USEPA's Quality Criteria for Water, 1986. Criteria concentrations based on total ammonia for marine water can be found in USEPA Ambient Water Quality Criteria for Ammonia (Saltwater)-1989, EPA440/5-88-004, April 1989.~~

~~ii. The conversion factor used to calculate the dissolved metal concentration was 0.982.~~

~~jj. The conversion factor used to calculate the dissolved metal concentration was 0.962.~~

~~kk. The conversion factor used to calculate the dissolved metal concentration was 0.85.~~

~~ll. Marine conversion factors (CF) which were used for calculating dissolved metals concentrations are given below. Conversion factors are applicable to both acute and chronic criteria for all metals except mercury. The CF for mercury was applied to the acute criterion only and is not applicable to the chronic criterion. Conversion factors are already incorporated into the criteria in the table. Dissolved criterion = criterion x CF~~

~~Metal~~	~~CF~~
~~Arsenic~~	~~1.000~~
~~Cadmium~~	~~0.994~~
~~Chromium (VI)~~	~~0.993~~
~~Copper~~	~~0.83~~
~~Lead~~	~~0.951~~
~~Mercury~~	~~0.85~~
~~Nickel~~	~~0.990~~
~~Selenium~~	~~0.998~~
~~Silver~~	~~0.85~~
~~Zinc~~	~~0.946~~

~~mm. The cyanide criteria are: 2.8µg/l chronic and 9.1µg/l acute and are applicable only to waters which are east of a line from Point Roberts to Lawrence Point, to Green Point to Deception Pass; and south from Deception Pass and of a line from Partridge Point to Point Wilson. The chronic criterion applicable to the remainder of the marine waters is 1 µg/L.~~))

Compound/Chemical	Chemical Abstracts Service (CAS)#	Aquatic Life Criteria - Freshwater		Aquatic Life Criteria - Marine Water		Human Health Criteria for Consumption of:	
		Acute	Chronic	Acute	Chronic	Water & Organisms	Organisms Only
Metals:							
Aluminum	7429905	Western Cordillera: 288 Marine West Coast Forest: 630 Cold Desert: 1400 (a,e)	Western Cordillera: 180 Marine West Coast Forest: 302 Cold Desert: 720 (b,e)	-	-	-	-
Antimony	7440360	-	-	-	-	12 (H)	180 (H)
Arsenic	7440382	300 (a,f)	130 (b,f)	69 (a,f,g)	36 (b,f,g)	10 (A,H)	10 (A,H)
Asbestos	1332214	-	-	-	-	7,000,000 fibers/L (C)	-
Beryllium	7440417	-	-	-	-	-	-
Cadmium	7440439	(a,f,h)	(b,f,i)	33 (a,f)	7.9 (b,f)	-	-
Chromium (III)	16065831	(a,j,k)	(b,j,l)	-	-	-	-
Chromium (VI)	18540299	18 (a,f,m)	6.6 (b,f,n)	1,100.0 (a,f,g)	50.0 (b,f,g)	-	-

Compound/Chemical	Chemical Abstracts Service (CAS)#	Aquatic Life Criteria - Freshwater		Aquatic Life Criteria - Marine Water		Human Health Criteria for Consumption of:	
		Acute	Chronic	Acute	Chronic	Water & Organisms	Organisms Only
Copper	7440508	Western Cordillera: 1.4 Marine West Coast Forest: 2.4 Cold Desert: 4.8 (a,f,o)	Western Cordillera: 1.2 Marine West Coast Forest: 1.8 Cold Desert: 3.2 (b,f,p)	4.8 (a,f,g)	3.1 (b,f,g)	1,300 (C)	-
Lead	7439921	(a,f,q)	(b,f,r)	210.0 (a,f,g)	8.1 (b,f,g)	-	-
Mercury	7439976	1.4 (a,f,s)	0.012 (b,t,u)	1.8 (a,f,g)	0.025 (b,t,u)	(G)	(G)
Methylmercury	22967926	-	-	-	-	-	- (H)
Nickel	7440020	(a,f,v)	(b,f,w)	74.0 (a,f,g)	8.2 (b,f,g)	150 (H)	190 (H)
Selenium	7782492	(x)	(y)	290 (a,f,g)	71.0 (b,f,g)	120 (H)	480 (H)
Silver	7440224	(a,f,z)	(b,f,aa)	2.3 (a,f,g)	0.91 (b,f,g)	-	-
Thallium	7440280	-	-	-	-	0.24	0.27
Zinc	7440666	(a,f,bb)	(b,f,cc)	90.0 (a,f,g)	81.0 (b,f,g)	2,300 (H)	2,900 (H)
Other chemicals:							
1,1,1-Trichloroethane	71556	-	-	-	-	47,000 (H)	160,000 (H)
1,1,2,2-Tetrachloroethane	79345	-	-	-	-	0.12 (B,H)	0.46 (B,H)
1,1,2-Trichloroethane	79005	-	-	-	-	0.44 (B,H)	1.8 (B,H)
1,1-Dichloroethane	75343	-	-	-	-	-	-
1,1-Dichloroethylene	75354	-	-	-	-	1200 (H)	4100 (H)
1,2,4-Trichlorobenzene	120821	-	-	-	-	0.12 (B,H)	0.14 (B,H)
1,2-Dichlorobenzene	95501	-	-	-	-	2000 (H)	2500 (H)
1,2-Dichloroethane	107062	-	-	-	-	9.3 (B,H)	120 (B,H)
1,2-Dichloropropane	78875	-	-	-	-	0.71 (B)	3.1 (B)
1,3-Dichloropropene	542756	-	-	-	-	0.24 (B)	2 (B)
1,2-Diphenylhydrazine	122667	-	-	-	-	0.015 (B,H)	0.023 (B,H)
1,2-Trans-Dichloroethylene	156605	-	-	-	-	600 (H)	5,800 (H)
1,3-Dichlorobenzene	541731	-	-	-	-	13 (H)	16 (H)
1,4-Dichlorobenzene	106467	-	-	-	-	460 (H)	580 (H)
2,3,7,8-TCDD (Dioxin)	1746016	-	-	-	-	0.000000064	0.000000064
2,4,6-Trichlorophenol	88062	-	-	-	-	0.25 (B)	0.28 (B)
2,4-Dichlorophenol	120832	-	-	-	-	25 (H)	34 (H)
2,4-Dimethylphenol	105679	-	-	-	-	85	97
2,4-Dinitrophenol	51285	-	-	-	-	60 (H)	610 (H)
2,4-Dinitrotoluene	121142	-	-	-	-	0.039 (B)	0.18 (B)

Compound/Chemical	Chemical Abstracts Service (CAS)#	Aquatic Life Criteria - Freshwater		Aquatic Life Criteria - Marine Water		Human Health Criteria for Consumption of:	
		Acute	Chronic	Acute	Chronic	Water & Organisms	Organisms Only
2,6-Dinitrotoluene	606202	-	-	-	-	-	-
2-Chloroethyvinyl Ether	110758	-	-	-	-	-	-
2-Chloronaphthalene	91587	-	-	-	-	170 (H)	180 (H)
2-Chlorophenol	95578	-	-	-	-	15	17
2-Methyl-4,6-Dinitrophenol (4,6-dinitro-o-cresol)	534521	-	-	-	-	7.1 (H)	25 (H)
2-Nitrophenol	88755	-	-	-	-	-	-
3,3'-Dichlorobenzidine	91941	-	-	-	-	0.0031 (B)	0.0033 (B)
3-Methyl-4-Chlorophenol (parachlorometa cresol)	59507	-	-	-	-	36	36
4,4'-DDD	72548	-	-	-	-	0.000036 (B,H)	0.000036 (B,H)
4,4'-DDE	72559	-	-	-	-	0.000051 (B,H)	0.000051 (B,H)
4,4'-DDT	50293	-	-	-	-	0.000025 (B,H)	0.000025 (B,H)
4,4'-DDT (and metabolites)	50293	1.1 (c)	0.001 (d)	0.13 (c)	0.001 (d)	-	-
4-Bromophenyl Phenyl Ether	101553	-	-	-	-	-	-
4-Chorophenyl Phenyl Ether	7005723	-	-	-	-	-	-
4-Nitrophenol	100027	-	-	-	-	-	-
Acenaphthene	83329	-	-	-	-	110 (H)	110 (H)
Acenaphthylene	208968	-	-	-	-	-	-
Acrolein	107028	3 (a)	3 (b)	-	-	1.0	1.1
Acrylonitrile	107131	-	-	-	-	0.019 (B)	0.028 (B)
Aldrin	309002	3 (c,dd)	0.0019 (d,dd)	1.3 (c,e)	0.0019 (d,dd)	0.0000057 (B,H)	0.0000058 (B,H)
alpha-BHC	319846	-	-	-	-	0.0005 (B,H)	0.00056 (B,H)
alpha-Endosulfan	959988	0.22 (c,ee)	0.056 (d,ee)	0.034 (c,ee)	0.0087 (d,ee)	9.7 (H)	10 (H)
Ammonia	7664417	(a,ff,ii)	(b,gg,ii)	0.233 (a,hh,ii)	0.035 (b,hh,ii)	-	-
Anthracene	120127	-	-	-	-	3,100 (H)	4,600 (H)
Benzene	71432	-	-	-	-	0.44 (B)	1.6 (B)
Benzidine	92875	-	-	-	-	0.00002 (B)	0.000023 (B)
Benzo(a) Anthracene	56553	-	-	-	-	0.014 (B,H)	0.021 (B,H)
Benzo(a) Pyrene	50328	-	-	-	-	0.0014 (B,H)	0.0021 (B,H)
Benzo(b) Fluoranthene	205992	-	-	-	-	0.014 (B,H)	0.021 (B,H)
Benzo(ghi) Perylene	191242	-	-	-	-	-	-
Benzo(k) Fluoranthene	207089	-	-	-	-	0.014 (B,H)	0.21 (B,H)
beta-BHC	319857	-	-	-	-	0.0018 (B,H)	0.002 (B,H)
beta-Endosulfan	33213659	0.22 (c,ee)	0.056 (d,ee)	0.034 (c,ee)	0.0087 (d,ee)	9.7	10
Bis(2-Chloroethoxy) Methane	111911	-	-	-	-	-	-

Compound/Chemical	Chemical Abstracts Service (CAS)#	Aquatic Life Criteria - Freshwater		Aquatic Life Criteria - Marine Water		Human Health Criteria for Consumption of:	
		Acute	Chronic	Acute	Chronic	Water & Organisms	Organisms Only
Bis(2-Chloroethyl) Ether	111444	-	-	-	-	0.02 (B)	0.06 (B)
Bis(2-Chloroisopropyl) Ether	39638329	-	-	-	-	- (H)	- (H)
Bis(2-Ethylhexyl) Phthalate	117817	-	-	-	-	0.23 (B,H)	0.25 (B,H)
Bromoform	75252	-	-	-	-	5.8 (B,H)	27 (B,H)
Butylbenzyl Phthalate	85687	-	-	-	-	0.56 (B,H)	0.58 (B,H)
Carbaryl	63252	2.1 (a)	2.1 (b)	1.6 (a)	-	-	-
Carbon Tetrachloride	56235	-	-	-	-	0.2 (B)	0.35 (B)
Chlordane	57749	2.4 (c)	0.0043 (d)	0.09 (c)	0.004 (d)	0.000093 (B,H)	0.000093 (B,H)
Chloride (dissolved)	168870	860 (a,hh,jj)	230 (b,hh,jj)	-	-	-	-
Chlorine (total residual)	7782505	19 (a)	11 (b)	13 (a)	7.5 (b)	-	-
Chlorobenzene	108907	-	-	-	-	380 (H)	890 (H)
Chlorodibromomethane	124481	-	-	-	-	0.65 (B,H)	3 (B,H)
Chloroethane	75003	-	-	-	-	-	-
Chloroform	67663	-	-	-	-	260 (H)	1200 (H)
Chlorpyrifos	2921882	0.083 (a)	0.041 (b)	0.011 (a)	0.0056 (b)	-	-
Chrysene	218019	-	-	-	-	1.4 (B,H)	2.1 (B,H)
Cyanide	57125	8.2 (a,kk)	1.9 (b,kk)	1.0 (a,kk,ll)	1.0 (b,kk,ll)	19 (D,H)	270 (D,H)
delta-BHC	319868	-	-	-	-	-	-
Demeton	8065483	-	0.1 (b)	-	0.1 (b)	-	-
Diazinon	333415	0.17 (a)	0.17 (b)	0.82 (a)	0.82 (b)	-	-
Dibenzo(a,h) Anthracene	53703	-	-	-	-	0.0014 (B,H)	0.0021 (B,H)
Dichlorobromomethane	75274	-	-	-	-	0.77 (B,H)	3.6 (B,H)
Dieldrin	60571	0.24 (a,dd)	0.056 (b,dd)	0.71 (c,dd)	0.0019 (d,dd)	0.0000061 (B,H)	0.0000061 (B,H)
Diethyl Phthalate	84662	-	-	-	-	4,200 (H)	5,000 (H)
Dimethyl Phthalate	131113	-	-	-	-	92,000 (H)	130,000 (H)
Di-n-Butyl Phthalate	84742	-	-	-	-	450 (H)	510 (H)
Di-n-Octyl Phthalate	117840	-	-	-	-	-	-
Endosulfan Sulfate	1031078	-	-	-	-	9.7 (H)	10
Endrin	72208	0.086 (a)	0.036 (b)	0.037 (c)	0.0023 (d)	0.034 (H)	0.035 (H)
Endrin Aldehyde	7421934	-	-	-	-	0.034	0.035
Ethylbenzene	100414	-	-	-	-	200 (H)	270 (H)
Fluoranthene	206440	-	-	-	-	16 (H)	16 (H)

Compound/Chemical	Chemical Abstracts Service (CAS)#	Aquatic Life Criteria - Freshwater		Aquatic Life Criteria - Marine Water		Human Health Criteria for Consumption of:	
		Acute	Chronic	Acute	Chronic	Water & Organisms	Organisms Only
Fluorene	86737	-	-	-	-	420 (H)	610 (H)
Guthion	86500	-	0.01 (b)	-	0.01 (b)	-	-
Hexachlorocyclohexane (gamma-BHC; Lindane)	58899	0.95 (a)	0.08 (d)	0.16 (c)	-	15 (H)	17 (H)
Heptachlor	76448	0.52 (c)	0.0038 (d)	0.053 (c)	0.0036 (d)	0.0000099 (B,H)	0.00001 (B,H)
Heptachlor Epoxide	1024573	-	-	-	-	0.0000074 (B,H)	0.0000074 (B,H)
Hexachlorobenzene	118741	-	-	-	-	0.000051 (B,H)	0.000052 (B,H)
Hexachlorobutadiene	87683	-	-	-	-	0.69 (B,H)	4.1 (B,H)
Hexachlorocyclopentadiene	77474	-	-	-	-	150 (H)	630 (H)
Hexachloroethane	67721	-	-	-	-	0.11 (B,H)	0.13 (B,H)
Indeno(1,2,3-cd) Pyrene	193395	-	-	-	-	0.014 (B,H)	0.021 (B,H)
Isophorone	78591	-	-	-	-	27 (B)	110 (B)
Malathion	121755	-	0.1 (b)	-	0.1 (b)	-	-
Methoxychlor	72435	-	0.03 (b)	-	0.03 (b)	-	-
Methyl Bromide	74839	-	-	-	-	520 (H)	2,400
Methyl Chloride	74873	-	-	-	-	-	-
Methylene Chloride	75092	-	-	-	-	16 (B,H)	250 (B,H)
Mirex	2385855	-	0.001 (b)	-	0.001 (b)	-	-
N-(1,3-Dimethylbutyl)-N'-phenyl-p-phenylenediamine-quinone(6PPD-q)		0.012 (a)	-	-	-	-	-
Napthalene	91203	-	-	-	-	-	-
Nitrobenzene	98953	-	-	-	-	55 (H)	320 (H)
N-Nitrosodimethylamine	62759	-	-	-	-	0.00065 (B)	0.34 (B)
N-Nitrosodi-n-Propylamine	621647	-	-	-	-	0.0044 (B)	0.058 (B)
N-Nitrosodiphenylamine	86306	-	-	-	-	0.62 (B)	0.69 (B)
Nonylphenol	84852153	28 (a)	6.6 (b)	7 (a)	1.7 (b)	-	-
Parathion	56382	0.065 (a)	0.013 (b)	-	-	-	-
Pentachlorophenol (PCP)	87865	(a,mm)	(b,nn)	13 (a)	6.7 (b)	0.046 (B,H)	0.1 (B,H)
Perfluorooctane sulfonic acid (PFOS)		3000 (a)	(oo)	550 (a)	-	-	-
Perfluorooctanoic acid (PFOA)		49000 (a)	(pp)	7000 (a)	-	-	-
Phenanthrene	85018	-	-	-	-	-	-
Phenol	108952	-	-	-	-	18,000 (H)	200,000 (H)
Polychlorinated Biphenyls (PCBs)		2.0 (d)	0.014 (d)	10.0 (d)	0.03 (d)	0.00017 (E,H)	0.00017 (E,H)
Pyrene	129000	-	-	-	-	310 (H)	460 (H)

Compound/Chemical	Chemical Abstracts Service (CAS)#	Aquatic Life Criteria - Freshwater		Aquatic Life Criteria - Marine Water		Human Health Criteria for Consumption of:	
		Acute	Chronic	Acute	Chronic	Water & Organisms	Organisms Only
Tetrachloroethylene	127184	-	-	-	-	4.9 (B,H)	7.1 (B,H)
Toluene	108883	-	-	-	-	180 (H)	410 (H)
Toxaphene	8001352	0.73 (a)	0.0002 (b)	0.21 (a)	0.0002 (b)	0.000032 (B)	0.000032 (B)
Tributyltin		0.46 (a)	0.072 (b)	0.42 (a)	0.0074 (b)	-	-
Trichloroethylene	79016	-	-	-	-	0.38 (B,H)	0.86 (B,H)
Vinyl Chloride	75014	-	-	-	-	0.02 (B,F)	0.26 (B,F,H)

Footnotes for aquatic life criteria in Table 240:

a. A 1-hour average concentration not to be exceeded more than once every three years on the average.

b. A 4-day average concentration not to be exceeded more than once every three years on average.

c. An instantaneous concentration not to be exceeded at any time.

d. A 24-hour average not to be exceeded at any time.

e. Criteria are calculated using the Aluminum Criteria Calculator V.2.0 that is published in EPA's "Final Aquatic Water Quality Criteria for Aluminum 2018" (EPA-822-R-1-001). Default criteria values were calculated for EPA Level II ecoregions and are applicable in the absence of water body or site-specific water quality data. The freshwater default acute criterion in the Western Cordillera ecoregion is 288 µg/L, 630 µg/L is the default acute criterion in the Marine West Coast Forest ecoregion, and 1400 µg/L is the default acute criterion in the Cold Desert ecoregion. The freshwater default chronic criterion in the Western Cordillera ecoregion is 180 µg/L, 302 µg/L is the default chronic criterion in the Marine West Coast Forest ecoregion, and 720 µg/L is the default chronic criterion in the Cold Desert ecoregion. The default criterion is used in the absence of concurrently sampled pH, hardness, and dissolved organic carbon for a site-specific location or water body. Criteria calculated using concurrently sampled pH, hardness, and dissolved organic carbon for a specific water body supersede the default criteria. The aluminum criteria are based on aluminum toxicity studies where aluminum was analyzed using total recoverable analytical methods. Washington may utilize total recoverable analytical methods to implement the criteria. For characterizing ambient waters, Washington may also utilize, as scientifically appropriate and as allowable by state and federal regulations, analytical methods that measure the bioavailable fraction of aluminum (e.g., utilizing a less aggressive initial acid digestion, such as to a pH of approximately 4 or lower, that includes the measurement of amorphous aluminum hydroxide yet minimizes the measurement of mineralized forms of aluminum such as aluminum silicates associated with suspended sediment particles or clays). Washington shall use measurements of total recoverable aluminum where required by federal regulations.

f. These ambient criteria in the table are for the dissolved fraction. The cyanide criteria are based on the weak acid dissociable method. The metals criteria may not be used to calculate total recoverable effluent limits unless the seasonal partitioning of the dissolved to total metals in the ambient water are known. When this information is absent, these metals criteria shall be applied as total recoverable values, determined by back-calculation, using the conversion factors incorporated in the criterion equations. Metals criteria may be adjusted on a site-specific basis when data are made available to the department clearly demonstrating the effective use of the water effects ratio approach established by USEPA, as generally guided by the procedures in USEPA Water Quality Standards Handbook, December 1983, as supplemented or replaced by USEPA or ecology. The adjusted site-specific criteria are not in effect until they have been incorporated into this chapter and approved by EPA. Information which is used to develop effluent limits based on applying metals partitioning studies or the water effects ratio approach shall be identified in the permit fact sheet developed pursuant to WAC 173-220-060 or 173-226-110, as appropriate, and shall be made available for the public comment period required pursuant to WAC 173-220-050 or 173-226-130(3), as appropriate. Ecology has developed supplemental guidance for conducting water effect ratio studies.

g. Marine conversion factors (CF) which were used for calculating dissolved metals concentrations are given below. Conversion factors are applicable to both acute and chronic criteria for all metals except mercury. The CF for mercury was applied to the acute criterion only and is not applicable to the chronic criterion. Conversion factors are already incorporated into the criteria in the table. Dissolved criterion = criterion x CF

Metal	CF
Arsenic	1.000
Cadmium	0.994
Chromium (VI)	0.993
Copper	0.83
Lead	0.951
Mercury	0.85
Nickel	0.990
Selenium	0.998
Silver	0.85
Zinc	0.946

h. Acute criterion = $(CF)(e^{(0.9789[\ln(\text{hardness})]-4.189)})$. Conversion factor (CF) is hardness dependent. CF is calculated for other hardnesses as follows: CF = 1.136672 - [(ln hardness)(0.041838)].

i. Chronic criterion = $(CF)(e^{(0.7977[\ln(\text{hardness})]-4.446)})$. Conversion factor (CF) is hardness dependent. CF is calculated for other hardnesses as follows: CF = 1.101672 - [(ln hardness)(0.041838)].

j. Where methods to measure trivalent chromium are unavailable, these criteria are to be represented by total-recoverable chromium.

k. Acute criterion = $(0.316)(e^{(0.8190[\ln(\text{hardness})] + 3.533)})$

l. Chronic criterion = $(0.860)(e^{(0.8190[\ln(\text{hardness})] + 0.4921)})$

m. The conversion factor used to calculate the dissolved metal concentration is 0.982.

n. The conversion factor used to calculate the dissolved metal concentration is 0.962.

o. The acute criterion is represented by the higher criteria value of the two equations: 1) Acute criterion = $e^{(0.700*\ln(DOC) + 0.579*\ln(\text{hardness}) + 0.778*pH - 6.738)}$ and 2) Acute criterion = $e^{(0.855*\ln(DOC) + 0.221*\ln(\text{hardness}) + 0.216*pH - 1.183)}$. Default criteria values were calculated for EPA Level II ecoregions and are applicable in the absence of water body or site-specific water quality data. The freshwater default acute criterion in the Western Cordillera ecoregion is 1.4 µg/L, 2.4 µg/L is the default acute criterion in the Marine West Coast Forest ecoregion, and 4.8 µg/L is the default acute criterion in the Cold Desert ecoregion. The default criterion is used in the absence of concurrently sampled pH, hardness, and dissolved organic carbon for a site-specific location or water body. Criteria calculated using concurrently sampled pH, hardness, and dissolved organic carbon for a specific water body supersede the default criteria.

p. Chronic criterion = $e^{(0.855*\ln(DOC) + 0.221*\ln(hardness) + 0.216*pH - 1.402)}$. Default criteria values were calculated for EPA Level II ecoregions and are applicable in the absence of water body or site-specific water quality data. The freshwater default chronic criterion in the Western Cordillera ecoregion is 1.2 µg/L, 1.8 µg/L is the default chronic criterion in the Marine West Coast Forest ecoregion, and 3.2 µg/L is the default chronic criterion in the Cold Desert ecoregion. 1.6 µg/L is applicable in western Washington and 1.8 µg/L is the applicable default chronic criterion in eastern Washington. The default criterion is used in the absence of concurrently sampled pH, hardness, and dissolved organic carbon for a site-specific location or water body. Criteria calculated using concurrently sampled pH, hardness, and dissolved organic carbon for a specific water body supersede the default criteria.

q. Acute criterion = (CF)($e^{(1.273[\ln(hardness)] - 1.460)}$). Conversion factor (CF) is hardness dependent. CF is calculated for other hardnesses as follows: CF = 1.46203 - [(ln hardness)(0.145712)].

r. Chronic criterion = (CF)($e^{(1.273[\ln(hardness)] - 4.705)}$). Conversion factor (CF) is hardness dependent. CF is calculated for other hardnesses as follows: CF = 1.46203 - [(ln hardness)(0.145712)].

s. The conversion factor used to calculate the dissolved metal concentration is 0.85.

t. These criteria are based on the total-recoverable fraction of the metal.

u. If the four-day average chronic concentration is exceeded more than once in a three-year period, the edible portion of the consumed species should be analyzed. Said edible tissue concentrations shall not be allowed to exceed 1.0 mg/kg of methylmercury.

v. Acute criterion = (0.998)($e^{(0.8460[\ln(hardness)] + 0.1667)}$)

w. Chronic criterion = (0.997)($e^{(0.8460[\ln(hardness)] - 1.466)}$)

x. There is no freshwater acute criterion for aquatic life for selenium. The freshwater chronic criterion is expected to adequately protect against acute effects.

y. Freshwater chronic selenium criteria:

15.1 mg/kg dry weight (egg-ovary tissue)[1]
8.5 mg/kg dry weight (whole-body tissue)[2]
11.3 mg/kg dry weight (muscle tissue)[2]
1.5 µg/L (water lentic)[3]
3.1 µg/L (water lotic)[3]

$$WQC_{int} = WQC - C_{bkgrnd}\,(1 - f_{int}) / f_{int}\ \text{(water lentic or lotic)}^{3,4}$$

[1] Egg-ovary supersedes any whole-body, muscle, or water column element when fish egg-ovary concentrations are measured, except as noted in footnote 4. Tissue criterion is not to be exceeded.

[2] Fish whole-body or muscle tissue supersedes the water column element when both fish tissue and water concentrations are measured, except as noted in footnote 4. Tissue criterion is not to be exceeded.

[3] Water column values are based on dissolved total selenium in water and are derived from fish tissue values via bioaccumulation modeling. When selenium inputs are increasing, water column values are the applicable criterion element in the absence of steady-state condition fish tissue data. Water column criteria are based on a 30-day average concentrations, except for WQC_{int} (see footnote 4). Water column criteria are not to be exceeded more than once every three years on average.

[4] Where WQC_{int} is the intermittent exposure concentration in µg/L; WQC is the applicable water column element, for either lentic or lotic waters; C_{bkgrnd} is the average daily background concentration occurring during the remaining time, integrated over 30 days; f_{int} is the fraction of any 30-day period during which elevated selenium concentrations occur, with f_{int} assigned a value ≥ 0.033 (corresponding to one day). Intermittent exposure criteria averaging period is the number of days per month with an elevated concentration.

z. Acute criterion = (0.85)($e^{(1.72[\ln(hardness)] - 8.590)}$)

aa. Chronic criterion = (0.85)($e^{(1.72[\ln(hardness)] - 9.511)}$)

bb. Acute criterion = (0.978)($e^{(0.8473[\ln(hardness)] + 0.3313)}$)

cc. Chronic criterion = (0.986)($e^{(0.8473[\ln(hardness)] - 0.6900)}$)

dd. Aldrin is metabolically converted to Dieldrin. Therefore, the sum of the Aldrin and Dieldrin concentrations are compared with the Dieldrin criteria.

ee. This value was derived from data for endosulfan. Where concentrations for both alpha-endosulfan and beta-endosulfan are available, the sum of alpha-endosulfan and beta-endosulfan concentrations shall be compared to the criteria.

ff. Shall not exceed the numerical value in total ammonia nitrogen (mg N/L) given by:

For salmonids present:
$$\frac{0.275}{1 + 10^{7.204-pH}} \pm \frac{39.0}{1 + 10^{pH-7.204}}$$

For salmonids absent:
$$\frac{0.411}{1 + 10^{7.204-pH}} \pm \frac{58.4}{1 + 10^{pH-7.204}}$$

gg. Shall not exceed the numerical concentration calculated as follows:

Unionized ammonia concentration for waters where salmonid habitat is an existing or designated use:

$$0.80 \div (FT)(FPH)(RATIO)$$

where:
RATIO = 13.5; 7.7 ≤ pH ≤ 9
RATIO = $(20.25 \times 10^{(7.7-pH)}) \div (1 + 10^{(7.4-pH)})$; 6.5 ≤ pH ≤ 7.7
FT = 1.4; 15 ≤ T ≤ 30
FT = $10^{[0.03(20-T)]}$; 0 ≤ T ≤ 15
FPH = 1; 8 ≤ pH ≤ 9
FPH = $(1 + 10^{(7.4-pH)}) \div 1.25$; 6.5 ≤ pH ≤ 8.0

Total ammonia concentrations for waters where salmonid habitat is not an existing or designated use and other fish early life stages are absent:

$$Chronic\ Criterion = \left(\frac{0.0577}{1 + 10^{7.688-pH}} + \frac{2.487}{1 + 10^{pH-7.688}}\right) \times \left(1.45 \times 10^{0.028(25-A)}\right)$$

where: A = the greater of either T (temperature in degrees Celsius) or 7.

Applied as a 30-day average concentration of total ammonia nitrogen (in mg N/L) not to be exceeded more than once every three years on average. The highest four-day average within the 30-day period should not exceed 2.5 times the chronic criterion.

Total ammonia concentration for waters where salmonid habitat is not an existing or designated use and other fish early life stages are present:

$$Chronic\ Criterion = \left(\frac{0.0577}{1 + 10^{7.688-pH}} + \frac{2.487}{1 + 10^{pH-7.688}}\right) \times B$$

where: B = the lower of either 2.85, or 1.45 x $10^{0.028 \times (25-T)}$. T = temperature in degrees Celsius.

Applied as a 30-day average concentration of total ammonia nitrogen (in mg N/L) not to be exceeded more than once every three years on the average. The highest four-day average within the 30-day period should not exceed 2.5 times the chronic criterion.

hh. Measured in milligrams per liter rather than micrograms per liter.

ii. The listed freshwater criteria are based on un-ionized or total ammonia concentrations, while those for marine water are based on un-ionized ammonia concentrations. Tables for the conversion of total ammonia to un-ionized ammonia for freshwater can be found in the USEPA's Quality Criteria for Water, 1986. Criteria concentrations based on total ammonia for marine water can be found in USEPA Ambient Water Quality Criteria for Ammonia (Saltwater)-1989, EPA440/5-88-004, April 1989.

jj. Criterion based on dissolved chloride in association with sodium. This criterion probably will not be adequately protective when the chloride is associated with potassium, calcium, or magnesium, rather than sodium.

kk. The criteria for cyanide is based on the weak acid dissociable method in the 19th Ed. Standard Methods for the Examination of Water and Wastewater, 4500-CN I, and as revised (see footnote f, above).

ll. The cyanide criteria are: 2.8 µg/L chronic and 9.1 µg/L acute and are applicable only to waters which are east of a line from Point Roberts to Lawrence Point, to Green Point to Deception Pass; and south from Deception Pass and of a line from Partridge Point to Point Wilson. The chronic criterion applicable to the remainder of the marine waters is l µg/L.

mm. Acute criterion = $e^{[1.005(pH) - 5.450]}$

nn. Chronic criterion = $e^{[1.005(pH) - 6.155]}$

oo. Freshwater chronic PFOS criteria:

8.4 µg/L (water)[1,2]
0.937 mg/kg ww (invertebrate whole-body)[1,3,4]
6.75 mg/kg ww (fish whole-body)[1,3,4]
2.91 mg/kg ww (fish muscle)[1,3,4]

[1] All water column and tissue criteria are intended to be independently applicable for compliance determinations and no one criterion takes primacy.

[2] Water column criteria are based on a four-day average concentration not to be exceeded more than once every three years on average.

[3] Tissue criteria derived from the chronic water column concentration with the use of bioaccumulation factors and are expressed as wet weight (ww) concentrations.

[4] Tissue data is an instantaneous point measurement that reflect integrative accumulation of PFOS over time and space. Criteria are not to be exceeded more than once every 10 years on average.

pp. Freshwater chronic PFOA criteria:

94 µg/L (water)[1,2]
1.11 mg/kg ww (invertebrate whole-body)[1,3,4]
6.10 mg/kg ww (fish whole-body)[1,3,4]
0.125 mg/kg ww (fish muscle)[1,3,4]

[1] All water column and tissue criteria are intended to be independently applicable for compliance determinations and no one criterion takes primacy.

[2] Water column criteria are based on a four-day average concentration not to be exceeded more than once every three years on average.

[3] Tissue criteria derived from the chronic water column concentration with the use of bioaccumulation factors and are expressed as wet weight (ww) concentrations.

[4] Tissue data is an instantaneous point measurement that reflect integrative accumulation of PFOS over time and space. Criteria are not to be exceeded more than once every 10 years on average.

Footnotes for human health criteria in Table 240:

A. This criterion for total arsenic is the maximum contaminant level (MCL) developed under the Safe Drinking Water Act. The MCL for total arsenic is applied to surface waters where consumption of organisms-only and where consumption of water + organisms reflect the designated uses. When the department determines that a direct or indirect industrial discharge to surface waters designated for domestic water supply may be adding arsenic to its wastewater, the department will require the discharger to develop and implement a pollution prevention plan to reduce arsenic through the use of AKART. Industrial wastewater discharges to a privately or publicly owned wastewater treatment facility are considered indirect discharges.

B. This criterion was calculated based on an additional lifetime cancer risk of one-in-one-million (1 x 10^{-6} risk level).

C. This criterion is based on a regulatory level developed under the Safe Drinking Water Act.

D. This recommended water quality criterion is expressed as total cyanide, even though the integrated risk information system RfD used to derive the criterion is based on free cyanide. The multiple forms of cyanide that are present in ambient water have significant differences in toxicity due to their differing abilities to liberate the CN-moiety. Some complex cyanides require even more extreme conditions than refluxing with sulfuric acid to liberate the CN-moiety. Thus, these complex cyanides are expected to have little or no "bioavailability" to humans. If a substantial fraction of the cyanide present in a water body is present in a complexed form (e.g., Fe4[Fe(CN)6]3), this criterion may be overly conservative.

E. This criterion applies to total PCBs, (e.g., the sum of all congener or all isomer or homolog or Aroclor analyses). The PCBs criteria were calculated using a chemical-specific risk level of 4 x 10^{-5}. Because that calculation resulted in a higher (less protective) concentration than the current criterion concentration (40 C.F.R. 131.36) the state made a chemical-specific decision to stay at the current criterion concentration.

F. This criterion was derived using the cancer slope factor of 1.4 (linearized multistage model with a twofold increase to 1.4 per mg/kg-day to account for continuous lifetime exposure from birth).

G. ((~~The human health criteria for mercury are contained in 40 C.F.R. 131.36.~~)) EPA has removed Washington from the National Toxics Rule at 40 C.F.R. 131.36 for mercury and promulgated new human health criteria for methylmercury in the EPA's final federal rule at 40 C.F.R. 131.45.

H. Human health criteria applicable for Clean Water Act purposes in the state of Washington are contained in 40 C.F.R. 131.45 and effective as of December 19, 2022 (87 FR 69183).