Canadian Water Quality Guidelines for the Protection of Aquatic Life

SUMMARY TABLE
Update 7.1
December 2007

Summary of Canadian water quality guidelines for the protection of aquatic life.

	Freshwater		Marine	
Parameter[a]	**Concentration ($\mu g \cdot L^{-1}$)**	**Date[b]**	**Concentration ($\mu g \cdot L^{-1}$)**	**Date[b]**
Acenaphthene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Acridine [See Polycyclic aromatic hydrocarbons (PAHs)]				
Aldicarb	1[c]	1993	0.15[c]	1993
Aldrin + Dieldrin[d]	~~0.004~~ [e,f]	1987		
Aluminium[d]	5–100[g]	1987		
Ammonia (total)	see fact sheet	2001		
Ammonia (un-ionized)	19[h]	2001		
Aniline	2.2[i]	1993	Insufficient data	1993
Anthracene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Arsenic[j]	5.0[k]	1997	12.5[c]	1997
Atrazine	1.8[i]	1989		
Benz*(a)*anthracene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Benzene[j]	370[c, k]	1999	110[c]	1999
Benzo*(a)*pyrene [See Polycyclic aromatic hydrocarbons (PAHs)]				
2,2-Bis(*p*-chlorophenyl)-1,1,1-trichloroethane [See DDT (total)]				
Bromacil	5.0[c,i]	1997	Insufficient data	1997
Bromoform [See Halogenated methanes, Tribromomethane]				
Bromoxynil	5.0[i]	1993	Insufficient data	1993
Cadmium	0.017[c,l]	1996	0.12[i]	1996
Captan	1.3[c]	1991		
Carbaryl	0.20[i]	1997	0.32[c,i]	1997
Carbofuran	1.8[i]	1989		
Carbon tetrachloride [See Halogenated methanes, Tetrachloromethane]				
Chlordane[d]	~~0.006~~ [e,f]	1987		
Chlorinated benzenes				
Monochlorobenzene	1.3[c,k]	1997	25[c,k]	1997
1,2-Dichlorobenzene	0.70[c,k]	1997	42[c,k]	1997
1,3-Dichlorobenzene	150[c,k]	1997	Insufficient data[k]	1997
1,4-Dichlorobenzene	26[c,k]	1997	Insufficient data[k]	1997
1,2,3-Trichlorobenzene	8.0[c,k]	1997	Insufficient data[k]	1997
1,2,4-Trichlorobenzene	24[c,k]	1997	5.4[c,k]	1997
1,3,5-Trichlorobenzene[d]	Insufficient data[k]	1997	Insufficient data[k]	1997

Continued.

Parameter[a]	Freshwater		Marine	
	Concentration (µg·L^{-1})	Date[b]	Concentration (µg·L^{-1})	Date[b]
Chlorinated benzenes—Continued				
1,2,3,4-Tetrachlorobenzene	1.8[c,k]	1997	Insufficient data[k]	1997
1,2,3,5-Tetrachlorobenzene[d]	Insufficient data[k]	1997	Insufficient data[k]	1997
1,2,4,5-Tetrachlorobenzene[d]	Insufficient data[k]	1997	Insufficient data[k]	1997
Pentachlorobenzene	6.0[c,k]	1997	Insufficient data[k]	1997
Hexachlorobenzene[d]	Insufficient data[e,f,k]	1997	Insufficient data[k]	1997
Chlorinated ethanes				
1,2-Dichloroethane	100[c,i]	1991	Insufficient data	1991
1,1,1-Trichloroethane	Insufficient data	1991	Insufficient data	1991
1,1,2,2-Tetrachloroethane	Insufficient data	1991	Insufficient data	1991
Chlorinated ethenes				
1,1,2-Trichloroethene (Tichloroethylene; TCE)	21[c,i]	1991	Insufficient data	1991
1,1,2,2-Tetrachloroethene (Tetrachloroethylene; PCE)	111[c,i]	1993	Insufficient data	1993
Chlorinated methanes [See Halogenated methanes]				
Chlorinated phenols[d]				
Monochlorophenols	7	1987		
Dichlorophenols	0.2	1987		
Trichlorophenols	18	1987		
Tetrachlorophenols	1	1987		
Pentachlorophenol (PCP)	0.5	1987		
Chlorine, reactive [See Reactive chlorine species]				
Chloroform [See Halogenated methanes, Trichloromethane]				
4-Chloro-2-methyl phenoxy acetic acid [See MCPA]				
Chlorothalonil	0.18[c]	1994	0.36[c]	1994
Chlorpyrifos	0.0035	1997	0.002[c]	1997
Chromium				
Trivalent chromium (Cr(III))	8.9[c,k]	1997	56[c,k]	1997
Hexavalent chromium (Cr(VI))	1.0[k]	1997	1.5[k]	1997
Chrysene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Colour	Narrative	1999	Narrative	1999
Copper[d]	2–4[m]	1987		
Cyanazine	2.0[c,i]	1990		
Cyanide[d]	5 (as free CN)	1987		
DDAC (Didecyl dimethyl ammonium chloride)	1.5[c]	1999	Insufficient data	1999
DDT (total)[d] (2,2-Bis(*p*-chlorophenyl)-1,1,1-trichloroethane; dichloro diphenyl trichloroethane)	~~0.001~~[e,f]	1987		
Debris (litter/settleable matter)			Narrative[c]	1996

Continued.

	Freshwater		Marine	
Parameter[a]	**Concentration (µg·L^{-1})**	**Date[b]**	**Concentration (µg·L^{-1})**	**Date[b]**
Deltamethrin	0.0004	1997	Insufficient data	1997
Deposited bedload sediment [See Total particulate matter]				
Dibromochloromethane [See Halogenated methanes]				
Dicamba	10[c,i]	1993		
Dichlorobenzene [See Chlorinated benzenes]				
Dichlorobromomethane [See Halogenated methanes]				
Dichloro diphenyl trichloroethane [See DDT (total)]				
Dichloroethane [See Chlorinated ethanes]				
Dichloroethylene [See Chlorinated ethanes, 1,2-Dichloroethane]				
Dichloromethane [See Halogenated methanes]				
Dichlorophenols [See Chlorinated phenols]				
2,4-Dichlorophenoxyacetic acid [see Phenoxy herbicides]				
Diclofop-methyl	6.1	1993		
Didecyl dimethyl ammonium chloride [See DDAC]				
Diethylene glycol [See Glycols]				
Di(2-ethylhexyl) phthalate [See Phthalate esters]				
Diisopropanolamine (DIPA)[aa]	1600[c]	2005	Insufficient data	2005
Dimethoate	6.2[c]	1993	Insufficient data	1993
Di-*n*-butyl phthalate [See Phthalate esters]				
Di-*n*-octyl phthalate [See Phthalate esters]				
Dinoseb	0.05	1992		
Dissolved gas supersaturation	Narrative	1999	Narrative	1999
Dissolved oxygen	5500–9500[k,n]	1999	>8000 and Narrative[c,k]	1996
Endosulfan[d]	0.02	1987		
Endrin[d]	~~0.0023~~[e,f]	1987		
Ethylbenzene[j]	90[c,k]	1996	25[c,k]	1996
Ethylene glycol [See Glycols]				
Fluoranthene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Fluorene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Glycols				
Ethylene glycol	192 000[k]	1997	Insufficient data	1997
Diethylene glycol	Insufficient data[k]	1997	Insufficient data	1997
Propylene glycol	500 000[k]	1997	Insufficient data	1997
Glyphosate	65[c]	1989		

Continued.

Parameter[a]	Freshwater		Marine	
	Concentration (µg·L^{-1})	Date[b]	Concentration (µg·L^{-1})	Date[b]
Halogenated methanes				
Monochloromethane (Methyl chloride)[d]	Insufficient data	1992	Insufficient data	1992
Dichloromethane (Methylene chloride)	98.1[c,i]	1992	Insufficient data	1992
Trichloromethane (Chloroform)	1.8[c,i]	1992	Insufficient data	1992
Tetrachloromethane (Carbon tetrachloride)	13.3[c,i]	1992	Insufficient data	1992
Monobromomethane (Methyl bromide)[d]	Insufficient data	1992	Insufficient data	1992
Tribromomethane (Bromoform)[d]	Insufficient data	1992	Insufficient data	1992
Dibromochloromethane[d]	Insufficient data	1992	Insufficient data	1992
Dichlorobromomethane[d]	Insufficient data	1992	Insufficient data	1992
HCBD [See Hexachlorobutadiene (HCBD)]				
Heptachlor (Heptachlor epoxide)[d]	~~0.01~~ [e,f]	1987		
Hexachlorobenzene [See Chlorinated benzenes]				
Hexachlorobutadiene (HCBD)	1.3[c, k]	1999		
Hexachlorocyclohexane (Lindane)[d]	0.01	1987		
Hypochlorous acid [See Reactive chlorine species]				
Imidacloprid[aa]	0.23[c]	2007	0.65[c]	2007
Inorganic fluorides	120[c]	2002		
3-Iodo-2-propynyl butyl carbamate [See IPBC]				
IPBC (3-Iodo-2-propynyl butyl carbamate)	1.9[c]	1999		
Iron[d]	300	1987		
Lead[d]	1–7[o]	1987		
Lindane [See Hexachlorocyclohexane]				
Linuron	7.0[c]	1995	Insufficient data	1995
MCPA (4-Chloro-2-methyl phenoxy acetic acid; 2-methyl-4-chloro phenoxy acetic acid)	2.6[c]	1995	4.2[c]	1995
Mercury[v]				
Inorganic Mercury[v]	0.026	2003	0.016[c,w]	2003
Methylmercury[v]	0.004[c,w]	2003		
Methoprene	0.09 (Target Organism Management value: 0.53)[c,j,cc]	2007	Insufficient data	2007
Methyl bromide [See Halogenated methanes, Monobromomethane]				
Methyl chloride [See Halogenated methanes, Monochloromethane]				
2-Methyl-4-chloro phenoxy acetic acid [See MCPA]				
Methylene chloride [See Halogenated methanes, Dichloromethane]				
Methyl *tertiary*-butyl ether [See MTBE]				
Metolachlor	7.8[c]	1991		
Metribuzin	1.0[c]	1990		
Molybdenum[j]	73[c]	1999		
Monobromomethane [See Halogenated methanes]				
Monochloramine [See Reactive chlorine species]				

Continued.

	Freshwater		Marine	
Parameter[a]	**Concentration (µg·L^{-1})**	**Date**[b]	**Concentration (µg·L^{-1})**	**Date**[b]
Monochlorobenzene [See Chlorinated benzenes]				
Monochloromethane [See Halogenated methanes]				
Monochlorophenols [See Chlorinated phenols]				
MTBE (methyl *tertiary*-butyl ether)	10 000[c]	2003	5 000[c]	2003
Naphthalene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Nickel[d]	25–150[p]	1987		
Nitrate	13 000[c,u,y]	2003	16 000[c,u,y]	2003
Nitrite[d]	60[z]	1987		
Nonylphenol and its ethoxylates	1.0[c,t]	2002	0.7[c,t]	2002
Nutrients	Guidance Framework[x]	2004	Guidance Framework [aa,bb]	2007
Organotins				
Tributyltin	0.008[c]	1992	0.001[c]	1992
Tricyclohexyltin	Insufficient data	1992	Insufficient data	1992
Triphenyltin	0.022[c,i]	1992	Insufficient data	1992
Oxygen, dissolved [See Dissolved oxygen]				
PAHs [See Polycyclic aromatic hydrocarbons (PAHs)]				
PCBs [See Polychlorinated biphenyls (PCBs)(total)]				
PCE [See Chlorinated ethenes, 1,1,2,2-Tetrachloroethene]				
PCP [See Chlorinated phenols, Pentachlorophenol]				
Pentachlorobenzene [See Chlorinated benzenes]				
Pentachlorophenol [See Chlorinated phenols]				
Permethrin[aa]	0.004[c]	2006	0.001[c]	2006
pH[d]	6.5–9	1987	7.0–8.7 and Narrative	1996
Phenanthrene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Phenols (mono- & dihydric)	4.0[k]	1999		
Phenoxy herbicides[d, q]	4.0	1987		
Phosphorus	Guidance Framework[x]	2004	Guidance Framework[bb]	2007
Phthalate esters				
Di-*n*-butyl phthalate	19[c]	1993	Insufficient data	1993
Di(2-ethylhexyl) phthalate	16[c]	1993	Insufficient data	1993
Di-*n*-octyl phthalate	Insufficient data	1993	Insufficient data	1993
Picloram	29[c]	1990		
Polychlorinated biphenyls (PCBs) (total)[d]	~~0.001~~ [e,f]	1987	~~0.01~~ [e,f]	1991

Continued.

Parameter[a]	Freshwater		Marine	
	Concentration (µg·L^{-1})	Date[b]	Concentration (µg·L^{-1})	Date[b]
Polycyclic aromatic hydrocarbons (PAHs)				
Acenaphthene	5.8[c]	1999	Insufficient data	1999
Acridine	4.4[c]	1999	Insufficient data	1999
Anthracene	0.012[c]	1999	Insufficient data	1999
Benz*(a)*anthracene	0.018[c]	1999	Insufficient data	1999
Benzo*(a)*pyrene	0.015[c]	1999	Insufficient data	1999
Chrysene	Insufficient data	1999	Insufficient data	1999
Fluoranthene	0.04[c]	1999	Insufficient data	1999
Fluorene	3.0[c]	1999	Insufficient data	1999
Naphthalene	1.1[c]	1999	1.4[c]	1999
Phenanthrene	0.4[c]	1999	Insufficient data	1999
Pyrene	0.025[c]	1999	Insufficient data	1999
Quinoline	3.4[c]	1999	Insufficient data	1999
Propylene glycol [See Glycols]				
Pyrene [See Polycyclic aromatic hydrocarbons (PAHs)]				
Quinoline [See Polycyclic aromatic hydrocarbons (PAHs)]				
Reactive chlorine species (hypochlorous acid and monochloramine)	0.5 and Narrative	1999	0.5 and Narrative	1999
Salinity			<10% fluctuation[c]	1996
Selenium[d]	1.0	1987		
Silver[d]	0.1	1987		
Simazine	10	1991		
Streambed substrate [See Total particulate matter]				
Styrene	72[c]	1999		
Sulfolane[aa]	50 000[c]	2005	Insufficient data	2005
Suspended sediments [See Total particulate matter]				
TCE [See Chlorinated ethenes, 1,1,2-Trichloroethene]				
Tebuthiuron	1.6[c]	1995	Insufficient data	1995
Temperature	Narrative[s]	1987	Not to exceed ±1°C and Narrative[c]	1996
Tetrachlorobenzene [See Chlorinated benzenes]				
Tetrachloroethane [See Chlorinated ethanes]				
Tetrachloroethene [See Chlorinated ethenes]				
Tetrachloroethylene [See Chlorinated ethenes, 1,1,2,2-Tetrachloroethene]				

Continued.

	Freshwater		Marine	
Parameter[a]	**Concentration (µg·L^{-1})**	**Date[b]**	**Concentration (µg·L^{-1})**	**Date[b]**
Tetrachloromethane [See Halogenated methanes]				
Tetrachlorophenols [See Chlorinated phenols]				
Thallium[j]	0.8	1999		
Toluene	2.0[c,j,k]	1996	215[c,k]	1996
Total particulate matter				
Deposited bedload sediment	Insufficient data	1999	Insufficient data	1999
Streambed substrate	Narrative	1999	Narrative	1999
Suspended sediments	Narrative	1999	Narrative	1999
Turbidity	Narrative	1999	Narrative	1999
Toxaphene[d]	~~0.008~~ [e,f]	1987		
Triallate	0.24[c]	1992		
Tribromomethane [See Halogenated methanes]				
Tributyltin [See Organotins]				
Trichlorobenzene [See Chlorinated benzenes]				
Trichloroethane [See Chlorinated ethanes]				
Trichloroethene [See Chlorinated ethenes]				
Trichloroethylene [See Chlorinated ethenes, 1,1,2-Trichloroethene]				
Trichloromethane [See Halogenated methanes]				
Trichlorophenols [See Chlorinated phenols]				
Tricyclohexyltin [See Organotins]				
Trifluralin	0.20[i]	1993		
Triphenyltin [See Organotins]				
Turbidity [See Total particulate matter]				
Zinc[d]	30	1987		

[a] Unless otherwise indicated, supporting documents are available from the National Guidelines and Standards Office, Environment Canada.

[b] The guidelines dated 1987 have been carried over from *Canadian Water Quality Guidelines* (CCREM 1987) and no fact sheet was prepared. The guidelines dated 1989 to 1997 were developed and initially published in CCREM 1987 as appendixes on the date indicated. They are published as fact sheets in this document. Other guidelines dated 1997 and those dated 1999 are published for the first time in this document.

[c] Interim guideline.

[d] No fact sheet created. For more information on this guideline, please refer to *Canadian Water Quality Guidelines* (CCREM 1987).

[e] This guideline (originally published in *Canadian Water Quality Guidelines* [CCREM 1987 + Appendixes] in 1987 or 1991 [PCBs in marine waters]) is no longer recommended and the value is withdrawn. A water quality guideline is not recommended. Environmental exposure is predominantly via sediment, soil, and/or tissue, therefore, the reader is referred to the respective guidelines for these media.

[f] This substance meets the criteria for Track 1 substances under the national CCME Policy for the Management of Toxic Substances (PMTS) (i.e., persistent, bioaccumulative, primarily the result of human activity, and CEPA-toxic or equivalent), and should be subject to virtual elimination strategies. Guidelines can serve as action levels or interim management objectives towards virtual elimination.

[g] Aluminium guideline= 5 µg·L^{-1} at pH <6.5
= 100 µg·L^{-1} at pH ≥6.5

[h] Ammonia guideline: Expressed as µg unionized ammonia·L^{-1}. This would be equivalent to 15.2 µg ammonia-nitrogen·L^{-1}. Guideline for total ammonia is temperature and pH dependent, please consult factsheet for more information.

[i] Guideline value slightly modified from CCREM 1987 + Appendixes due to re-evaluation of the significant figures.

[j] The technical document for the guideline is available from the Ontario Ministry of the Environment.

[k] Substance has been re-evaluated since CCREM 1987 + Appendixes. Either a new guideline has been derived or insufficient data existed to derive a new guideline.

[l] Cadmium guideline $= 10^{\{0.86[\log(\text{hardness})] - 3.2\}}$.

[m]Copper guideline = 2 µg·L^{-1} at a water hardness of 0–120 mg·L^{-1} (soft to medium) as $CaCO_3$
= 3 µg·L^{-1} at a water harness of 120–180 mg·L^{-1} (hard) as $CaCO_3$
= 4 µg·L^{-1} at a water harness >180 mg·L^{-1} (very hard) as $CaCO_3$

[n]Dissolved oxygen for warm-water biota: early life stages = 6000 µg·L^{-1}
other life stages = 5500 µg·L^{-1}
for cold-water biota: early life stages = 9500 µg·L^{-1}
other life stages = 6500 µg·L^{-1}

[o]Lead guideline = 1 µg·L^{-1} at a water harness of 0–60 mg·L^{-1} (soft) as $CaCO_3$
= 2 µg·L^{-1} at a water harness of 60–120 mg·L^{-1} (medium) as $CaCO_3$
= 4 µg·L^{-1} at a water harness of 120–180 mg·L^{-1} (hard) as $CaCO_3$
= 7 µg·L^{-1} at a water harness >180 mg·L^{-1} (very hard) as $CaCO_3$

[p]Nickel guideline = 25 µg·L^{-1} at a water harness of 0–60 mg·L^{-1} (soft) as $CaCO_3$
= 65 µg·L^{-1} at a water harness of 60–120 mg·L^{-1} (medium) as $CaCO_3$
= 110 µg·L^{-1} at a water harness of 120–180 mg·L^{-1} (hard) as $CaCO_3$
= 150 µg·L^{-1} at a water harness >180 mg·L^{-1} (very hard) as $CaCO_3$

[q]The guideline of 4.0 µg·L^{-1} for phenoxy herbicides is based on data for ester formulations of 2,4-dichlorophenoxyacetic acid.

[r]The technical document for the guideline is available from British Columbia Ministry of Environment, Lands and Parks.

[s]Temperature: (for more information, see CCREM 1987)

Thermal Stratification: Thermal additions to receiving waters should be such that thermal stratification and subsequent turnover dates are not altered from those existing prior to the addition of heat from artificial origins.

Maximum Weekly Average Temperature: Thermal additions to receiving waters should be such that the maximum weekly average temperature is not exceeded.

Short-term Exposure to Extreme Temperature: Thermal additions to receiving waters should be such that the short-term exposures to maximum temperatures are not exceeded. Exposures should not be so lengthy or frequent as to adversely affect the important species.

[t]Expressed on a TEQ basis using NP TEFs, see Table 2 in factsheet.

[u]For protection from direct toxic effects; the guidelines do not consider indirect effects due to eutrophication.

[v]May not prevent accumulation of methylmercury in aquatic life, therefore, may not protect wildlife that consume aquatic life; see fact sheet for details. Consult also the appropriate Canadian Tissue Residue Guideline for the Protection of Wildlife Consumers of Aquatic Biota.

[w]May not fully protect higher trophic level fish; see factsheet for details.

[x]Canadian Guidance Framework for Phosphorus is for developing phosphorus guidelines (does not provide guidance on other freshwater nutrients). It provides Trigger Ranges for Total Phosphorus (see Guidance Framework for Phosphorus factsheet):

ultra-oligotrophic <4 µg·L^{-1}
oligotrophic 4-10 µg·L^{-1}
mesotrophic 10-20 µg·L^{-1}
meso-eutrophic 20-35 µg·L^{-1}
eutrophic 35-100 µg·L^{-1}
hyper-eutrophic >100 µg·L^{-1}

[y]Guidelines are expressed in µg nitrate·L^{-1}. These values are equivalent to 2900 µg nitrate-nitrogen·L^{-1}, and 3600 µg nitrate-nitrogen·L^{-1}, for freshwater and marine respectively.

[z]Guideline is expressed as µg nitrite-nitrogen·L^{-1}. This value is equivalent to 197 µg nitrite·L^{-1}.

[aa]Supporting documents are available from the Canadian Council of Ministers of the Environment at http://www.ccme.ca/publications/ceqg_rcqe.html?category_id=125

[bb]The Canadian Guidance Framework for the Management of Nearshore Marine Systems is for developing nutrient (phosphorus and nitrogen) guidelines for nearshore marine systems. Refer to fact sheet for details

[cc]Two protective values for methoprene were derived to resolve the Canadian Water Quality Guideline (CWQG) guiding principle that *all* forms of aquatic life at all life stages are to be protected, with the fact that methoprene is applied intentionally to water to control mosquito populations. The first is an interim CWQG of 0.09 µg a.i.·L^{-1} that is protective of all aquatic life including mosquitoes (derivation of guideline included mosquito data). The second is an interim Target Organism Management value of 0.53 µg a.i.·L^{-1} that is protective of most aquatic life with the exception that some mosquito species are not protected (derivation of management value excluded mosquito data; the management value exceeds the 24-h LC50 for some mosquito species). See fact sheet or consult the Ontario Ministry of the Environment's technical supporting document on which value to apply .

Reference

CCREM (Canadian Council of Resource and Environment Ministers). 1987. Canadian water quality guidelines. Prepared by the Task Force on Water Quality Guidelines.

Reference listing:

Canadian Council of Ministers of the Environment. 2007. Canadian water quality guidelines for the protection of aquatic life: Summary table. Updated December, 2007. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg.

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