



Canadian Sediment Quality Guidelines for the Protection of Aquatic Life

SUMMARY TABLES

Update 2002

Table 1. Interim freshwater sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight), and incidence (%) of adverse biological effects in concentration ranges defined by these values.*

Substance	ISQG	PEL	% = ISQG	ISQG < % < PEL	% = PEL
Acenaphthene [See Polycyclic aromatic hydrocarbons (PAHs)]					
Acenaphthylene [See Polycyclic aromatic hydrocarbons (PAHs)]					
Anthracene [See Polycyclic aromatic hydrocarbons (PAHs)]					
Aroclor 1254 [See Polychlorinated biphenyls (PCBs)]					
Arsenic	5.9 mg·kg ⁻¹	17.0 mg·kg ⁻¹	5	25	12
Benz(<i>a</i>)anthracene [See Polycyclic aromatic hydrocarbons (PAHs)]					
Benzo(<i>a</i>)pyrene [See Polycyclic aromatic hydrocarbons (PAHs)]					
Cadmium	0.6 mg·kg ⁻¹	3.5 mg·kg ⁻¹	11	12	47
Chlordane	4.50 µg·kg ⁻¹	8.87 µg·kg ⁻¹	2	17	70
Chromium	37.3 mg·kg ⁻¹	90.0 mg·kg ⁻¹	2	19	49
Chrysene [See Polycyclic aromatic hydrocarbons (PAHs)]					
Copper	35.7 mg·kg ⁻¹	197 mg·kg ⁻¹	4	38	44
DDTs					
DDD [†] (2,2-Bis(<i>p</i> -chlorophenyl)-1,1,-dichloroethane; Dichloro diphenyl dichloroethane)	3.54 µg·kg ⁻¹	8.51 µg·kg ⁻¹	3	30	85
DDE [†] (1,1-Dichloro-2,2,bis(<i>p</i> -chlorophenyl)-ethene; Diphenyl dichloro ethylene)	1.42 µg·kg ⁻¹	6.75 µg·kg ⁻¹	6	20	47
DDT [†] (2,2-Bis(<i>p</i> -chlorophenyl)-1,1,1-trichloroethane; Dichloro diphenyl trichloroethane)	1.19 µg·kg ⁻¹ ‡	4.77 µg·kg ⁻¹ §	8	5	59
Dibenz(<i>a,h</i>)anthracene [See Polycyclic aromatic hydrocarbons (PAHs)]					
Dieldrin	2.85 µg·kg ⁻¹	6.67 µg·kg ⁻¹	1	10	60
Endrin	2.67 µg·kg ⁻¹	62.4 µg·kg ⁻¹	1	64	59
Fluoranthene [See Polycyclic aromatic hydrocarbons (PAHs)]					
Fluorene [See Polycyclic aromatic hydrocarbons (PAHs)]					

Continued.

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Table 1. Continued.

Substance	ISQG	PEL	% = ISQG	ISQG < % < PEL	% = PEL
Heptachlor epoxide	0.60 µg·kg ⁻¹	2.74 µg·kg ⁻¹	3	12	67
Hexachlorocyclohexane [See Lindane]					
Lead	35.0 mg·kg ⁻¹	91.3 mg·kg ⁻¹	5	23	42
Lindane (Hexachlorocyclohexane)	0.94 µg·kg ⁻¹	1.38 µg·kg ⁻¹	0	50	49
Mercury	0.17 mg·kg ⁻¹	0.486 mg·kg ⁻¹	8	34	36
2-Methylnaphthalene [See Polycyclic aromatic hydrocarbons (PAHs)]					
Naphthalene [See Polycyclic aromatic hydrocarbons (PAHs)]					
Nonylphenol and its ethoxylates	1.4 mg·kg ⁻¹ †††,***				
PAHs [See Polycyclic aromatic hydrocarbons (PAHs)]					
PCBs [See Polychlorinated biphenyls (PCBs)]					
PCDD/Fs [see Polychlorinated dibenzo- <i>p</i> -dioxins and polychlorinated dibenzofurans]					
Phenanthrene [See Polycyclic aromatic hydrocarbons (PAHs)]					
Polychlorinated biphenyls (PCBs)					
Aroclor 1254	60 µg·kg ⁻¹ #	340 µg·kg ⁻¹ **			
Total PCBs	34.1 µg·kg ⁻¹	277 µg·kg ⁻¹	4	40	50
Polychlorinated dibenzo- <i>p</i> -dioxins and polychlorinated dibenzofurans	0.85 ng·TEQ/kg dw §§	21.5 ng·TEQ/kg dw §§	0 ^{##}	24 ^{##}	46 ^{##}
Polycyclic aromatic hydrocarbons (PAHs)					
Acenaphthene	6.71 µg·kg ⁻¹ †	88.9 µg·kg ⁻¹ §			
Acenaphthylene	5.87 µg·kg ⁻¹ †	128 µg·kg ⁻¹ §			
Anthracene	46.9 µg·kg ⁻¹ †	245 µg·kg ⁻¹ §			
Benz(<i>a</i>)anthracene	31.7 µg·kg ⁻¹	385 µg·kg ⁻¹	13	6	38
Benzo(<i>a</i>)pyrene	31.9 µg·kg ⁻¹	782 µg·kg ⁻¹	11	16	30
Chrysene	57.1 µg·kg ⁻¹	862 µg·kg ⁻¹	8	14	25
Dibenz(<i>a,h</i>)anthracene	6.22 µg·kg ⁻¹ †	135 µg·kg ⁻¹ §			
Fluoranthene	111 µg·kg ⁻¹	2355 µg·kg ⁻¹	8	23	49
Fluorene	21.2 µg·kg ⁻¹ †	144 µg·kg ⁻¹ §			
2-Methylnaphthalene	20.2 µg·kg ⁻¹ †	201 µg·kg ⁻¹ §			
Naphthalene	34.6 µg·kg ⁻¹ †	391 µg·kg ⁻¹ §			
Phenanthrene	41.9 µg·kg ⁻¹	515 µg·kg ⁻¹	4	17	44
Pyrene	53.0 µg·kg ⁻¹	875 µg·kg ⁻¹	7	16	32
Pyrene [See Polycyclic aromatic hydrocarbons (PAHs)]					
Toxaphene	0.1 µg·kg ⁻¹ ††	— ††			
Zinc	123 mg·kg ⁻¹	315 mg·kg ⁻¹	5	32	36

* ISQGs and PELs presented here have been calculated using a modification of the NSTP approach (CCME 1995).

† Sum of *p,p'* and *o,p'* isomers.

‡ Provisional; adoption of marine ISQG.

§ Provisional; adoption of marine PEL.

Provisional; adoption of lowest effect level from Ontario (Persaud et al. 1993).

** Provisional; 1% TOC; adoption of severe effect level of 34 µg·g⁻¹ TOC from Ontario (Persaud et al. 1993).†† Provisional; 1% TOC; adoption of the chronic sediment quality criterion of 0.01 µg·g⁻¹ TOC of the New York State Department of Environmental Conservation (NYSDEC 1994).

††† No PEL derived.

§§ Values are expressed as toxic equivalency (TEQ) units, based on WHO 1998 TEF values for fish.

^{##} Expressed on a TEQ basis using NP TEFs; assumes 1% TOC.

^{***} Provisional; use of equilibrium partitioning approach.

^{†††} Note that the incidence of adverse biological effects below the TEL, between the TEL and PEL, and above the PEL were 22%, 24% and 65%, respectively, prior to the application of a safety factor.

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Table 2. Interim marine sediment quality guidelines (ISQGs; dry weight), probable effect levels (PELs; dry weight), and incidence (%) of adverse biological effects in concentration ranges defined by these values.*

Substance	ISQG	PEL	% = ISQG	ISQG < % < PEL	% = PEL
Acenaphthene [See Polycyclic aromatic hydrocarbons; (PAHs)]					
Acenaphthylene [See Polycyclic aromatic hydrocarbons (PAHs)]					
Anthracene [See Polycyclic aromatic hydrocarbons (PAHs)]					
Aroclor 1254 [See Polychlorinated biphenyls (PCBs)]					
Arsenic	7.24 mg·kg ⁻¹	41.6 mg·kg ⁻¹	3	13	47
Benz(<i>a</i>)anthracene [See Polycyclic aromatic hydrocarbons (PAHs)]					
Benzo(<i>a</i>)pyrene [See Polycyclic aromatic hydrocarbons (PAHs)]					
Cadmium	0.7 mg·kg ⁻¹	4.2 mg·kg ⁻¹	6	20	71
Chlordane	2.26 µg·kg ⁻¹	4.79 µg·kg ⁻¹	9	12	17
Chromium	52.3 mg·kg ⁻¹	160 mg·kg ⁻¹	4	15	53
Chrysene [See Polycyclic aromatic hydrocarbons (PAHs)]					
Copper	18.7 mg·kg ⁻¹	108 mg·kg ⁻¹	9	22	56
DDTs					
DDD [†] (2,2-Bis(<i>p</i> -chlorophenyl)-1,1,-dichloroethane; Dichloro diphenyl dichloroethane)	1.22 µg·kg ⁻¹	7.81 µg·kg ⁻¹	4	11	46
DDE [†] (1,1-Dichloro-2,2,bis(<i>p</i> -chlorophenyl)-ethene; Diphenyl dichloro ethylene)	2.07 µg·kg ⁻¹	374 µg·kg ⁻¹	5	16	50
DDT [†] (2,2-Bis(<i>p</i> -chlorophenyl)-1,1,1-trichloroethane; Dichloro diphenyl trichloroethane)	1.19 µg·kg ⁻¹	4.77 µg·kg ⁻¹	8	5	59
Dibenz(<i>a,h</i>)anthracene [See Polycyclic aromatic hydrocarbons (PAHs)]					
Dieldrin	0.71 µg·kg ⁻¹	4.30 µg·kg ⁻¹	4	13	50
Endrin	2.67 µg·kg ⁻¹ ‡	62.4 µg·kg ⁻¹ §			
Fluoranthene [See Polycyclic aromatic hydrocarbons (PAHs)]					
Fluorene [See Polycyclic aromatic hydrocarbons (PAHs)]					
Heptachlor epoxide	0.60 µg·kg ⁻¹ ‡	2.74 µg·kg ⁻¹ §			
Hexachlorocyclohexane [See Lindane]					
Lead	30.2 mg·kg ⁻¹	112 mg·kg ⁻¹	6	26	58
Lindane (Hexachlorocyclohexane)	0.32 µg·kg ⁻¹	0.99 µg·kg ⁻¹	3	21	26

Continued.

Table 2. Continued.

Substance	ISQG	PEL	% = ISQG	ISQG < % < PEL	% = PEL
Mercury	0.13 mg·kg ⁻¹	0.70 mg·kg ⁻¹	8	24	37
2-Methylnaphthalene [See Polycyclic aromatic hydrocarbons (PAHs)]					
Naphthalene [See Polycyclic aromatic hydrocarbons (PAHs)]					
Nonylphenol and its ethoxylates	1.0 mg·kg ⁻¹ ††,§§				
PAHs [See Polycyclic aromatic hydrocarbons (PAHs)]					
PCBs [See Polychlorinated biphenyls (PCBs)]					
PCDD/Fs [see Polychlorinated dibenzo- <i>p</i> -dioxins and polychlorinated dibenzo furans]					
Phenanthrene [See Polycyclic aromatic hydrocarbons (PAHs)]					
Polychlorinated biphenyls (PCBs)					
Aroclor 1254	63.3 µg·kg ⁻¹	709 µg·kg ⁻¹	1	24	76
Total PCBs	21.5 µg·kg ⁻¹	189 µg·kg ⁻¹	16	37	55
Polychlorinated dibenzo- <i>p</i> -dioxins and polychlorinated dibenzo furans	0.85 ng TEQ/kg dw ^{††}	21.5 ng TEQ/kg dw ^{††}			
Polycyclic aromatic hydrocarbons (PAHs)					
Acenaphthene	6.71 µg·kg ⁻¹	88.9 µg·kg ⁻¹	8	29	57
Acenaphthylene	5.87 µg·kg ⁻¹	128 µg·kg ⁻¹	7	14	51
Anthracene	46.9 µg·kg ⁻¹	245 µg·kg ⁻¹	9	20	75
Benz(<i>a</i>)anthracene	74.8 µg·kg ⁻¹	693 µg·kg ⁻¹	9	16	78
Benzo(<i>a</i>)pyrene	88.8 µg·kg ⁻¹	763 µg·kg ⁻¹	8	22	71
Chrysene	108 µg·kg ⁻¹	846 µg·kg ⁻¹	9	19	72
Dibenz(<i>a,h</i>)anthracene	6.22 µg·kg ⁻¹	135 µg·kg ⁻¹	16	12	65
Fluoranthene	113 µg·kg ⁻¹	1 494 µg·kg ⁻¹	10	20	80
Fluorene	21.2 µg·kg ⁻¹	144 µg·kg ⁻¹	12	20	70
2-Methylnaphthalene	20.2 µg·kg ⁻¹	201 µg·kg ⁻¹	0	23	82
Naphthalene	34.6 µg·kg ⁻¹	391 µg·kg ⁻¹	3	19	71
Phenanthrene	86.7 µg·kg ⁻¹	544 µg·kg ⁻¹	8	23	78
Pyrene	153 µg·kg ⁻¹	1 398 µg·kg ⁻¹	7	19	83
Pyrene [See Polycyclic aromatic hydrocarbons (PAHs)]					
Toxaphene	0.1 µg·kg ⁻¹ #	— **			
Zinc	124 mg·kg ⁻¹	271 mg·kg ⁻¹	4	27	65

* ISQGs and PELs presented here have been calculated using a modification of the NSTP approach (CCME 1995).

† Sum of *p,p'* and *o,p'* isomers.

‡ Provisional; adoption of freshwater ISQG.

§ Provisional; adoption of freshwater PEL.

Provisional; 1% TOC; adoption of the chronic sediment quality criterion of 0.01 µg·g⁻¹TOC of the New York State Department of Environmental Conservation (NYSDEC 1994).

** No PEL derived.

†† Values are expressed as toxic equivalency (TEQ) units, based on WHO 1998 TEF values for fish.

†† Expressed as a TEQ basis using NP TEF; assumes 1% TOC.

§§ Provisional; use of equilibrium partitioning approach.

References

- CCME (Canadian Council of Ministers of the Environment) 1995. Protocol for the derivation of Canadian sediment quality guidelines for the protection of aquatic life. CCME EPC-98E. Prepared by Environment Canada, Guidelines Division, Technical Secretariat of the CCME Task Group on Water Quality Guidelines, Ottawa. [Reprinted in Canadian environmental quality guidelines, Chapter 6, Canadian Council of Ministers of the Environment, 1999, Winnipeg.]
- NYSDEC (New York State Department of Environmental Conservation). 1994. Technical guidance for screening contaminated sediments. Prepared by the Division of Fish and Wildlife and the Division of Marine Resources. November 22, 1993. New York.
- Persaud, D., R. Jaagumagi, and A. Hayton. 1993. Guidelines for the protection and management of aquatic sediment quality in Ontario. Ontario Ministry of the Environment, Water Resources Branch, Toronto.

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Canadian Council of Ministers of the Environment. 2002. Canadian sediment quality guidelines for the protection of aquatic life: Summary tables. Updated. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg.

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