

Atlantic RBCA - Ecological Tier II Pathway-Specific Standards (PSS) for Sediment - Freshwater and Marine (mg/kg)

Media		Sediment					
Pathway		Freshwater Sediment			Marine Sediment		
Parameter	Units	Value	Comments	Reference	Value	Comments	Reference
Inorganic Parameters							
Aluminum	mg/kg	-			-		
Antimony	mg/kg	25	Recommended SQG-high value	Simpson et al., 2013	25	Recommended SQG-high value	Simpson et al., 2013
Arsenic	mg/kg	17	PEL	CCME	41.6	PEL	CCME
Barium	mg/kg	-			130	Based on TEL; no PEL or similar values identified	Buchman, 2008
Beryllium	mg/kg	-			-		
Boron (Total)	mg/kg	-			-		
Cadmium	mg/kg	3.5	PEL	CCME	4.2	PEL	CCME
Chromium (hexavalent)	mg/kg	-			-		
Chromium (total)	mg/kg	90	PEL	CCME	160	PEL	CCME
Cobalt	mg/kg	-			-		
Copper	mg/kg	197	PEL	CCME	108	PEL	CCME
Cyanide	mg/kg	-			-		
Iron	mg/kg	43,766	upper SWQG; Working sediment quality guidelines	BCMOE, 2017	-		
Lead	mg/kg	91.3	PEL	CCME	112	PEL	CCME
Manganese	mg/kg	1100	upper SWQG; Working sediment quality guidelines	BCMOE, 2017	-		
Mercury (total)	mg/kg	0.486	PEL	CCME	0.7		CCME
Molybdenum	mg/kg	-			-		
Nickel	mg/kg	75	upper SWQG; Working sediment quality guidelines	BCMOE, 2017	50	upper SWQG; Working sediment quality guidelines	BCMOE, 2017
Selenium	mg/kg	2	Alert concentration	BC MOE, 2014	2	Alert concentration	BCMOE, 2014
Silver	mg/kg	0.5	lower SWQG (upper SWQG not available); Working sediment quality guidelines	BCMOE, 2017	2.2	upper SWQG; Working sediment quality guidelines	BCMOE, 2017
Strontium	mg/kg	-			-		
Thallium	mg/kg	-			-		
Tin	mg/kg	-			48	Based on TEL; no PEL or similar values identified	Buchman, 2008
Uranium	mg/kg	-			-		
Vanadium	mg/kg	-			-		
Zinc	mg/kg	315	PEL	CCME	271	PEL	CCME
General Chemistry Parameters							
Chloride	mg/kg	-			-		
Sodium	mg/kg	-			-		
Petroleum Hydrocarbon (PHC) Parameters							
Benzene	mg/kg	1.2	Chronic benchmark - narcosis-based (HC ₅)@ 1% organic carbon; EqP approach; typical sediment type	ARBCA, 2021	1.2	Chronic benchmark - narcosis-based (HC ₅)@ 1% organic carbon; EqP approach; typical sediment type	ARBCA, 2021
Toluene	mg/kg	1.4	Chronic benchmark - narcosis-based (HC ₅)@ 1% organic carbon; EqP approach; typical sediment type	ARBCA, 2021	1.4	Chronic benchmark - narcosis-based (HC ₅)@ 1% organic carbon; EqP approach; typical sediment type	ARBCA, 2021
Ethylbenzene	mg/kg	1.2	Chronic benchmark - narcosis-based (HC ₅)@ 1% organic carbon; EqP approach; typical sediment type	ARBCA, 2021	1.2	Chronic benchmark - narcosis-based (HC ₅)@ 1% organic carbon; EqP approach; typical sediment type	ARBCA, 2021
Xylene	mg/kg	1.3	Chronic benchmark - narcosis-based (HC ₅)@ 1% organic carbon; EqP approach; typical sediment type	ARBCA, 2021	1.3	Chronic benchmark - narcosis-based (HC ₅)@ 1% organic carbon; EqP approach; typical sediment type	ARBCA, 2021
Modified TPH (Gas)	mg/kg	15	Chronic benchmark - narcosis-based (HC ₅)@ 1% organic carbon; EqP approach; typical sediment type	ARBCA, 2021	15	Chronic benchmark - narcosis-based (HC ₅)@ 1% organic carbon; EqP approach; typical sediment type	ARBCA, 2021
Modified TPH (Fuel)	mg/kg	25	Chronic benchmark - narcosis-based (HC ₅)@ 1% organic carbon; EqP approach; typical sediment type	ARBCA, 2021	25	Chronic benchmark - narcosis-based (HC ₅)@ 1% organic carbon; EqP approach; typical sediment type	ARBCA, 2021

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Modified TPH (Lube)	mg/kg	43	Chronic benchmark - narcosis-based (HC ₅)@ 1% organic carbon; EqP approach; typical sediment type	ARBCA, 2021	43	Chronic benchmark - narcosis-based (HC ₅)@ 1% organic carbon; EqP approach; typical sediment type	ARBCA, 2021
MTBE	mg/kg	-			-		
Total TPH	mg/kg	500	Maximum Limit	ARBCA, 2021	500	Maximum Limit	ARBCA, 2021
Polycyclic Aromatic Hydrocarbons (PAH) Parameters							
Naphthalene	mg/kg	0.391	PEL	CCME	0.391	PEL	CCME
1 - Methyl naphthalene	mg/kg	0.201	PEL; assumed equal toxic potency as 2-methyl isomer	CCME	0.201	PEL; assumed equal toxic potency as 2-methyl isomer	CCME
2 - Methyl naphthalene	mg/kg	0.201	PEL	CCME	0.201	PEL	CCME
Acenaphthene	mg/kg	0.0889	PEL	CCME	0.0889	PEL	CCME
Acenaphthylene	mg/kg	0.128	PEL	CCME	0.128	PEL	CCME
Anthracene	mg/kg	0.245	PEL	CCME	0.245	PEL	CCME
Fluoranthene	mg/kg	2.355	PEL	CCME	1.494	PEL	CCME
Fluorene	mg/kg	0.144	PEL	CCME	0.144	PEL	CCME
Phenanthrene	mg/kg	0.515	PEL	CCME	0.544	PEL	CCME
Pyrene	mg/kg	0.875	PEL	CCME	1.398	PEL	CCME
Benz[a]anthracene	mg/kg	0.385	PEL	CCME	0.693	PEL	CCME
Benzo[a]pyrene	mg/kg	0.782	PEL	CCME	0.763	PEL	CCME
Benzo[b,j,k]fluoranthene isomers	mg/kg	13.4	upper SWQG for 'k' isomer; Working sediment quality guidelines	BCMOE, 2017	4.5	upper SWQG for all isomers @ 1% organic carbon; Working sediment quality guidelines	BCMOE, 2017
Benzo[g,h,i]perylene	mg/kg	0.32	upper SWQG @ 1% organic carbon; Working sediment quality guidelines	BCMOE, 2017	0.78	upper SWQG @ 1% organic carbon; Working sediment quality guidelines	BCMOE, 2017
Chrysene	mg/kg	0.862	PEL	CCME	0.846	PEL	CCME
Dibenz[a,h]anthracene	mg/kg	0.135	PEL	CCME	0.135	PEL	CCME
Indeno[1,2,3-c,d]pyrene	mg/kg	3.2	upper SWQG @ 1% organic carbon; Working sediment quality guidelines	BCMOE, 2017	0.88	upper SWQG @ 1% organic carbon; Working sediment quality guidelines	BCMOE, 2017
Volatile Organic Compound (VOC) Parameters							
Bromodichloromethane	mg/kg	-			-		
Bromoform	mg/kg	0.65	Lower of ESB based on conventional and narcosis approaches; normalized to 1% TOC	USEPA, 2008	-		
Bromomethane	mg/kg	-			-		
Carbon Tetrachloride (Tetrachloromethane)	mg/kg	1.2	Lower of ESB based on conventional and narcosis approaches; normalized to 1% TOC	USEPA, 2008	-		
Chlorobenzene	mg/kg	0.41	Lower of ESB based on conventional and narcosis approaches; normalized to 1% TOC	USEPA, 2008	-		
Chloroethane	mg/kg	-			-		
Chloroform	mg/kg	-			-		
Chloromethane	mg/kg	-			-		
Dibromochloromethane	mg/kg	-			-		
1,2-Dichlorobenzene	mg/kg	0.33	Lower of ESB based on conventional and narcosis approaches; normalized to 1% TOC	USEPA, 2008	0.023	lower SWQG (upper SWQG not available) @ 1% organic carbon; Working sediment quality guidelines	BCMOE, 2017
1,3-Dichlorobenzene	mg/kg	1.7	Lower of ESB based on conventional and narcosis approaches; normalized to 1% TOC	USEPA, 2008	-		
1,4-Dichlorobenzene	mg/kg	0.34	Lower of ESB based on conventional and narcosis approaches; normalized to 1% TOC	USEPA, 2008	0.09	upper SWQG @ 1% organic carbon; Working sediment quality guidelines	BCMOE, 2017
1,1-Dichloroethane	mg/kg	-			-		
1,2-Dichloroethane	mg/kg	-			-		
1,1-Dichloroethylene	mg/kg	-			-		
cis-1,2-Dichloroethylene	mg/kg	-			-		
trans-1,2-Dichloroethylene	mg/kg	-			-		
1,2-Dichloropropane	mg/kg	-			-		
1,3-Dichloropropene	mg/kg	-			-		
Ethylene Dibromide	mg/kg	-			-		
Methylene Chloride (Dichloromethane)	mg/kg	-			-		

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Parameter	Units	Value	Comments	Reference	Value	Comments	Reference
Styrene	mg/kg	-			-		
1,1,1,2-Tetrachloroethane	mg/kg	-			-		
1,1,2,2-Tetrachloroethane	mg/kg	1.4	Lower of ESB based on conventional and narcosis approaches; normalized to 1% TOC	USEPA, 2008	-		
Tetrachloroethylene	mg/kg	0.41	Lower of ESB based on conventional and narcosis approaches; normalized to 1% TOC	USEPA, 2008	-		
1,1,1-Trichloroethane	mg/kg	0.03	Lower of ESB based on conventional and narcosis approaches; normalized to 1% TOC	USEPA, 2008	-		
1,1,2-Trichloroethane	mg/kg	-			-		
Trichloroethylene	mg/kg	0.22	Lower of ESB based on conventional and narcosis approaches; normalized to 1% TOC	USEPA, 2008	-		
Vinyl Chloride	mg/kg	-			-		
Pesticides							
Aldicarb	mg/kg	-			-		
Aldrin	mg/kg	0.08	upper SWQG @ 1% organic carbon; Working sediment quality guidelines	BCMOE, 2017	0.005	lower SWQG (upper SWQG not available) @ 1% organic carbon; Working sediment quality guidelines	BCMOE, 2017
Atrazine	mg/kg	-			-		
Azinphos-methyl	mg/kg	-			-		
Bendiocarb	mg/kg	-			-		
Bromoxynil	mg/kg	-			-		
Carbaryl	mg/kg	-			-		
Carbofuran	mg/kg	-			-		
Chlorothalonil	mg/kg	-			-		
Chlorpyrifos	mg/kg	-			-		
Cyanazine	mg/kg	-			-		
2,4-D	mg/kg	-			-		
DDT	mg/kg	0.00477	PEL	CCME	0.00477	PEL	CCME
Diazinon	mg/kg	0.0074	Lower of ESB based on conventional and narcosis approaches; normalized to 1% TOC	USEPA, 2008	-		
Dicamba	mg/kg	-			-		
Dichlorop-methyl	mg/kg	-			-		
Dieldrin	mg/kg	0.00667	PEL	CCME	0.0043	PEL	CCME
Dimethoate	mg/kg	-			-		
Dinoseb	mg/kg	-			-		
Diquat	mg/kg	-			-		
Diuron	mg/kg	-			-		
Endosulfan	mg/kg	0.006	Lower of ESB for mixed isomers based on conventional and narcosis approaches; normalized to 1% TOC	USEPA, 2008	-		
Endrin	mg/kg	0.0624	PEL	CCME	0.0624	PEL	CCME
Glyphosate	mg/kg	-			-		
Heptachlor	mg/kg	0.00274	PEL for heptachlor epoxide	CCME	0.00274	PEL for heptachlor epoxide	CCME
Lindane*	mg/kg	0.00138	PEL	CCME	0.00099	PEL	CCME
Linuron	mg/kg	-			-		
Malathion*	mg/kg	0.00067	Lower of ESB based on conventional and narcosis approaches; normalized to 1% TOC	USEPA, 2008	-		
MCPA	mg/kg	-			-		
Methoxychlor	mg/kg	0.019	Lower of ESB based on conventional and narcosis approaches; normalized to 1% TOC	USEPA, 2008	-		
Metolachlor	mg/kg	-			-		
Metribuzin	mg/kg	-			-		
Paraquat	mg/kg	-			-		
Parathion	mg/kg	-			-		
Phorate	mg/kg	-			-		
Picloram	mg/kg	-			-		

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Media		Sediment					
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Parameter	Units	Value	Comments	Reference	Value	Comments	Reference
Simazine	mg/kg	-			-		
Tebuthiuron	mg/kg	-			-		
Terbufos	mg/kg	-			-		
Toxaphene*	mg/kg	0.0001	ISQG, no PEL exists	CCME	0.0001	ISQG, no PEL exists	CCME
Triallate	mg/kg	-			-		
Trifluralin	mg/kg	-			-		
PFAS Substances							
Perfluorooctane sulfonate (PFOS)	mg/kg	-			-		
Perfluorooctanoic acid (PFOA)	mg/kg	-			-		
Perfluorobutanoate (PFBA)	mg/kg	-			-		
Perfluorobutanesulfonate (PFBS)	mg/kg	-			-		
Perfluorohexanesulfonate (PFHxS)	mg/kg	-			-		
Perfluoropentanoate (PFPeA)	mg/kg	-			-		
Perfluorohexanoate (PFHxA)	mg/kg	-			-		
Perfluoroheptanoate (PFHpA)	mg/kg	-			-		
Perfluorononanoate (PFNA)	mg/kg	-			-		
Other Parameters							
Polychlorinated Biphenyls (Total PCBs)	mg/kg	0.277	PEL	CCME	0.189	PEL	CCME
Dioxins and Furans (TEQ) ^a	ng TEQ/kg	21.5	PEL	CCME	21.5	PEL	CCME
Pentachlorophenol (PCP)	mg/kg	0.4	Sensitive use freshwater standard	BCMOECCS CSR Schedule 3.4	0.36	Sensitive use marine/estuarine standard	BCMOECCS CSR Schedule 3.4
Organotins - Tributyltin	mg/kg	0.07	Recommended SQG-high value @ 1% TOC	Simpson et al., 2013	0.07	Recommended SQG-high value @ 1% TOC	Simpson et al., 2013
Ethylene Glycol	mg/kg	-			-		
Propylene Glycol	mg/kg	-			-		
Phenol	mg/kg	-			0.42	Marine sediment quality standard	Washington DOE, 2013

Notes:

All values expressed in mg/kg (dry weight bulk sediment concentration), unless otherwise noted.

"-" indicates no guideline available.

* indicates that the benchmark value is below currently achievable analytical RDLs. For sites with potential sediment contamination in relation to this substance, additional sediment assessment and/or consultation with provincial regulators should occur to confirm this substance is not likely to be present at levels that could adversely affect sediment biota.

a. Dioxin and Furan TEQ is to be calculated following the approach presented in CCME (2001).

For any values adopted from BCMOECCS CSR Schedule 3.4, the values are for a "typical" site, rather than a "sensitive" site.

For those organic parameters where partitioning to sediment organic carbon (OC) was considered in the guideline derivation process by the source agency, a default sediment OC content of 1% was assumed (i.e., Foc = 0.01). Such guideline values may be adjustable as a function of sediment OC content. The original sediment quality guideline derivation documentation should be consulted to verify the appropriateness of this adjustment (not all sediment quality guidelines for organics are adjustable on the basis of sediment OC), and the appropriate method by which to make such an adjustment, as well as any limits placed by the source agency on such adjustments.

References for Sediment Quality Guideline Sources:

Atlantic PIRI. 2021. Atlantic RBCA (Risk-Based Corrective Action) for Impacted Sites in Atlantic Canada. Version 4. User Guidance.

Canadian Council of Ministers of the Environment (CCME); <http://ceqg-rceq.ccmec.ca/en/index.html>.

Canadian Council of Ministers of the Environment (CCME). 2001. Canadian sediment quality guidelines for the protection of aquatic life: Polychlorinated dioxins and furans (PCDD/Fs). In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg.

BCMOE. 2017. https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/bc_env_working_water_quality_guidelines.pdf.

BCMOE. Schedule 3.4. Generic Numerical Sediment Standards. http://www.bclaws.ca/civix/document/id/complete/statreg/375_96_10.

BCMOE. 2014. Ambient Water Quality Guidelines for Selenium. Technical Report. Update. April, 2014. Water Protection and Sustainability Branch, Environmental Sustainability and Strategic Policy Division, British Columbia Ministry of Environment.

Buchman, M.F. 2008. NOAA Screening Quick Reference Table, NOAA OR&R Report 08-1, Seattle, WA. Office of Response and Restoration Division, National Oceanic and Atmospheric Administration. 34 pp.

NYSDEC. 2014. Screening and Assessment of Contaminated Sediment. New York State Department of Environmental Conservation, Division of Fish, Wildlife and Marine Resources, Bureau of Habitat. June 24, 2014.

Simpson S.L., Batley, G.B. and Chariton, A.A. 2013. Revision of the ANZECC/ARMCANZ Sediment Quality Guidelines. CSIRO Land and Water Science Report 08/07. CSIRO Land and Water.

U.S. EPA. 2008. Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: Compendium of Tier 2 Values for Nonionic Organics. EPA/600/R-02/016. PB2008-107282. March, 2008.

Washington Department of Ecology (DOE). 2013. Sediment Management Standards. Chapter 173-204 WAC. Revised February 2013, Effective September 2013. Publication no. 13-09-055.