

**Chapter 584: Surface Water Quality Criteria for Toxic Pollutants**

**SUMMARY:** This rule establishes ambient water quality criteria for toxic pollutants in the surface waters of the State. The rule also sets forth procedures that may be used to determine alternative statewide criteria or site-specific criteria adopted as part of a licensing proceeding.

1. **Criteria and Applicability.** The ambient water quality criteria established by this rule are applicable to all surface waters of the State. These criteria are intended to prevent the occurrence of toxic pollutants in toxic amounts as prohibited by both the US Clean Water Act and State law and protect aquatic life and human health. Aquatic life criteria are intended to assure that toxic pollutants are not present in concentrations or amounts that would cause acute and or chronic adverse impacts on organisms in, on or using the surface waters. Human health criteria are intended to assure that toxic pollutants are not present in concentrations or amounts that would cause adverse impact to persons who eat organisms or drink water taken from the surface waters. In the case of marine waters the consumption of water will not be considered for application of human health criteria.
2. **Narrative Water Quality Criteria.** Except as naturally occurs, surface waters must be free of pollutants in concentrations which impart toxicity and cause those waters to be unsuitable for the existing and designated uses of the water body.
3. **Numerical Water Quality Criteria**

**A. Statewide Criteria**

- (1) **Statewide Criteria for toxic pollutants with national water criteria.** Except as naturally occur, levels of toxic pollutants in surface waters must not exceed federal water quality criteria as established by USEPA, pursuant to Section 304(a) of the Clean Water Act, or alternative criteria established below.

Statewide criteria are contained in Appendix A of this rule.

- (2) **Alternative Statewide Criteria.** Alternative statewide criteria must be adopted through rulemaking. Alternative statewide criteria must be based on sound scientific rationale and be as protective as EPA's water quality criteria. Such criteria must also be protective of the most sensitive designated and existing uses of the water body, including, but not limited to, habitat for fish and other aquatic life, human consumption of fish and drinking water supply after treatment. A proposal for alternative statewide criteria must be initiated in accordance with petition for rulemaking provisions of the State Administrative Procedures Act, 5 M.R.S., Section 8055, and include a thorough literature search of the properties of the toxicant, including but not limited to its toxicity, carcinogenicity, teratogenicity, mutagenicity, bioaccumulation/bioconcentration, and regulation by other states or foreign countries. Any such proposal must also take into consideration, at a minimum, the following:
  - (a) **Aquatic Life Criteria.** Physical, chemical or biological conditions found in Maine waters that differ from the information used as the basis for national criteria from the USEPA. When toxicity testing is to be done, the procedures in 3(B)(1) will be used. Ambient data must be collected in general conformance with Chapter 530, section 4(D) and have sufficient geographic distribution to reflect variation of the

characteristics in question. Where discharges may affect the factors used to determine water quality criteria, significant sources representative of the pollutant, characteristics and geographic distribution will be evaluated as part of a proposal.

- (b) **Human Health Criteria.** Changes to statewide criteria for the protection of human health must be supported by information following the general methods and considerations specified by USEPA in "Revisions to the Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000)," EPA-822-B-00-004, USEPA, Office of Science and Technology, Washington, D.C., 65 Federal Register No. 214, pp. 66443-66482, November 3, 2000. The Department shall consider this information and information provided by the Department of Human Services.

The Department may request additional materials and shall consider all relevant information when determining whether to adopt alternative statewide criteria.

- (3) **Statewide criteria for toxic pollutants lacking national criteria.** The requirements of section 3(A)(2) also apply to the adoption of criteria for toxic pollutants not having water quality criteria established by USEPA, pursuant to Section 304(a) of the Clean Water Act.

- B. Site-Specific Criteria.** Site-specific numerical criteria for a toxic substance reflecting specific circumstances different from those used in, or not considered in the derivation of the statewide criteria, or for toxic pollutants lacking national criteria, must be adopted by the Department only as part of a waste discharge license proceeding, pursuant to 38 MRS Sections 413, 414, and 414-A. Site-specific criteria must be based on sound scientific rationale, be as protective as federal water quality criteria and must be protective of the most sensitive designated and existing uses of the water body, including, but not limited to, habitat for fish and other aquatic life, human consumption of fish and drinking water supply after treatment.

Where the Department finds a request for site-specific criteria may affect other sources discharging to the same waterway, it may, pursuant to 38 MRS, Section 414-A(5)(A), reopen for modification those licenses for consideration in the same proceeding. The information necessary to ensure that criteria are adequately evaluated must be submitted by a person requesting alternative criteria. The adequacy of this information shall be determined by the Department and may include, among other things, a literature search, user surveys and consumption rate calculations. A literature search of the properties of toxicants includes, but is not limited to, its toxicity, carcinogenicity, teratogenicity, mutagenicity, bioaccumulation/bioconcentration, and regulation by other states or foreign countries. Requests must provide information identifying specific uses of the water body in question, and any other relevant site-specific circumstance or information different from those used, or any not considered, in the derivation of the statewide criteria. Relevant information includes such things as sensitive or unique physical, chemical or biological conditions of the waterbody, rare or significant plant or wildlife communities and habitats located in the water body, or human populations having distinct uses or needs with regard to the water body.

Any request to the Department to establish site-specific criteria must also include, at a minimum, the following. A plan of study must be submitted to the Department for review and approval prior to the beginning of the studies, and may include the consideration of existing relevant scientific information as well as proposals for site-specific investigations.

Note: Site specific criteria have been adopted for copper, cadmium, and aluminum in freshwater sections of the Androscoggin River, for copper in the Little Androscoggin River and for aluminum, cadmium, copper, lead, and zinc in the St. Croix River. Please see footnotes in Appendix A for applicability.

**(1) Aquatic Life Criteria**

- (a) Minimum requirements include toxicity tests conducted generally according to the USEPA Water Quality Standards Handbook: Second Edition, EPA-823-B-94-005-a, USEPA, Office of Water, Washington, DC, August, 1994, and applicable Water-effect Ratio Guidance or other guidance for development of site specific criteria approved by the Department.
  - (b) For complex effluents with more than one potentially toxic pollutant, both dilution waters (receiving water and laboratory water) must be spiked with all pollutants present in the effluent in significant amounts, except the pollutant of interest, or the whole effluent at levels representative of the calculated receiving water concentrations at the appropriate design flow. Pollutants present in significant amounts relative to toxic levels must be determined by means of periodic testing within two years of submitting the plan of study to the Department. The pollutant of interest must be added at various concentrations bracketing the target concentration (the existing or anticipated criterion) to determine an appropriate site-specific criterion. This procedure must be repeated for each pollutant for which site-specific criteria are to be proposed.
  - (c) For discharges to freshwater, the water flea (*Ceriodaphnia dubia*) reproductive and survival test, and the brook trout (*Salvelinus fontinalis*), or other salmonid approved by the Department, survival and growth tests must be conducted. For discharges to marine waters, Mysid shrimp (*Americamysis bahia*) survival test, and the sea urchin (*Arbacia punctulata*) fertilization test must be conducted.
  - (d) Results should be based on measured concentrations.
  - (e) For heavy metal tests, the metal must be added in the form of inorganic salts of relatively high solubility, such as nitrate salts or in some cases, chloride or sulfate salts.
  - (f) Sufficient testing must be conducted to properly characterize seasonal variations and the water quality criteria of concern. Receiving water and effluent sampling must be representative of expected conditions and exclude periods of floods, storm events and abnormal operation of the discharge source.
- (2) Human Health Criteria.** Persons requesting site specific criteria for the protection of human health must provide information following the general methods and considerations specified by USEPA in "Revisions to the Methodology for Deriving

Ambient Water Quality Criteria for the Protection of Human Health (2000)," EPA-822-B-00-004, USEPA, Office of Science and Technology, Washington, D.C., 65 Federal Register No. 214, pp. 66443-66482, November 3, 2000. The Department shall consider this information and information provided by the Department of Human Services. In determining if site specific criteria are appropriate, the Department shall first evaluate whether there is an identifiable population(s) using a water body whose use(s) is distinct from that of the population considered when establishing the statewide criteria. If the Department identifies such a population, it shall consider activities or customs that would constitute a use of the water body substantially different in type or extent than that upon which statewide criteria are based. The Department shall consider, among other things, the following:

- (a) Studies designed and implemented to provide accurate information regarding the fact and extent of specific human activities that create a potential exposure to toxics in the water body, including such things as the rate of consumption of organisms, use of a water body as a drinking water supply, recreation in and on the water, and other specific uses of the water body established by local cultural or commercial practices;
  - (b) The importance of organisms affected by a toxic substance, taking into consideration their places in the food chain and the degree to which they are used or consumed by humans;
  - (c) Scientific evidence typically relied upon by experts in the field of toxicology showing the potential effect of a toxic substance in the discharge that is the subject of the licensing, on human health, given a particular established use of the water body; and
  - (d) Unique characteristics of the water body or organisms depending on it that effect exposure of humans to toxics in the water body.
4. **Risk levels.** For any pollutant believed to be carcinogenic, a risk level that would result, at most, in one additional cancer per one million people (risk of  $1 \times 10^{-6}$ ) exposed to the carcinogen must be used in determining the human health criterion. Notwithstanding the above, the Department shall utilize a  $10^{-4}$  risk level when calculating ambient water quality criteria for inorganic arsenic.
5. The following assumptions have been used to determine the statewide criteria contained in Appendix A of this rule.

**A. Form of metals.** All metals criteria must be considered as total metal.

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NOTE: Persons may request that the Department express criteria for metals as the dissolved form by submitting the appropriate information to allow recalculation of relative toxicity using conversion factors and translator procedures published by EPA: "The Metals Translator: Guidance for Calculating a Total Recoverable Permit Limit from a Dissolved Criterion", EPA 823-B-96-007, USEPA, Office of Water, Washington, DC, June 1996.

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**B. Ambient water physical characteristics.** Fresh water quality must be calculated using a pH of 7.0, a temperature of 25 degrees Celsius, and a hardness of 20 mg/L. Marine water quality must be calculated using a pH of 8.0, a temperature of 20 degrees Celsius, and a salinity of 30

parts per thousand. Estuarine water quality must be calculated using a pH of 8.0, a temperature of 20 degrees Celsius and a salinity of 20 parts per thousand.

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NOTE: These characteristics, however, may vary depending on the location of the discharge. The relative criteria for a pollutant subject to these considerations may be recalculated in any given licensing proceeding using the actual local ambient physical water characteristics. See Chapter 530.

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- C. Human health assumptions.** In accordance with Human Health Ambient Water Quality Criteria: 2015 Update. EPA 820-F-15-001 (see Table I Footnote qq for a list of pollutants that were not included in this update due to ongoing research), human health criteria are determined assuming consumption of 2.4 Liters of water by a person weighing 80 kg, and a fish consumption rate of 32.4 grams per day. Notwithstanding the above, when calculating human health criteria for inorganic arsenic (which is governed by 38 M.R.S. § 420(2)(J)), the Department shall utilize a state-wide fish consumption rate of 138 grams per day. It is also noted that inorganic arsenic was not included in the 2015 EPA Human Health Ambient Water Quality Criteria document and therefore its criteria is calculated using 2 Liters of water and 70 kg for drinking water intake and body weight, respectively.

In waters subject to a designated use of sustenance fishing, human health criteria will be determined assuming consumption of 2.4 Liters of water by a person weighing 80 kg, and a fish consumption rate of 200 grams per day, except for those parameters that did not change with EPA's criteria recommendations referenced in EPA 820-F-15-001 for which the human health criteria will be determined assuming consumption of 2 Liters of water by a person weighing 70 kg, a fish consumption rate of 200 grams per day, and a cancer risk level of one in 1,000,000 (except for the cancer risk level for inorganic arsenic, which is governed by 38 M.R.S. § 420 (2)(J)). Waters subject to a designated use of sustenance fishing are specified under 38 M.R.S. § 465-A(1)(D), 38 M.R.S. § 467(7)(A)(B)(D), 38 M.R.S. § 467(13), 38 M.R.S. § 467 (15)(C), 38 M.R.S. § 467(15)(A)(E)(F), 38 M.R.S. § 468(8), 38 M.R.S. § 469(7).

AUTHORITY: 38 MRS Sections 341-H, 420, and 464(5)  
 EFFECTIVE DATE: October 9, 2005 (filing 2005-402, 06-096 Chapter 530.5 repealed and replaced by this rule and Chapter 530)  
 EFFECTIVE DATE: July 29, 2012 – filing 2012-211

**Chapter 584. Appendix A.** Statewide criteria for toxic pollutants with national water quality criteria for Priority Pollutants and non Priority Pollutants. "FR Cite/Source" refers to the EPA publication from which the criteria are derived. The "Gold Book" is Quality Criteria for Water: 1986. EPA 440/5-86-001.

**1. Table I. Criteria for Priority Pollutant listed pursuant to 304(a) of the Clean Water Act.** See also the footnotes following this table.

Priority Pollutant	CAS Number	Freshwater		Saltwater		Human Health For Consumption of:		Sustenance Fishing Waters Human Health For Consumption of:		FR Cite/Source
		CMC (µg/L)	CCC (µg/L)	CMC (µg/L)	CCC (µg/L)	Water and Organisms (ug/L)	Organisms Only (ug/L)	Water and Organisms (ug/L)	Organisms Only (ug/L)	
Antimony	7440360					5.5 B, qq	350 B, qq	5 B, qq	56 B, qq	65FR66443
Arsenic	7440382	340 A,K	150 A,K	69 A,bb	36 A,bb	1.3 M,S,aME, qq	3.7 M,S, aME, qq	1.1, qq, M,S	2.6 qq, M, S	65FR31682 57FR60848
Beryllium	7440417					Z, qq	qq	Z, qq	qq	65FR31682
Cadmium	7440439	0.40 E, mm	0.22 E, mm	33	7.9	Z, qq	qq	Z, qq	qq	81FR19176
Chromium III	16065831	483 E,K	23.1 E,K			Z Total, qq	qq	Z Total, qq	qq	EPA820/B-96-001 65FR31682
Chromium VI	18540299	16 K	11 K	1,108 bb	50 bb	Z Total, qq	qq	Z Total, qq	qq	65FR31682
Copper	7440508	3.07 E,K,cc, nn, oo	2.36 E,K,cc, nn, oo	5.78 cc,ff	3.73 cc,ff	1,300 U, qq	qq	1,300 U, qq	qq	65FR31682
Lead	7439921	10.52 E,bb,gg,rr	0.41 E,bb,gg,rr	221 bb	8.52 bb	Z		Z	Z	65FR31682
Mercury	7439976	See <i>Certain deposits and discharges prohibited</i> , 38 M.R.S. § 420 (1-B) and §413(11)								

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Nickel	7440020	120.2 E,K	13.4 E,K	75 bb	8.28 bb	400 B, qq	1,000 B, qq	123 B, qq	149 B, qq	65FR31682
Selenium	7782492	L,R	5.0	291 bb,dd	71 bb,dd	162 Z, qq	2,250, qq	118, qq	365, qq	62FR42160 65FR31682 65FR66443
Silver	7740224	0.23 G, E		2.24 G						65FR31682
Thallium	7440280					0.17, qq	0.25, qq	0.04 qq	0.04 qq	68FR75507
Zinc	7440666	30.6 E,K,ss	30.6 E,K	95 bb	86 bb	6,000 U, qq	14,000 U, qq	1,842 qq	2,234 qq	65FR31682 65FR66443
Cyanide	57125	22 K,Q	5.2 K,Q	1 Q,bb	1 Q,bb	4 qq	300 qq	4 qq	50 qq	80FR36986
Asbestos	1332214					7x10 <sup>6</sup> fibers/L I		7x10 <sup>6</sup> fibers/L I		57FR60848
2,3,7,8-TCDD Dioxin	1746016	Also see 38 M.R.S. § 420(2)				2.7E-9 J, qq	2.8E-9 J, qq	4.5E-10 J,qq	4.5E-10 J, qq	65FR66443
Acrolein	107028	3	3			3 qq	200 qq	3 qq	40 qq	74FR46587 80FR36986
Acrylonitrile	107131					0.061 qq	4.6 qq	0.057 qq	0.74 qq	65FR66443 80FR36986
Benzene	71432					0.57 qq	10 qq	0.45 qq	1.7 qq	IRIS 01/19/00 65FR66443 80FR36986

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Bromoform	75252					6.8 qq	77 qq	4.6 qq	12 qq	65FR66443 80FR36986
Carbon Tetrachloride	56235					0.4 qq	3 qq	0.2 qq	0.5 qq	65FR66443 80FR36986
Chlorobenzene	108907					100 qq	600 qq	50 qq	90 qq	68FR75507 80FR36986
Chlorodibromomethane	124481					0.79 qq	14 qq	0.61 qq	2.2 qq	65FR66443 80FR36986
Chloroethane	75003									
2-Chloroethylvinyl Ether	110758									
Chloroform	67663					60 qq	2000 qq	50 qq	200 qq	80FR36986
Dichlorobromomethane	75274					0.93 qq	18 qq	0.73 qq	2.9 qq	65FR66443 80FR36986
1,1-Dichloroethane	75343									
1,2-Dichloroethane	107062					9.9 qq	430 qq	8.8 qq	69 qq	65FR66443 80FR36986
1,1-Dichloroethylene	75354					300 qq	10000 qq	300 qq	2000 qq	80FR36986
1,2-Dichloropropane	78875					0.89 qq	20 qq	0.72 qq	3.3 qq	65FR66443 80FR36986
1,3-Dichloropropene	542756					0.26 qq	7.7 qq	0.22 qq	1.2 qq	80FR36986



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Ethylbenzene	100414					53 qq	83 qq	12 qq	13 qq	80FR36986
Methyl Bromide	74839					100 qq	8000 qq	100 qq	1000 qq	65FR66443 80FR36986
Methyl Chloride	74873									65FR31682
Methylene Chloride	75092					20 qq	800 qq	10 qq	100 qq	65FR66443 80FR36986
1,1,2,2-Tetrachloroethane	79345					0.2 qq	2 qq	0.1 qq	0.3 qq	65FR66443 80FR36986
Tetrachloroethylene	127184					8.6 qq	19 qq	2.6 qq	3.1 qq	65FR66443 80FR36986
Toluene	108883					54 qq	340 qq	30 qq	55 qq	80FR36986
1,2-Trans-Dichloroethylene	156605					100 qq	2000 qq	100 qq	400 qq	80FR36986
1,1,1-Trichloroethane	71556					Z	Z	Z	Z	65FR31682
1,1,2-Trichloroethane	79005					0.53 qq	5.8 qq	0.36 qq	0.95 qq	65FR66443 80FR36986
Trichloroethylene	79016					0.6 qq	4 qq	0.3 qq	0.7 qq	65FR66443 80FR36986
Vinyl Chloride	75014					0.022 qq	1.1 qq	0.02 qq	0.17 qq	80FR36986
2-Chlorophenol	95578					30 qq	500 qq	20 qq	90 qq	65FR66443 80FR36986

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2,4-Dichlorophenol	120832					10 qq	40 qq	5 qq	6 qq	65FR66443 80FR36986
2,4-Dimethylphenol	105679					100 qq	2000 qq	90 qq	300 qq	65FR66443 80FR36986
2-Methyl-4,6-Dinitrophenol	534521					2 qq	20 qq	1 qq	3 qq	65FR66443 80FR36986
2,4-Dinitrophenol	51285					10 qq	200 qq	10 qq	40 qq	65FR66443 80FR36986
2-Nitrophenol	88755									
4-Nitrophenol	100027									
3-Methyl-4-Chlorophenol	59507					500 qq	2000 qq	200 qq	300 qq	80FR36986
Pentachlorophenol	87865	8.72 F,K	6.69 F,K	13 bb	7.9 bb	0.02 qq	0.02 qq	0.004 qq	0.004 qq	65FR66443 65FR31682 80FR36986
Phenol	108952					4,000 U, qq	200,000 U, qq	4000 qq	30,000 qq	80FR36986
2,4,6-Trichlorophenol	88062					1.1 qq	1.8 qq	0.27 qq	0.3 qq	65FR66443 80FR36986

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Acenaphthene	83329					50 qq	60 qq	9 qq	9 qq	65FR66443 80FR36986
Acenaphthylene	208968									
Anthracene	120127					200 qq	200 qq	40 qq	40 qq	65FR66443 80FR36986
Benzidine	92875					0.00014 qq	0.0069 qq	0.00013 qq	0.0011 qq	65FR66443 80FR36986
Benzo(a)Anthracene	56553					0.00085 qq	0.00087 qq	0.00014 qq	0.00014 qq	65FR66443 80FR36986
Benzo(a)Pyrene	50328					0.000085 qq	0.000087 qq	0.000014 qq	0.000014	65FR66443 80FR36986
Benzo(b)Fluoranthene	205992					0.00085 qq	0.00087 qq	0.00014 qq	0.00014 qq	65FR66443 80FR36986
Benzo(ghi)Perylene	191242									
Benzo(k)Fluoranthene	207089					0.0085 qq	0.0087 qq	0.0014 qq	0.0014 qq	65FR66443 80FR36986
Bis2-ChloroethoxyMethane	111911									

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Bis2-ChloroethylEther	111444					0.03 qq	1.4 qq	0.027 qq	0.23 qq	65FR66443 80FR36986
Bis2-ChloroisopropylEther	108601					200 qq	2000 qq	200 qq	400 qq	65FR66443 80FR36986
Bis2-EthylhexylPhthalate <sup>x</sup>	117817					0.22 qq	0.25 qq	0.04 qq	0.04 qq	65FR66443 80FR36986
4-BromophenylPhenylEther	101553									
Butylbenzyl Phthalate <sup>w</sup>	85687					0.068 qq	0.068 qq	0.011 qq	0.011 qq	65FR66443 80FR36986
2-Chloronaphthalene	91587					600 qq	800 qq	100 qq	100 qq	65FR66443 80FR36986
4-ChlorophenylPhenylEther	7005723									
Chrysene	218019					0.085 qq	0.087 qq	0.014 qq	0.014 qq	65FR66443 80FR36986
Dibenzo(a,h)Anthracene	53703					0.000085 qq	0.000087 qq	0.000014 qq	0.000014 qq	65FR66443 80FR36986
1,2-Dichlorobenzene	95501					1000 qq	2000 qq	300 qq	400 qq	80FR36986

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1,3-Dichlorobenzene	541731					6 qq	9 qq	1 qq	2 qq	65FR31682 80FR36986
1,4-Dichlorobenzene	106467					300 qq	600 qq	80 qq	100 qq	80FR36986
3,3'-Dichlorobenzidine	91941					0.042 qq	0.097 qq	0.013 qq	0.016 qq	65FR66443 80FR36986
Diethyl Phthalate <sup>w</sup>	84662					400 qq	400 qq	70 qq	70 qq	65FR66443 80FR36986
Dimethyl Phthalate <sup>w</sup>	131113					1000 qq	1000 qq	200 qq	200 qq	65FR66443 80FR36986
Di-n-Butyl Phthalate <sup>w</sup>	84742					20 qq	20 qq	3 qq	3 qq	65FR66443 80FR36986
2,4-Dinitrotoluene	121142					0.048 qq	1.1 qq	0.039 qq	0.18 qq	65FR66443 80FR36986
2,6-Dinitrotoluene	606202									
Di-n-Octyl Phthalate	117840									
1,2-Diphenylhydrazine	122667					0.03 qq	0.1 qq	0.01 qq	0.02 qq	65FR66443 80FR36986

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Fluoranthene	206440					10 qq	10 qq	2 qq	2 qq	65FR66443 80FR36986
Fluorene	86737					40 qq	50 qq	7 qq	7 qq	65FR66443 80FR36986
Hexachlorobenzene	118741					0.000052 qq	0.000052 qq	0.0000084 qq	0.0000084 qq	65FR66443 80FR36986
Hexachlorobutadiene	87683					0.006 qq	0.006 qq	0.001 qq	0.001 qq	65FR66443 80FR36986
Hexachlorocyclopentadiene	77474					2 qq	3 qq	0.4 qq	0.4 qq	80FR36986
Hexachloroethane	67721					0.08 qq	0.09 qq	0.01 qq	0.01 qq	65FR66443 80FR36986
Indeno(1,2,3-cd)Pyrene	193395					0.00085 qq	0.00087 qq	0.00014 qq	0.00014 qq	65FR66443 80FR36986
Isophorone	78591					34 qq	1200 qq	30 qq	200 qq	65FR66443 80FR36986
Naphthalene	91203									
Nitrobenzene	98953					10 qq	400 qq	10 qq	60 qq	65FR66443 80FR36986

Priority Pollutant	CAS Number	Freshwater		Saltwater		Human Health For Consumption of:		Sustenance Fishing Waters Human Health For Consumption of:		FR Cite/ Source
		CMC (µg/L)	CCC (µg/L)	CMC (µg/L)	CCC (µg/L)	Water and Organisms (ug/L)	Organisms Only (ug/L)	Water and Organisms (ug/L)	Organisms Only (ug/L)	
N-Nitrosodimethylamine	62759					0.00069 B, qq	1.63 B, qq	0.00068 B, qq	0.26 B, qq	65FR66443
N-Nitrosodi-n-Propylamine	621647					0.005 B, qq	0.27 B, qq	0.004 B, qq	0.04 B, qq	65FR66443
N-Nitrosodiphenylamine	86306					2.23 B, qq	3.24 B, qq	0.49 B, qq	0.53 B, qq	65FR66443
Phenanthrene	85018									
Pyrene	129000					20 qq	20 qq	3 qq	3 qq	65FR66443 80FR36986
1,2,4-Trichlorobenzene	120821					0.048 qq	0.05 qq	0.008 qq	0.0081 qq	80FR36986
Aldrin	309002	3.0 G		1.3 G		0.00000051 qq	0.00000051 qq	0.000000082 qq	0.000000082 qq	65FR31682 65FR66443 80FR36986
alpha-BHC	319846					0.00024 qq	0.00026 qq	0.000041 qq	0.000041 qq	65FR66443 80FR36986
beta-BHC	319857					0.0062 qq	0.0093 qq	0.0014 qq	0.0015 qq	65FR66443 80FR36986
gamma-BHC (Lindane)	58899	0.95 K		0.16 G		2.8 qq	2.9 qq	0.47 qq	0.47 qq	80FR36986
delta-BHC	319868									

Priority Pollutant	CAS Number	Freshwater		Saltwater		Human Health For Consumption of:		Sustenance Fishing Waters Human Health For Consumption of:		FR Cite/ Source
		CMC (µg/L)	CCC (µg/L)	CMC (µg/L)	CCC (µg/L)	Water and Organisms (ug/L)	Organisms Only (ug/L)	Water and Organisms (ug/L)	Organisms Only (ug/L)	
Chlordane	57749	2.4 G	0.0043 G,aa	0.09 G	0.004 G, aa	0.00021 qq	0.00021 qq	0.000034 qq	0.000034 qq	65FR31682 65FR66443 80FR36986
4,4'-DDT	50293	1.1 G,ii	0.001 G,aa,ii	0.13 G,ii	0.001 G,aa,ii	0.00002 qq	0.00002 qq	0.0000032 qq	0.0000032 qq	65FR31682 65FR66443 80FR36986
4,4'-DDE	72559					0.000012 qq	0.000012 qq	0.0000019 qq	0.0000019 qq	65FR66443 80FR36986
4,4'-DDD	72548					0.000082 qq	0.000082 qq	0.000013 qq	0.000013 qq	65FR66443 80FR36986
Dieldrin	60571	0.24 K	0.056 K,O	0.71 G	0.0019 G,aa	0.00000082 qq	0.00000082 qq	0.00000013 qq	0.00000013 qq	65FR31682 65FR66443 80FR36986
alpha-Endosulfan	959988	0.22 G,Y	0.056 G,Y	0.034 G,Y	0.0087 G,Y	10 qq	20 qq	3 qq	3 qq	65FR31682 65FR66443 80FR36986
beta-Endosulfan	33213659	0.22 G,Y	0.056 G,Y	0.034 G,Y	0.0087 G,Y	20 qq	30 qq	4 qq	5 qq	65FR31682 65FR66443 80FR36986
Endosulfan Sulfate	1031078					20 qq	30 qq	4 qq	4 qq	65FR66443 80FR36986



Priority Pollutant	CAS Number	Freshwater		Saltwater		Human Health For Consumption of:		Sustenance Fishing Waters Human Health For Consumption of:		FR Cite/ Source
		CMC (µg/L)	CCC (µg/L)	CMC (µg/L)	CCC (µg/L)	Water and Organisms (ug/L)	Organisms Only (ug/L)	Water and Organisms (ug/L)	Organisms Only (ug/L)	
Endrin	72208	0.086 K	0.036 K,O	0.037 G	0.0023 G,aa	0.02 qq	0.02 qq	0.004 qq	0.004 qq	80FR36986
Endrin Aldehyde	7421934					0.7 qq	0.8 qq	0.1 qq	0.1 qq	65FR66443 80FR36986
Heptachlor	76448	0.52 G	0.0038 G,aa	0.053 G	0.0036 G,aa	0.0000039 qq	0.0000039 qq	0.00000063 qq	0.00000063 qq	65FR31682 65FR66443 80FR36986
Heptachlor Epoxide	1024573	0.52 G,V	0.0038 G,V,aa	0.053 G,V	0.0036 G,V,aa	0.000021 B, qq	0.000021 B, qq	0.0000034 qq	0.0000034 qq	65FR31682 65FR66443 80FR36986
Polychlorinated Biphenyls PCBs			0.014 N,aa		0.03 N,aa	0.000035 B,N, qq	0.000035 B,N, qq	0.0000056 B, N, qq	0.0000056 B, N, qq	65FR31682 65FR66443
Toxaphene	8001352	0.73	0.0002 aa	0.21	0.0002 aa	0.00046 qq	0.00047 qq	0.000076 qq	0.000076 qq	65FR31682 65FR66443 80FR36986

**Footnotes to Table I:**

- A. This recommended water quality criterion was derived from data for arsenic (III), but is applied here to total arsenic, which might imply that arsenic (III) and arsenic (V) are equally toxic to aquatic life and that their toxicities are additive. In the arsenic criteria document (EPA 440/5-84-033, January 1985), Species Mean Acute Values are given for both arsenic (III) and arsenic (V) for five species and the ratios of the SMAVs for each species range from 0.6 to 1.7. Chronic values are available for both arsenic (III) and arsenic (V) for one species; for the fathead minnow, the chronic value for arsenic (V) is 0.29 times the chronic value for arsenic (III). No data are known to be available concerning whether the toxicities of the forms of arsenic to aquatic organisms are additive.

- B. This criterion has been revised to reflect The Environmental Protection Agency's  $q_1^*$  or RfD, as contained in the Integrated Risk Information System (IRIS) as of May 17, 2002. The fish tissue bioconcentration factor (BCF) from the 1980 Ambient Water Quality Criteria document was retained in each case.
- E. The freshwater criterion for this metal is expressed as a function of hardness (mg/L) in the water column. The value given here corresponds to a hardness of 20 mg/L. Also see part 7 under "Additional Notes" after Table II.
- F. Freshwater aquatic life values for pentachlorophenol are expressed as a function of pH, and are calculated as follows:  $CMC = \exp(1.005(pH) - 4.869)$ ;  $CCC = \exp(1.005(pH) - 5.134)$ . Values displayed in table correspond to a pH of 7.0.
- G. This Criterion is based on 304(a) aquatic life criterion issued in 1980, and was issued in one of the following documents: Aldrin/Dieldrin (EPA 440/5-80-019), Chlordane (EPA 440/5-80-027), DDT (EPA 440/5-80-038), Endosulfan (EPA 440/5-80-046), Endrin (EPA 440/5-047), Heptachlor (440/580-052), Hexachlorocyclohexane (EPA 440/5-80-054), Silver (EPA 440/5-80-071). The Minimum Data Requirements and derivation procedures were different in the 1980 Guidelines than in the 1985 Guidelines. For example, a "CMC" derived using the 1980 Guidelines was derived to be used as an instantaneous maximum. If assessment is to be done using an averaging period, the values given should be divided by 2 to obtain a value that is more comparable to a CMC derived using the 1985 Guidelines.
- I. This criterion for asbestos is the Maximum Contaminant Level (MCL) developed under the Safe Drinking Water Act.
- J. These values are not applicable to bleach kraft pulp mills. See 38 M.R.S., section 420(2)(I).
- K. This recommended criterion is based on a 304(a) aquatic life criterion that was issued in the *1995 Updates: Water Quality Criteria Documents for the Protection of Aquatic Life in Ambient Water*, (EPA-820-B-96-001, September 1996). This value was derived using the GLI Guidelines (60FR15393-15399, March 23, 1995; 40CFR132 Appendix A); the difference between the 1985 Guidelines and the GLI Guidelines are explained on page iv of the 1995 Updates. None of the decisions concerning the derivation of this criterion were affected by any considerations that are specific to the Great Lakes.
- L. The  $CMC = 1 / [(f_1/CMC_1) + (f_2/CMC_2)]$  where  $f_1$  and  $f_2$  are the fractions of total selenium that are treated as selenite and selenate, respectively, and  $CMC_1$  and  $CMC_2$  are 185.9  $\mu\text{g/l}$  and 12.83  $\mu\text{g/l}$ , respectively.
- M. EPA is currently reassessing the criteria for arsenic.
- N. This criterion applies to total PCBs (e.g. the sum of all congener or all isomer or homolog or Aroclor analyses).
- O. The derivation of the CCC for this pollutant did not consider exposure through the diet, which is probably important for aquatic life occupying upper trophic levels.
- P. Although a new RfD is available in IRIS, the surface water criteria will not be revised until the National Primary Drinking Water Regulations: Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR) is completed, since public comment on the relative source contribution (RSC) for chloroform is anticipated.
- Q. This recommended water quality criterion is expressed as  $\mu\text{g}$  free cyanide (as CN)/L.
- R. This value for Selenium was announced (61FR58444-58449, November 14, 1996) as a proposed GLI 303(c) aquatic life criterion. EPA is currently working on this criterion and so this value might change substantially in the near future.
- S. This recommended water quality criterion refers to the inorganic form only.
- U. The organoleptic effect criterion is more stringent than the value for priority toxic pollutants. Also see Part 6.
- V. This value was derived from data for heptachlor and the criteria document provides insufficient data to estimate the relative toxicities of heptachlor and heptachlor epoxide.
- W. Although EPA has not published a final criteria document for this compound, it is EPA's understanding that sufficient data exist to allow calculation of aquatic criteria. It is anticipated that industry intends to publish in the peer reviewed literature draft aquatic life criteria generated in accordance with EPA Guidelines. EPA will review such criteria for possible issuance as national WQC.
- X. There is a full set of aquatic life toxicity data that show that BEHP is not toxic to aquatic organisms at or below its solubility limit.

- Y. This value was derived from data for endosulfan and is most appropriately applied to the sum of alpha- endosulfan and beta-endosulfan.
- Z. A more stringent MCL has been issued. Also see part 6 below.
- aa This criterion is based on a 304(a) aquatic life criterion issued in 1980 or 1986, and in one of the following documents: Aldrin/Dieldrin (EPA 440/5-80-019), Chlordane (EPA 440/5-80-027), DDT (EPA 440/5-80-038), Endrin (EPA 440/5-80-047), Heptachlor (EPA 440/5-80-052), Polychlorinated Biphenyls (EPA 440/5-80-019), Toxaphene (EPA 440/5-86-038). The CCC is currently based on the Final Residual Value (FRV) procedure. Since the publication of the Great Lakes Aquatic Criteria Guidelines in 1995 (60FR15393-15399, March 23, 1995), the Agency no longer uses the FRV procedure for deriving CCCs for new or revised 304(a) aquatic life criteria. Therefore, the Agency anticipates that future revisions of this CCC will not be based on the FRV procedure.
- bb This water quality criterion is based on a 304(a) aquatic life criterion that was derived using the 1985 Guidelines (*Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses*, PB85-227049, January 1985) and was issued in one of the following criteria documents: Arsenic (EPA 440/5-84-033), Chromium (EPA 440/5-84-029), Copper (EPA 440/5-84-031), Cyanide (EPA 440/5-84-028), Lead (EPA 440/5-84-027), Nickel (EPA 440/5-86-004), Pentachlorophenol (EPA 440/5-86-009), Toxaphene, (EPA 440/5-86-006), Zinc (EPA 440/5-87- 003).
- cc When the concentration of dissolved organic copper is elevated, copper is substantially less toxic and use of Water Effect Ratio might be appropriate.
- dd The selenium criteria document (EPA 440/5-87-006, September 1987) provides that if selenium is as toxic to saltwater fishes in the field as it is to freshwater fishes in the field, the status of the fish community should be monitored whenever the concentration of selenium exceeds 5.0 µg/L in saltwater because the saltwater CCC does not take into account uptake via the food chain.
- ff This recommended water quality criterion was derived in *Ambient Water Quality Criteria Saltwater Copper Addendum* (Draft, April 14, 1995) and was promulgated in the Interim final National Toxics Rule (60FR22228-22237, May 4, 1995).
- gg EPA is actively working on this criterion and so this recommended water quality criterion may change substantially in the near future.
- ii This criterion applies to DDT and its metabolites (i.e. the total concentration of DDT and its metabolites should not exceed this value).
- jj. This criterion is expressed as total cyanide, even though the IRIS 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 condition the 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 water body is present in a complex form (e.g.  $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3$ ), this recommended criterion may be over conservative.
- aME As noted in 06-096 CMR 584.4 and CMR 584.5.C, when calculating ambient water quality (human health) criteria for inorganic arsenic, a  $10^{-4}$  risk level and a state-wide consumption value of 138 grams of organisms per day shall be utilized. In waters subject to a designated use of sustenance fishing as specified under 38 MRS §465-A(1)(D), 38 MRS §467(7)(A)(B)(D), 38 MRS §467(13), 38 MRS §467 (15)(C), 38 MRS §467(15)(A)(E)(F), 38 MRS §468(8), 38 MRS §469(7), a fish consumption rate of 200 grams per day shall be used. Other values specific to inorganic arsenic shall include a bioconcentration factor of 26 L/kg, a cancer slope (potency) factor of 1.75 mg/kg/day, and an inorganic factor of 30%.
- mm. When calculating acute and chronic permit limits for the Androscoggin River, use a Water Effect Ratio (WER) of 1.3 for acute and 3.0 for chronic for cadmium. Rationale for the WERs is provided in *Androscoggin River Water Effect Ratios* (Integral Consulting Inc., April 13, 2015). WER is defined as an appropriate measure of the toxicity of a material obtained in on site water divided by the same measure of the toxicity of the same material obtained simultaneously in laboratory dilution water.

When calculating acute permit limits for the St. Croix River, use a Water Effect Ratio (WER) of 1.2 for acute for cadmium. Rationale for the WERs is provided in *St. Croix River Water-Effect Ratios* (Integral Consulting, Inc., July 2019). WER is defined as an appropriate measure of the toxicity of a material obtained in onsite water divided by the same measure of the toxicity of the same material obtained simultaneously in laboratory dilution water.

- nn. When calculating acute and chronic permit limits for the Androscoggin River, use a Water Effect Ratio (WER) of 2.5 for acute and 2.5 for chronic for copper. The final WER for chronic copper was determined to be 3.5, however, 2.5 is used to prevent the chronic criteria from exceeding the acute criteria. Rationale for the WERs is provided in *Androscoggin River Water Effect Ratios* (Integral Consulting Inc., April 13, 2015). WER is defined as an appropriate measure of the toxicity of a material obtained in on site water divided by the same measure of the toxicity of the same material obtained simultaneously in laboratory dilution water.
- When calculating acute permit limits for the St. Croix River, use a Water Effect Ratio (WER) of 3.0 for acute for copper. Rationale for the WERs is provided in *St. Croix River Water-Effect Ratios* (Integral Consulting, Inc., July 2019). WER is defined as an appropriate measure of the toxicity of a material obtained in onsite water divided by the same measure of the toxicity of the same material obtained simultaneously in laboratory dilution water.
- oo. When calculating acute and chronic permit limits for total copper in the Little Androscoggin River from the outfall of the Paris Utility District in Paris, to the confluence of the Little Androscoggin River with the main stem Androscoggin River in Auburn, the ambient water quality criteria (AWQC) for acute exposure must be 10.85 micrograms per liter ( $\mu\text{g/L}$ ) and the chronic AWQC must be 6.78  $\mu\text{g/L}$ . Rationale for the previously noted AWQCs is based on the Biotic Ligand Model (BLM) that is summarized in the Board of Environmental Protection (BEP) Final Order for the Paris Utility District dated November 20, 2014. As stated in the aforementioned Final Order “The copper BLM calculates metal toxicity to aquatic organisms as a function of simultaneous concentrations of chemical constituents in water that can either compete with copper and render it biologically unavailable, or compete with copper for binding sites at the point of entry into a vulnerable organism.”
- qq. Human Health Ambient Water Quality Criteria: 2015 Update. EPA 820-F-15-001. It should be noted that EPA used a fish consumption rate of 22 g/day to calculate their 2015 values, however the criteria listed here are calculated using a fish consumption rate of 32.4 g/day, generally, and 200 g/day for waters subject to a designated use of sustenance fishing. It should also be noted that antimony, arsenic, barium, beryllium, cadmium, chromium (III or VI), copper, manganese, nickel, nitrates, nitrosamines, N-nitrosodibutylamine, N-nitrosodiethylamine, N-nitrosodipyrrolidine, N-nitrosodimethylamine, N-nitrosodi-n-propylamine, N-nitrosodiphenylamine, polychlorinated biphenyls (PCBs), selenium, thallium, zinc, or 2,3,7,8-TCDD (dioxin) were not included in the 2015 EPA update due to ongoing research.
- rr. When calculating acute and chronic permit limits for the St. Croix River, use a Water Effect Ratio (WER) of 3.0 for acute and 4.8 for chronic for lead. Rationale for the WERs is provided in *St. Croix River Water-Effect Ratios* (Integral Consulting, Inc., July 2019). WER is defined as an appropriate measure of the toxicity of a material obtained in onsite water divided by the same measure of the toxicity of the same material obtained simultaneously in laboratory dilution water.
- ss. When calculating acute permit limits for the St. Croix River, use a Water Effect Ratio (WER) of 2.0 for acute for zinc. Rationale for the WERs is provided in *St. Croix River Water-Effect Ratios* (Integral Consulting, Inc., July 2019). WER is defined as an appropriate measure of the toxicity of a material obtained in onsite water divided by the same measure of the toxicity of the same material obtained simultaneously in laboratory dilution water.

**2. Table II. Criteria for Non-Priority Pollutants.** See also the footnotes following this table.

Non Priority Pollutant	CAS Number	Freshwater		Saltwater		Human Health For Consumption of:		Sustenance Fishing Waters Human Health For Consumption of:		FR Cite/Source
		CMC (µg/L)	CCC (ug/L)	CMC (µg/L)	CCC (ug/L)	Water and Organisms (µg/L)	Organisms Only (ug/L)	Water and Organisms (µg/L)	Organisms Only (ug/L)	
Aluminum pH 6.5 - 9.0	7429905	750 G,O, P	87 G,L,O,P							53FR33178
Ammonia	7664417	11,000 D	1,400 D	7,300 D	1,100 D					EPA822-R-99-014 EPA440-588-004 EPA822-R-13-001
Barium	7440393					1,000 A, qq		1,000 A, qq		Gold Book
Boron		Narrative Statement – See document								Gold Book
Carbaryl	63-25-2	2.1	2.1	1.6						77FR30280
Chloride	16887006	860,000 G	230,000 G							53FR19028
Chlorine	7782505	19	11	13	7.5	C				Gold Book
Chlorophenoxy Herbicide 2,4,5,-TP	93721					100 qq	300 qq	40 qq	40 qq	80FR36986
Chlorophenoxy Herbicide 2,4,D	94757					1200 qq	8000 qq	670 qq	1300 qq	80FR36986
Chloropyrifos	2921882	0.083 G	0.041 G	0.011 G	0.0056 G					Gold Book
Demeton	8065483		0.1 F		0.1 F					Gold Book

Non Priority Pollutant	CAS Number	Freshwater		Saltwater		Human Health For Consumption of:		Sustenance Fishing Waters Human Health For Consumption of:		FR Cite/Source
		CMC (µg/L)	CCC (ug/L)	CMC (µg/L)	CCC (ug/L)	Water and Organisms (µg/L)	Organisms Only (ug/L)	Water and Organisms (µg/L)	Organisms Only (ug/L)	
Ether, Bis Chloromethyl	542881					0.00015 qq	0.011 qq	0.00014 qq	0.0018 qq	65FR66443 80FR36986
Guthion	86500		0.01 F		0.01 F					Gold Book
Hexachlorocyclohexane-Technical	608731					0.0049 qq	0.0067 qq	0.001 qq	0.0011 qq	80FR36986 EPA 440/5-80-054
Iron	7439896		1000 F			300 A				Gold Book
Malathion	121755		0.1 F		0.1 F					Gold Book
Manganese	7439965					B, qq	100 A, qq	B, qq	100 A, qq	Gold Book
Methoxychlor	72435		0.03 F		0.03 F	0.01 qq	0.01 qq	0.002 qq	0.002 qq	80FR36986
Mirex	2385855		0.001 F		0.001 F					Gold Book
Nitrates	14797558					10,000 A, qq	qq	10,000 A, qq	qq	Gold Book
Nitrosamines						0.0008 A, qq	1.24 qq	0.0008 A, qq	1.24 qq	Gold Book
Dinitrophenols	25550587					10 qq	700 qq	10 qq	100 qq	65FR66443 80FR36986
Nonylphenol	84852153	28	6.6	7	1.7					71FR9337

Non Priority Pollutant	CAS Number	Freshwater		Saltwater		Human Health For Consumption of:		Sustenance Fishing Waters Human Health For Consumption of:		FR Cite/Source
		CMC (µg/L)	CCC (ug/L)	CMC (µg/L)	CCC (ug/L)	Water and Organisms (µg/L)	Organisms Only (ug/L)	Water and Organisms (µg/L)	Organisms Only (ug/L)	
Nitrosodibutylamine, N	924163					0.0061 A, qq	0.118 A, qq	0.0048 A, qq	0.019 A, qq	65FR66443
Nitrosodiethylamine, N	55185					0.0008 A, qq	1.24 A, qq	0.0008 A, qq	1.24 A, qq	Gold Book
Nitrosopyrrolidine, N	930552					0.016, qq	18.4, qq	0.016, qq	3.0, qq	65FR66443
Diazanon	333415	0.17	0.17	0.82	0.82					71FR9336
Parathion	56382	0.065 J	0.013 J							Gold Book
Pentachlorobenzene	608935					0.07 qq	0.07 qq	0.01 qq	0.01 qq	65FR66443 80FR36986
Sulfide-Hydrogen Sulfide	7783064		2.0 F		2.0 F					Gold Book
Tetrachlorobenzene, 1,2,4,5-	95943					0.02 qq	0.02 qq	0.003 qq	0.003 qq	65FR66443 80FR36986
Tributyltin TBT		0.46 Q	0.072 Q	0.42 Q	0.0074 Q					69FR342
Trichlorophenol, 2,4,5	95954					200 B, qq	400 B, qq	60 qq	60 qq	65FR66443 80FR36986

**Footnotes to Table II:**

- A This human health criterion is the same as originally published in the Red Book (EPA 440/9-76-023, July 1976) which predates the 1980 methodology and did not utilize the fish ingestion BCF approach. This same criterion value is now published in the Gold Book (Quality Criteria for Water: 1986. EPA 440/5-86-001).
- B The organoleptic effect criterion is more stringent than the value presented in the non priority pollutant table.
- C A more stringent Maximum Contaminant Level (MCL) has been issued by EPA under the Save Drinking Water Act. Refer to drinking water regulations 40CFR141 or Safe Drinking Water Hotline (1-800-426-4791) for values. Also see part 6 below.
- D Total Ammonia Nitrogen Aquatic life criteria are pH, temperature and/or salinity dependent. See part 7(C) for fresh water and reference document for marine waters. The values presented in the table are based on pH of 7.0 and temperature of 25°C in fresh waters; and pH of 8.0, temperature of 20°C and salinity of 30 parts per thousand in marine waters.
- F The derivation of this value is presented in the Red Book (EPA 440/9-76-023, July, 1976).
- G This value is based on a 304(a) aquatic life criterion that was derived using the 1985 Guidelines (*Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses*, PB85-227049, January 1985) and was issued in one of the following criteria documents: Aluminum (EPA 440/5-86-008); Chloride (EPA 440/5-88-001); Chloropyrifos (EPA 440/5-86-005).
- J This value is based on a 304(a) aquatic life criterion that was issued in the *1995 Updates: Water Quality Criteria Documents for the Protection of Aquatic Life in Ambient Water* (EPA-820-B-96-001). This value was derived using the GLI Guidelines (60FR15393-15399, March 23, 1995; 40CFR132 Appendix A); the differences between the 1985 Guidelines and the GLI Guidelines are explained on page iv of the 1995 Updates. No decision concerning this criterion was affected by any considerations that are specific to the Great Lakes.
- L There are three major reasons why the use of Water-Effect Ratios might be appropriate. (1) The value of 87 µg/l is based on a toxicity test with the striped bass in water with pH= 6.5-6.6 and hardness <10 mg/L. Data in “Aluminum Water-Effect Ratio for the 3M Plant Effluent Discharge, Middleway, West Virginia” (May 1994) indicate that aluminum is substantially less toxic at higher pH and hardness, but the effects of pH and hardness are not well quantified at this time. (2) In tests with the brook trout at low pH and hardness, effects increased with increasing concentrations of total aluminum even though the concentration of dissolved aluminum was constant, indicating that total recoverable is a more appropriate measurement than dissolved, at least when particulate aluminum is primarily aluminum hydroxide particles. In surface waters, however, the total recoverable procedure might measure aluminum associated with clay particles, which might be less toxic than aluminum associated with aluminum hydroxide. (3) EPA is aware of field data indicating that many high quality waters in the U.S. contain more than 87 µg aluminum/L, when either total recoverable or dissolved is measured.
- N This value was announced (62FR42554, August 7, 1997) as a proposed 304(a) aquatic life criterion. Although EPA has not responded to public comment, EPA has published this as a 304(a) criterion as guidance for States and Tribes to consider when adopting water quality criteria.
- O When calculating acute and chronic permit limits for the Androscoggin River, use a Water Effect Ratio (WER) of 1.3 for acute and 3.7 for chronic for aluminum. Rationale for the WERs is provided in *Androscoggin River Water Effect Ratios* (Integral Consulting Inc., April 13, 2015).
- P When calculating acute and chronic permit limits for the St. Croix River, use a Water Effect Ratio (WER) of 6.1 for aluminum. Rationale for the WER is provided in *Aluminum Water-Effect Ration for Georgia-Pacific Corporation Woodland, Maine Pulp & Paper Operations Discharge and St. Croix River* prepared by AScI Corporation/ASCI-Duluth dated November 1996, and summarized in the letter from William R. Beckwith of EPA Region 1 to Barry Mower, DEP, dated March 2, 1998.



**ADDITIONAL NOTES****3. Criteria Maximum Concentration and Criterion Continuous Concentration**

The Criteria Maximum Concentration (CMC) is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed briefly without resulting in an unacceptable effect. The Criterion Continuous Concentration (CCC) is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect. The CMC and CCC are just two of the six parts of an aquatic life criterion; the other four parts are the acute averaging period, chronic averaging period, acute frequency of allowed exceedence, and chronic frequency of allowed exceedence. Because 304(a) aquatic life criteria are national guidance, they are intended to be protective of the vast majority of the aquatic communities in the United States.

**4. Criteria Recommendations for Priority Pollutants, Non Priority Pollutants**

This compilation lists all priority toxic pollutants and some non priority toxic pollutants, and both human health effect and aquatic organism effect criteria issued pursuant to CWA §304(a). Blank spaces indicate that EPA has no CWA §304(a) criteria recommendations. For a number of non-priority toxic pollutants not listed, CWA §304(a) “water + organism” human health criteria are not available, but EPA has published MCLs under the SDWA that may be used in establishing water quality standards to protect water supply designated uses. Because of variations in chemical nomenclature systems, this listing of toxic pollutants does not duplicate the listing in Appendix A of 40 CFR Part 423. Also listed are the Chemical Abstracts Service CAS registry numbers, which provide a unique identification for each chemical.

**5. Water Quality Criteria published pursuant to Section 304(a) or Section 303(c) of the CWA**

Many of the values in the compilation were published in the California Toxics Rule. Although such values were published pursuant to Section 303(c) of the CWA, they represent the EPA’s most recent calculation of water quality criteria and are thus the Agency’s 304(a) criteria.

**6. Maximum Contaminant Levels and Organoleptic Effects**

The compilation includes footnotes for pollutants with Maximum Contaminant Levels (MCLs) more stringent than the recommended water quality criteria in the compilation. MCLs for these pollutants are not included in the compilation, but can be found in the appropriate drinking water regulations (10-144 CMR Chapter 231, 40 CFR 141.11-16 and 40 CFR 141.60-63). In addition to toxic effects, some pollutants impart organoleptic effects (e.g., taste and odor) that may impair uses of the waters of the State by making water and edible aquatic life unpalatable but not toxic to humans. Pollutants with organoleptic effect criteria more stringent than the criteria based on toxicity (e.g., included in both the priority and non-priority pollutant tables) are footnoted as such. For both MCL and organoleptic effects, the Department will consider all available information regarding such characteristics in regulating the discharge of pollutant to ensure the uses of the waters of the State are protected in all respects.

## 7. Specific Chemical Calculations

### A. Selenium Aquatic Life

This compilation contains aquatic life criteria for selenium that are the same as those published in the proposed CTR. In the CTR, EPA proposed an acute criterion for selenium based on the criterion proposed for selenium in the Water Quality Guidance for the Great Lakes System (61 FR 58444). The GLI and CTR proposals take into account data showing that selenium's two prevalent oxidation states in water, selenite and selenate, present differing potentials for aquatic toxicity, as well as new data indicating that various forms of selenium are additive. The new approach produces a different selenium acute criterion concentration, or CMC, depending upon the relative proportions of selenite, selenate, and other forms of selenium that are present. EPA is currently undertaking a reassessment of selenium, and expects the 304(a) criteria for selenium will be revised based on the final reassessment (63FR26186). However, until such time as revised water quality criteria for selenium are published by the Agency, the recommended water quality criteria in this compilation are EPA's current 304(a) criteria.

### B. Parameters for Calculating Freshwater Metals Criteria That Are Hardness-Dependent

Chemical	$m_A$	$b_A$	$m_C$	$b_C$
Cadmium	0.97899	-3.866	0.7977	-3.909
Chromium III	0.8190	3.7256	0.8190	0.6848
Copper	0.9422	-1.700	0.8545	-1.702
Lead	1.273	-1.460	1.273	-4.705
Nickel	0.8460	2.255	0.8460	0.0584
Silver	1.72	-6.59	--	--
Zinc	0.8473	0.884	0.8473	0.884

Hardness-dependant metals' criteria, as total metal, may be calculated from the following.

$$CMC = \exp\{m_A [\ln(\text{hardness})] + b_A\}$$

$$CCC = \exp\{m_C [\ln(\text{hardness})] + b_C\}$$

A conversion factor for freshwater cadmium criteria is then applied to the above stated calculation for CCC and CMC as stated in EPA's *Aquatic Life Ambient Water Quality Criteria for Cadmium* (EPA-820-R-16-002) dated March 2016. Freshwater acute and chronic conversion factors for cadmium are 1.011 and 0.976, respectively.

### C. Calculation of Freshwater Ammonia Criterion

Freshwater Ammonia criterion is derived from *Aquatic Life Ambient Water Quality Criteria for Ammonia-Freshwater* (EPA 822-R-18-002) dated April 2013. Criteria frequency may not be exceeded more than once in three years on average. Chronic criteria (30-day rolling average), may not exceed 2.5 times the criterion continuous concentration as a 4-day average within a 30-day period.

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