DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

Water Quality Control Commission

REGULATION NO. 38 - CLASSIFICATIONS AND NUMERIC STANDARDS FOR SOUTH PLATTE RIVER BASIN, LARAMIE RIVER BASIN, REPUBLICAN RIVER BASIN, SMOKY HILL RIVER BASIN

5 CCR 1002-38

[Editor's Notes follow the text of the rules at the end of this CCR Document.]

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38.6 TABLES

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(3) Table Value Standards

In certain instances in the tables in Appendix 38-1, the designation "TVS" is used to indicate that for a particular parameter a "table value standard" has been adopted. This designation refers to numerical criteria set forth in the Basic Standards and Methodologies for Surface Water. The criteria for which the TVS are applicable are on the following table.

TABLE VALUE STANDARDS
(Concentrations in µg/l unless noted)

PARAMETER[1]	**TABLE VALUE STANDARDS** [2][3]
Aluminum (T)	Acute = $e^{(1.3695[\ln(\text{hardness})]+1.8308)}$ pH equal to or greater than 7.0 Chronic=$e^{(1.3695[\ln(\text{hardness})]-0.1158)}$ pH less than 7.0 Chronic= $e^{(1.3695[\ln(\text{hardness})]-0.1158)}$ or 87, whichever is more stringent
Ammonia [4]	Cold Water = (mg/l as N)Total $acute = \frac{0.275}{1+10^{7.204-pH}} + \frac{39.0}{1+10^{pH-7.204}}$ $chronic = \left(\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}}\right) * MIN\left(2.85,\ 1.45*10^{0.028(25-T)}\right)$
	Warm Water = (mg/l as N)Total $acute = \frac{0.411}{1+10^{7.204-pH}} + \frac{58.4}{1+10^{pH-7.204}}$
	$chronic\ \ (Apr\,1-Aug\,31) = \left(\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}}\right) * MIN\left(2.85,\ 1.45*10^{0.028(25-T)}\right)$ $chronic\ (Sep\,1-Mar\,31) = \left(\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}}\right) * 1.45*10^{0.028*(25-MAX(T,\ 7))}$

PARAMETER[1]	TABLE VALUE STANDARDS [2][3]					
Cadmium	Acute(warm)[5] = (1.136672-(ln(hardness)* 0.041838))*e(0.9789*ln(hardness)-3.443) Acute(cold)[5] = (1.136672-(ln(hardness)* 0.041838))*e(0.9789*ln(hardness)-3.866) Chronic = (1.101672-(ln(hardness)*0.041838))* e(0.7977*ln(hardness)-3.909) ~~Acute = (1.136672-[ln(hardness) x (0.041838)])*e(0.9151[ln(hardness)]-3.1485)~~ ~~Acute(Trout) = (1.136672-[ln(hardness) x (0.041838)])*e(0.9151[ln(hardness)]-3.6236)~~ ~~Chronic = (1.101672-[ln(hardness) x (0.041838)])*e(0.7998[ln(hardness)]-4.4451)~~					
Chromium III[5~~6~~]	Acute = e(0.819[ln(hardness)]+2.5736) Chronic = e(0.819[ln(hardness)]+0.5340)					
Chromium VI[5~~6~~]	Acute = 16 Chronic = 11					
Copper	Acute = e(0.9422[ln(hardness)]-1.7408) Chronic = e(0.8545[ln(hardness)]-1.7428)					
Lead	Acute = (1.46203-[ln(hardness)*(0.145712)])*e(1.273[ln(hardness)]-1.46) Chronic = (1.46203-[(ln hardness)* (0.145712)])*e(1.273[ln(hardness)]-4.705)					
Manganese	Acute= e(0.3331[ln(hardness)]+6.4676) Chronic= e(0.3331[ln(hardness)]+5.8743)					
Nickel	Acute = e(0.846[ln(hardness)]+2.253) Chronic = e(0.846[ln(hardness)]+0.0554)					
Selenium[6~~7~~]	Acute = 18.4 Chronic = 4.6					
Silver	Acute = ½ e(1.72[ln(hardness)]-6.52) Chronic = e(1.72[ln(hardness)]-9.06) Chronic(Trout) = e(1.72[ln(hardness)]-10.51)					
Temperature	TEMPERATURE TIER	TIER CODE	SPECIES EXPECTED TO BE PRESENT	APPLICABLE MONTHS	TEMPERATURE STANDARD (°C)	
					(MWAT)	(DM)
	Cold Stream Tier I	CS-I	brook trout, cutthroat trout	June – Sept.	17.0	21.7
				Oct. - May	9.0	13.0
	Cold Stream Tier II	CS-II	all other cold-water species	April – Oct.	18.3	23.9
				Nov. - March	9.0	13.0
	Cold Lake	CL	brook trout, brown trout, cutthroat trout, lake trout, rainbow trout, Arctic grayling, sockeye salmon	April – Dec.	17.0	21.2
				Jan. - March	9.0	13.0
	Cold Large Lake (>100 acres surface area)	CLL	brown trout, lake trout, rainbow trout	April – Dec.	18.3	23.8
				Jan. - March	9.0	13.0
	Warm Stream Tier I	WS-I	common shiner, Johnny darter, orangethroat darter	March – Nov.	24.2	29.0
				Dec. – Feb.	12.1	14.5
	Warm Stream Tier II	WS-II	brook stickleback, central stoneroller, creek chub, longnose dace, Northern redbelly dace, finescale dace,razorback sucker, white sucker	March – Nov.	27.5	28.6
				Dec. – Feb.	13.8	14.3
	Warm Stream Tier III	WS-III	all other warm-water species	March – Nov.	28.7	31.8
				Dec. – Feb.	14.3	15.9
	Warm Lakes	WL	Yellow perch, walleye,	April – Dec.	26.3	29.5

PARAMETER[1]	TABLE VALUE STANDARDS [2][3]					
			pumpkinseed, smallmouth bass, striped bass, white bass, largemouth bass, bluegill, spottail shiner, Northern pike, tiger muskellunge, black crappie, common carp, gizzard shad, sauger, white crappie, wiper	Jan. - March	13.2	14.8
Uranium	Acute = $e^{(1.1021[\ln(\text{hardness})]+2.7088)}$ Chronic = $e^{(1.1021[\ln(\text{hardness})]+2.2382)}$					
Zinc	Acute = $0.978*e^{(0.9094[\ln(\text{hardness})]+0.9095)}$ Chronic = $0.986*e^{(0.9094[\ln(\text{hardness})]+0.6235)}$					

TABLE VALUE STANDARDS - FOOTNOTES

(1) Metals are stated as dissolved unless otherwise specified.

(2) Hardness values to be used in equations are in mg/l as calcium carbonate and shall be no greater than 400 mg/L except for aluminum for which hardness shall be no greater than 220 mg/L. The hardness values used in calculating the appropriate metal standard should be based on the lower 95 per cent confidence limit of the mean hardness value at the periodic low flow criteria as determined from a regression analysis of site-specific data. Where insufficient site-specific data exists to define the mean hardness value at the periodic low flow criteria, representative regional data shall be used to perform the regression analysis. Where a regression analysis is not appropriate, a site-specific method should be used. In calculating a hardness value, regression analyses should not be extrapolated past the point that data exist.

(3) Both acute and chronic numbers adopted as stream standards are levels not to be exceeded more than once every three years on the average.

(4) For acute conditions the default assumption is that salmonids could be present in cold water segments and should be protected, and that salmonids do not need to be protected in warm water segments. For chronic conditions, the default assumptions are that early life stages could be present all year in cold water segments and should be protected. In warm water segments the default assumption is that early life stages are present and should be protected only from April 1 through August 31. These assumptions can be modified by the Commission on a site-specific basis where appropriate evidence is submitted.

(5) The acute(warm) cadmium equation applies to segments classified as Aquatic Life Warm Class 1 or 2. The acute(cold) cadmium equation applies to segments classified as Aquatic Life Cold Class 1 or 2.

(~~5~~6) Unless the stability of the chromium valence state in receiving waters can be clearly demonstrated, the standard for chromium should be in terms of chromium VI. In no case can the sum of the instream levels of Hexavalent and Trivalent Chromium exceed the water supply standard of 50 µg/l total chromium in those waters classified for domestic water use.

(~~6~~7) Selenium is a bioaccumulative metal and subject to a range of toxicity values depending upon numerous site-specific variables.

(~~7~~8) E.coli criteria and resulting standards for individual water segments, are established as indicators of the potential presence of pathogenic organisms. Standards for E. coli are expressed as a two-month geometric mean. Site-specific or seasonal standards are also two-month geometric means unless otherwise specified.

(~~8~~9) All phosphorus standards are based upon the concentration of total phosphorus.

(~~9~~10) The pH standards of 6.5 (or 5.0) and 9.0 are an instantaneous minimum and maximum, respectively to be applied as effluent limits. In determining instream attainment of water quality

standards for pH, appropriate averaging periods may be applied, provided that beneficial uses will be fully protected.

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38.100 STATEMENT OF BASIS, SPECIFIC STATUTORY AUTHORITY AND PURPOSE; DECEMBER 9, 2019 RULEMAKING; FINAL ACTION JANUARY 13, 2020; EFFECTIVE DATE JUNE 30, 2020

The provisions of C.R.S. 25-8-202(1)(a), (b) and (2); 25-8-203; 25-8-204; and 25-8-402; provide the specific statutory authority for adoption of these regulatory amendments. The commission also adopted in compliance with 24-4-103(4) C.R.S. the following statement of basis and purpose.

BASIS AND PURPOSE

A. Aquatic Life Standards for Cadmium

Cadmium is a naturally-occurring element frequently found alongside other metals, and numerous treatment techniques are available to remove cadmium from wastewater. Cadmium has both acute and chronic effects on aquatic life, and can negatively impact survival, growth, reproduction, immune and endocrine systems, development, and behavior.

The commission revised the hardness-based cadmium table value standards to protect the Aquatic Life use. The updated standards incorporate toxicity data that have become available since the cadmium standards were last updated in the 2005 Regulation No. 31 rulemaking hearing. The updated standards are based on the United States Environmental Protection Agency's (EPA) "Aquatic Life Ambient Water Quality Criteria – 2016" and toxicity data that have become available since EPA's recommended criteria were released in 2016.

The updated standards include two acute equations (acute(cold) and acute(warm)) and one chronic equation. The acute(cold) and chronic equations are the same as the acute and chronic criteria recommended by EPA in 2016. The acute(cold) equation, which is lowered to protect trout, is protective of trout and other sensitive cold water species and applies in segments classified as Aquatic Life Cold Class 1 or 2. The acute(warm) equation, which is not lowered to protect trout, is protective of warm water species and applies in segments classified as Aquatic Life Warm Class 1 or 2. The chronic equation is protective of both cold and warm water aquatic life and applies in segments classified as either Aquatic Life Cold Class 1 or 2 or Aquatic Life Warm Class 1 or 2.

Compared to the previous cadmium table value standards, the updated standards are generally less stringent. The acute(cold) standard is less stringent than the previous acute(trout) standard when water hardness is greater than 45 mg/L $CaCO_3$. The acute(warm) equation is less stringent than the previous acute standard when water hardness is greater than 101 mg/L $CaCO_3$. The updated chronic equation is less stringent than the previous chronic standard at all water hardness values.

In the past, Colorado has had separate acute equations for waters with trout and waters without trout. The updated standards include separate acute equations for cold waters (both with and without trout) and warm waters. This change in approach is due to the addition of toxicity data showing that sculpin, which inhabit cold waters, are also sensitive to cadmium. To ensure protection of sculpin and other sensitive cold water aquatic life in waters where trout are absent, the acute(cold) equation applies to all cold waters. As a result, the acute trout (tr) qualifier for cadmium is no longer needed on select cold water segments and was deleted from all segments where it had applied.

B. Clarifications to Appendix 38-1

To improve the clarity and usability of the tables, an acronym list was added to the front of Appendix 38-1 and the footnote referencing Section 38.6 was also simplified.

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