

1.1 **Pollution Control Agency**

1.2 **Proposed Permanent Rules Relating to Water Quality**

1.3 **7050.0150 DETERMINATION OF WATER QUALITY, BIOLOGICAL AND**
1.4 **PHYSICAL CONDITIONS, AND COMPLIANCE WITH STANDARDS.**

1.5 [For text of subps 1 to 3, see M.R.]

1.6 Subp. 4. **Definitions.** For the purposes of this ~~part~~ chapter and chapter 7053, the
1.7 following terms have the meanings given them.

1.8 [For text of items A and B, see M.R.]

1.9 C. "BOD₅" or "five-day biochemical oxygen demand" means the amount of
1.10 dissolved oxygen needed by aerobic biological organisms to break down organic material
1.11 present in a given water sample at a certain temperature over a five-day period.

1.12 E D. "Chlorophyll-a" means a pigment in green plants including algae.
1.13 The concentration of chlorophyll-a, expressed in weight per unit volume of water, is a
1.14 measurement of the abundance of algae.

1.15 E. "Diel flux" means the daily change in a constituent, such as dissolved oxygen
1.16 or pH, when there is a distinct daily cycle in the measurement. Diel dissolved oxygen
1.17 flux means the difference between the maximum daily dissolved oxygen concentration
1.18 and the minimum daily dissolved oxygen concentration.

1.19 E F. "Ecoregion" means an area of relative homogeneity in ecological systems
1.20 based on similar soils, land use, land surface form, and potential natural vegetation.
1.21 Minnesota ecoregions are shown on the map in part 7050.0468.

1.22 E G. "Eutrophication" means the increased productivity of the biological
1.23 community in water bodies in response to increased nutrient loading. Eutrophication
1.24 is characterized by increased growth and abundance of algae and other aquatic plants,
1.25 reduced water clarity transparency, reduction or loss of dissolved oxygen, and other

2.1 chemical and biological changes. The acceleration of eutrophication due to excess
2.2 nutrient loading from human sources and activities, called cultural eutrophication, causes
2.3 a degradation of ~~lake~~ water quality and possible loss of beneficial uses.

2.4 F H. "Fish and other biota" and "lower aquatic biota" mean the aquatic
2.5 community including, but not limited to, game and nongame fish, minnows and other
2.6 small fish, mollusks, insects, crustaceans and other invertebrates, submerged or emergent
2.7 rooted vegetation, suspended or floating algae, substrate-attached algae, and microscopic
2.8 organisms. "Other biota" includes aquatic or semiaquatic organisms that depend on
2.9 aquatic systems for food or habitat such as amphibians and certain wildlife species.

2.10 G I. "Hydraulic residence time" means the time water resides in a basin or,
2.11 alternately, the time it would take to fill the basin if it were empty.

2.12 H J. "Impaired water" or "impaired condition" means a water body that
2.13 does not meet applicable water quality standards or fully support applicable beneficial
2.14 uses, due in whole or in part to water pollution from point or nonpoint sources, or any
2.15 combination thereof.

2.16 I K. "Index of biological integrity" or "IBI" means an index developed by
2.17 measuring attributes of an aquatic community that change in quantifiable and predictable
2.18 ways in response to human disturbance, representing the health of that community.

2.19 J L. "Lake" means an enclosed basin filled or partially filled with standing fresh
2.20 water with a maximum depth greater than 15 feet. Lakes may have no inlet or outlet, an
2.21 inlet or outlet, or both an inlet and outlet.

2.22 K M. "Lake morphometry" means the physical characteristics of the lake basin
2.23 that are reasonably necessary to determine the shape of a lake, such as maximum length
2.24 and width, maximum and mean depth, area, volume, and shoreline configuration.

3.1 ~~E~~ N. "Mixing status" means the frequency of complete mixing of the lake
3.2 water from surface to bottom, which is determined by whether temperature gradients are
3.3 established and maintained in the water column during the summer season.

3.4 ~~M~~ O. "Measurable increase" or "measurable impact" means a change in
3.5 trophic status that can be discerned above the normal variability in water quality data
3.6 using a weight of evidence approach. The change in trophic status does not require a
3.7 demonstration of statistical significance to be considered measurable. Mathematical
3.8 models may be used as a tool in the data analysis to help predict changes in trophic status.

3.9 ~~N~~ P. "Natural causes" means the multiplicity of factors that determine the
3.10 physical, chemical, or biological conditions that would exist in a water body in the absence
3.11 of measurable impacts from human activity or influence.

3.12 ~~Θ~~ Q. "Normal fishery" and "normally present" mean the fishery and other
3.13 aquatic biota expected to be present in the water body in the absence of pollution of the
3.14 water, consistent with any variability due to natural hydrological, substrate, habitat, or
3.15 other physical and chemical characteristics. Expected presence is based on comparing
3.16 the aquatic community in the water body of interest to the aquatic community in
3.17 representative reference water bodies.

3.18 ~~P~~ R. "Nuisance algae bloom" means an excessive population of algae that is
3.19 characterized by obvious green or blue-green pigmentation in the water, floating mats of
3.20 algae, reduced light transparency, aesthetic degradation, loss of recreational use, possible
3.21 harm to the aquatic community, or possible toxicity to animals and humans. Algae
3.22 blooms are measured through tests for chlorophyll-a, observations ~~using a~~ of Secchi disk
3.23 transparency, and observations of impaired recreational and aesthetic conditions by the
3.24 users of the water body, or any other reliable data that identifies the population of algae
3.25 in an aquatic community.

4.1 S. "Periphyton" means algae on the bottom of a water body. In rivers or
4.2 streams, these forms are typically found attached to logs, rocks, or other substrates, but
4.3 when dislodged the algae will become part of the seston.

4.4 Q T. "Readily available and reliable data and information" means chemical,
4.5 biological, and physical data and information determined by the commissioner to meet the
4.6 quality assurance and quality control requirements in subpart 8, that are not more than ten
4.7 years old from the time they are used for the assessment. A subset of data in the ten-year
4.8 period, or data more than ten years old can be used if credible scientific evidence shows
4.9 that these data are representative of current conditions.

4.10 R U. "Reference water body" means a water body least impacted by point or
4.11 nonpoint sources of pollution that is representative of water bodies in the same ecoregion
4.12 or watershed. Reference water bodies are used as a base for comparing the quality of
4.13 similar water bodies in the same ecoregion or watershed.

4.14 S V. "Reservoir" means a body of water in a natural or artificial basin or
4.15 watercourse where the outlet or flow is artificially controlled by a structure such as a dam.
4.16 Reservoirs are distinguished from river systems by having a hydraulic residence time of at
4.17 least 14 days. For purposes of this item, residence time is determined using a flow equal to
4.18 the 122Q₁₀ for the months of June through September, ~~a 122Q₄₀ for the summer months.~~

4.19 W. "River nutrient region" means the geographic basis for regionalizing the
4.20 river eutrophication criteria as described in Heiskary, S. and K. Parson, Regionalization
4.21 of Minnesota's Rivers for Application of River Nutrient Criteria, Minnesota Pollution
4.22 Control Agency (2010), which is incorporated by reference. The document is not subject
4.23 to frequent change and is available through the Minitex interlibrary loan system.

4.24 ~~T. "Secchi disk transparency" means the average water depth of the point where~~
4.25 ~~a weighted white or black and white disk disappears when viewed from the shaded side of~~

5.1 ~~a boat, and the point where it reappears upon raising it after it has been lowered beyond~~
5.2 ~~visibility. The Secchi disk measures water clarity and is usually used in lakes.~~

5.3 X. "Secchi disk" means a tool that is used to measure the transparency of lake
5.4 water. A Secchi disk is an eight-inch weighted disk on a calibrated rope, either white or
5.5 with quadrants of black and white. To measure water transparency with a Secchi disk, the
5.6 disk is viewed from the shaded side of a boat. The depth of the water at the point where
5.7 the disk reappears upon raising it after it has been lowered beyond visibility is recorded.

5.8 Y. "Secchi disk transparency" means the transparency of water as measured by
5.9 either a Secchi disk, a Secchi tube, or a transparency tube.

5.10 Z. "Secchi tube" means a tool that is used to measure the transparency of stream
5.11 or river water. A Secchi tube is a clear plastic tube, one meter in length and 1-3/4 inch in
5.12 diameter, with a mini-Secchi disk on a string. To measure water transparency, the tube
5.13 is filled with water collected from a stream or river and, looking into the tube from the
5.14 top, the weighted Secchi disk is lowered into the tube by a string until it disappears and
5.15 then raised until it reappears, allowing the user to raise and lower the disk within the
5.16 same water sample numerous times. The depth of the water at the midpoint between
5.17 disappearance and reappearance of the disk is recorded in centimeters, which are marked
5.18 on the side of the tube. If the Secchi disk is visible when it is lowered to the bottom of the
5.19 tube, the transparency reading is recorded as "greater than 100 centimeters."

5.20 AA. "Seston" means particulate matter suspended in water bodies and includes
5.21 plankton and organic and inorganic matter.

5.22 BB. "Shallow lake" means an enclosed basin filled or partially filled with
5.23 standing fresh water with a maximum depth of 15 feet or less or with 80 percent or more
5.24 of the lake area shallow enough to support emergent and submerged rooted aquatic
5.25 plants (the littoral zone). It is uncommon for shallow lakes to thermally stratify during
5.26 the summer. The quality of shallow lakes will permit the propagation and maintenance

of a healthy indigenous aquatic community and they will be suitable for boating and other forms of aquatic recreation for which they may be usable. ~~For purposes of this chapter,~~ Shallow lakes are differentiated from wetlands and lakes on a case-by-case basis. Wetlands are defined in part 7050.0186, subpart 1a.

~~✓~~ CC. "Summer-average" means a representative average of concentrations or measurements of nutrient enrichment factors, taken over one summer ~~growing~~ season ~~from June 1 through September 30.~~

DD. "Summer season" means a period annually from June 1 through September 30.

~~W~~ EE. "Transparency tube" means a tool that is used to measure the transparency of stream or river water. A transparency tube is a graduated clear plastic tube, 24 inches or more in length by 1-1/2 inches in diameter, with a stopper at the bottom end. ~~The inside surface of which the stopper is painted black and white. To measure water transparency,~~ the tube is filled with water from a surface water; the water is released through a valve at the bottom end until the painted surface of the stopper is just visible through the water column when viewed from the top of the tube. ~~The depth of water at the point of initial visibility is the transparency. The transparency tube measures water clarity and is usually used in rivers and streams,~~ in centimeters, is noted. More water is released until the screw in the middle of the painted symbol on the stopper is clearly visible; this depth is noted. The two observed depths are averaged to obtain a transparency measurement.

~~×~~ FF. "Trophic status or condition" means the productivity of a lake as measured by the phosphorus content, algae abundance, and depth of light penetration.

~~Y~~ GG. "Water body" means a lake, reservoir, wetland, or a geographically defined portion of a river or stream.

Subp. 5. **Impairment of waters due to excess algae or plant growth.** In evaluating whether the narrative standards in subpart 3, which prohibit any material increase

in undesirable slime growths or aquatic plants including algae, are being met, the commissioner will use all readily available and reliable data and information for the following factors of use impairment:

A. representative summer-average concentrations of total phosphorus and total nitrogen measured in the water body ~~throughout the summer growing season;~~

B. representative summer-average concentrations of chlorophyll-a seston measured in the water body ~~throughout the summer growing season;~~

C. representative summer-average measurements of ~~light~~ Secchi disk transparency in the water body, ~~as measured with a Secchi disk in lakes or a transparency tube in rivers and streams, throughout the growing season; and~~

D. representative summer-average concentrations of five-day biochemical oxygen demand measured in rivers and streams;

E. representative diel dissolved oxygen flux measurements in rivers and streams as averaged over a minimum of four consecutive days during the summer season;

F. representative measurements of pH in the water body during the summer season;

G. representative measurements of chlorophyll-a (periphyton) on substrates on the beds of rivers and streams during the summer season; and

~~D~~ H. any other scientifically objective, credible, and supportable factor.

Subp. 5a. Impaired condition; lakes, shallow lakes, and reservoirs.

A. For lakes, shallow lakes, and reservoirs, a finding of an impaired condition must be supported by data showing:

(1) elevated levels of nutrients in under subpart 5, item A₂; and

8.1 (2) at least one factor showing impaired conditions resulting from nutrient
8.2 overenrichment ~~in~~ under subpart 5, items B and C.

8.3 B. The trophic status data described in subpart 5, items A to ~~D~~ C and H, must
8.4 be assessed in light of the magnitude, duration, and frequency of nuisance algae blooms in
8.5 the water body; and documented impaired recreational and aesthetic conditions observed
8.6 by the users of the water body due to excess algae or plant growth, reduced transparency,
8.7 or other deleterious conditions caused by nutrient overenrichment.

8.8 C. Assessment of trophic status and the response of a given water body to
8.9 nutrient enrichment will take into account the trophic status of reference water bodies; and
8.10 all relevant factors that affect the trophic status of the given water body appropriate for its
8.11 geographic region, such as the temperature, morphometry, hydraulic residence time, mixing
8.12 status, watershed size, and location. ~~The factors in this subpart apply to lakes, shallow~~
8.13 ~~lakes, and reservoirs and, where scientifically justified, to rivers, streams, and wetlands.~~

8.14 Subp. 5b. **Impaired condition; rivers and streams.** For rivers and streams, a
8.15 finding of an impaired condition must be supported by data showing:

8.16 A. elevated levels of nutrients under subpart 5, item A, and at least one factor
8.17 showing impaired conditions resulting from nutrient overenrichment under subpart 5,
8.18 item B, D, E, F, or H; or

8.19 B. elevated levels of chlorophyll-a (periphyton) under subpart 5, item G.

8.20 Subp. 5c. **Impaired condition; navigational pools.** For navigational pools, a
8.21 finding of impaired condition must be supported by data showing:

8.22 A. elevated levels of nutrients under subpart 5, item A; and

8.23 B. impaired conditions resulting from nutrient overenrichment under subpart
8.24 5, item B.

8.25 [For text of subps 6 to 8, see M.R.]

9.1 **7050.0220 SPECIFIC WATER QUALITY STANDARDS BY ASSOCIATED USE**
 9.2 **CLASSES.**

9.3 [For text of subps 1 to 3, see M.R.]

9.4 Subp. 3a. **Cold water sport fish, drinking water, and associated use classes.**

9.5 Water quality standards applicable to use Classes 1B, 2A, 3A or 3B, 4A and 4B, and 5
 9.6 surface waters.

9.7 **A. MISCELLANEOUS SUBSTANCE, CHARACTERISTIC, OR POLLUTANT**

	2A	2A	2A	1B	3A/3B	4A	4B	5
	CS	MS	FAV	DC	IC	IR	IR	AN

9.10

9.11 (1) Ammonia, un-ionized as N, µg/L

9.12	16	—	—	—	—	—	—	—
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9.13 (2) Asbestos, >10 µm (c), fibers/L

9.14	—	—	—	7.0e+06	—	—	—	—
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9.15 (3) Bicarbonates (HCO₃), meq/L

9.16	—	—	—	—	—	5	—	—
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9.17 (4) Bromate, µg/L

9.18	—	—	—	10	—	—	—	—
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9.19 (5) Chloride, mg/L

9.20	230	860	1,720	250(S)	50/100	—	—	—
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	2A	2A	2A	1B	3A/3B	4A	4B	5
	CS	MS	FAV	DC	IC	IR	IR	AN

9.23

9.24 (6) Chlorine, total residual, µg/L

9.25	11	19	38	—	—	—	—	—
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9.26 (7) Chlorite, µg/L

10.1	—	—	—	1,000	—	—	—	—
10.2	(8) Color, Pt-Co							
10.3	30	—	—	15(S)	—	—	—	—
10.4	(9) Cyanide, free, µg/L							
10.5	5.2	22	45	200	—	—	—	—
10.6	(10) <i>Escherichia (E.) coli</i> bacteria, organisms/100 mL							
10.7	See	—	—	—	—	—	—	—
10.8	item D							
10.9	2A	2A	2A	1B	3A/3B	4A	4B	5
10.10	CS	MS	FAV	DC	IC	IR	IR	AN
10.11	<hr/>							
10.12	(11) Eutrophication standards for lakes and reservoirs (phosphorus, total, µg/L;							
10.13	chlorophyll-a, µg/L; Secchi depth <u>disk</u> transparency, meters)							
10.14	See part	—	—	—	—	—	—	—
10.15	7050.0222,							
10.16	subparts 2							
10.17	and 2a							
10.18	<u>(12) Eutrophication standards for rivers, streams, and navigational pools (phosphorus,</u>							
10.19	<u>total µg/L; chlorophyll-a (seston), µg/L; five-day biochemical oxygen demand (BOD₅),</u>							
10.20	<u>mg/L; diel dissolved oxygen flux, mg/L; chlorophyll-a (periphyton), mg/m²)</u>							
10.21	<u>See part</u>	=	=	=	=	=	=	=
10.22	<u>7050.0222,</u>							
10.23	<u>subparts 2</u>							
10.24	<u>and 2b</u>							
10.25	(12) <u>(13)</u> Fluoride, mg/L							
10.26	—	—	—	4	—	—	—	—
10.27	(13) <u>(14)</u> Fluoride, mg/L							
10.28	—	—	—	2(S)	—	—	—	—

11.1	(14) <u>(15)</u> Foaming agents, µg/L							
11.2	—	—	—	500(S)	—	—	—	—
11.3	(15) <u>(16)</u> Hardness, Ca+Mg as CaCO ₃ , mg/L							
11.4	—	—	—	—	50/250	—	—	—
11.5	2A	2A	2A	1B	3A/3B	4A	4B	5
11.6	CS	MS	FAV	DC	IC	IR	IR	AN
11.7	<hr/>							
11.8	(16) <u>(17)</u> Hydrogen sulfide, mg/L							
11.9	—	—	—	—	—	—	—	0.02
11.10	(17) <u>(18)</u> Nitrate as N, mg/L							
11.11	—	—	—	10	—	—	—	—
11.12	(18) <u>(19)</u> Nitrite as N, mg/L							
11.13	—	—	—	1	—	—	—	—
11.14	(19) <u>(20)</u> Nitrate + Nitrite as N, mg/L							
11.15	—	—	—	10	—	—	—	—
11.16	(20) <u>(21)</u> Odor, TON							
11.17	—	—	—	3(S)	—	—	—	—
11.18	2A	2A	2A	1B	3A/3B	4A	4B	5
11.19	CS	MS	FAV	DC	IC	IR	IR	AN
11.20	<hr/>							
11.21	(21) <u>(22)</u> Oil, µg/L							
11.22	500	5,000	10,000	—	—	—	—	—
11.23	(22) <u>(23)</u> Oxygen, dissolved, mg/L							

12.1	7, as a	—	—	—	—	—	—	—
12.2	daily							
12.3	minimum							
12.4	(23) <u>(24)</u> pH minimum, su							
12.5	6.5	—	—	6.5(S)	6.5/6.0	6.0	6.0	6.0
12.6	(24) <u>(25)</u> pH maximum, su							
12.7	8.5	—	—	8.5(S)	8.5/9.0	8.5	9.0	9.0
12.8	(25) <u>(26)</u> Radioactive materials							
12.9	See	—	—	See	—	See	See	—
12.10	item E			item E		item E	item E	
12.11	2A	2A	2A	1B	3A/3B	4A	4B	5
12.12	CS	MS	FAV	DC	IC	IR	IR	AN
12.13	<hr/>							
12.14	(26) <u>(27)</u> Salinity, total, mg/L							
12.15	—	—	—	—	—	—	1,000	—
12.16	(27) <u>(28)</u> Sodium, meq/L							
12.17	—	—	—	—	—	60% of	—	—
12.18						total		
12.19						cations		
12.20	(28) <u>(29)</u> Specific conductance at 25°C, µmhos/cm							
12.21	—	—	—	—	—	1,000	—	—
12.22	(29) <u>(30)</u> Sulfate, mg/L							
12.23	—	—	—	250(S)	—	—	—	—
12.24	(30) <u>(31)</u> Sulfates, wild rice present, mg/L							
12.25	—	—	—	—	—	10	—	—

13.1	2A	2A	2A	1B	3A/3B	4A	4B	5
13.2	CS	MS	FAV	DC	IC	IR	IR	AN

13.3

13.4 ~~(31)~~ (32) Temperature, °F

13.5	No material	—	—	—	—	—	—	—
13.6	increase							

13.7 ~~(32)~~ (33) Total dissolved salts, mg/L

13.8	—	—	—	—	—	700	—	—
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13.9 ~~(33)~~ (34) Total dissolved solids, mg/L

13.10	—	—	—	500(S)	—	—	—	—
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13.11 ~~(34)~~ (35) ~~Turbidity, NTU~~ Total suspended solids (TSS), mg/L13.12 ~~10~~ See part13.13 7050.0222,13.14 subpart 2 — — ~~NA~~ — — — — —

13.15 B. METALS AND ELEMENTS

13.16	2A	2A	2A	1B	3A/3B	4A	4B	5
13.17	CS	MS	FAV	DC	IC	IR	LS	AN

13.18

13.19 (1) Aluminum, total, µg/L

13.20	87	748	1,496	50-	—	—	—	—
13.21				200(S)				

13.22 (2) Antimony, total, µg/L

13.23	5.5	90	180	6	—	—	—	—
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13.24 (3) Arsenic, total, µg/L

13.25	2.0	360	720	10	—	—	—	—
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13.26 (4) Barium, total, µg/L

14.1	—	—	—	2,000	—	—	—	—
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14.2	(5) Beryllium, total, µg/L							
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14.3	—	—	—	4.0	—	—	—	—
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14.4	2A	2A	2A	1B	3A/3B	4A	4B	5
14.5	CS	MS	FAV	DC	IC	IR	LS	AN

14.6	<hr/>							
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14.7	(6) Boron, total, µg/L							
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14.8	—	—	—	—	—	500	—	—
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14.9	(7) Cadmium, total, µg/L							
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14.10	1.1	3.9	7.8	5	—	—	—	—
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14.11	Class 2A cadmium standards are hardness dependent. Cadmium values shown are for a							
14.12	total hardness of 100 mg/L only. See part 7050.0222, subpart 2, for examples at other							
14.13	hardness values and equations to calculate cadmium standards for any hardness value							
14.14	not to exceed 400 mg/L.							

14.15	(8) Chromium +3, total, µg/L							
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14.16	207	1,737	3,469	—	—	—	—	—
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14.17	Class 2A trivalent chromium standards are hardness dependent. Chromium +3 values							
14.18	shown are for a total hardness of 100 mg/L only. See part 7050.0222, subpart 2, for							
14.19	examples at other hardness values and equations to calculate trivalent chromium standards							
14.20	for any hardness value not to exceed 400 mg/L.							

14.21	(9) Chromium +6, total, µg/L							
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14.22	11	16	32	—	—	—	—	—
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14.23	(10) Chromium, total, µg/L							
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14.24	—	—	—	100	—	—	—	—
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14.25	2A	2A	2A	1B	3A/3B	4A	4B	5
14.26	CS	MS	FAV	DC	IC	IR	LS	AN

14.27	<hr/>							
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15.1 (11) Cobalt, total, µg/L

15.2 2.8 436 872 – – – – –

15.3 (12) Copper, total, µg/L

15.4 9.8 18 35 1,000 – – – –

15.5 (S)

15.6 Class 2A copper standards are hardness dependent. Copper values shown are for a
15.7 total hardness of 100 mg/L only. See part 7050.0222, subpart 2, for examples at other
15.8 hardness values and equations to calculate copper standards for any hardness value not to
15.9 exceed 400 mg/L.

15.10 (13) Iron, total, µg/L

15.11 – – – 300(S) – – – –

15.12 (14) Lead, total, µg/L

15.13 3.2 82 164 NA – – – –

15.14 Class 2A lead standards are hardness dependent. Lead values shown are for a total hardness
15.15 of 100 mg/L only. See part 7050.0222, subpart 2, for examples at other hardness values
15.16 and equations to calculate lead standards for any hardness value not to exceed 400 mg/L.

15.17 (15) Manganese, total, µg/L

15.18 – – – 50(S) – – – –

15.19 **2A 2A 2A 1B 3A/3B 4A 4B 5**
15.20 **CS MS FAV DC IC IR LS AN**

15.21

15.22 (16) Mercury, total, in water, ng/L

15.23 6.9 2,400* 4,900* 2,000 – – – –

15.24 (17) Mercury, total in edible fish tissue, mg/kg or parts per million

15.25 0.2 – – – – – –

15.26 (18) Nickel, total, µg/L

15.27 158 1,418 2,836 – – – –

16.1 Class 2A nickel standards are hardness dependent. Nickel values shown are for a total
 16.2 hardness of 100 mg/L only. See part 7050.0222, subpart 2, for examples at other hardness
 16.3 values and equations to calculate nickel standards for any hardness value not to exceed
 16.4 400 mg/L.

16.5 (19) Selenium, total, µg/L

16.6	5.0	20	40	50	—	—	—	—
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16.7 (20) Silver, total, µg/L

16.8	0.12	2.0	4.1	100(S)	—	—	—	—
------	------	-----	-----	--------	---	---	---	---

16.9 Class 2A silver MS and FAV are hardness dependent. Silver values shown are for a
 16.10 total hardness of 100 mg/L only. See part 7050.0222, subpart 2, for examples at other
 16.11 hardness values and equations to calculate silver standards for any hardness value not to
 16.12 exceed 400 mg/L.

16.13	2A	2A	2A	1B	3A/3B	4A	4B	5
16.14	CS	MS	FAV	DC	IC	IR	LS	AN

16.15

16.16 (21) Thallium, total, µg/L

16.17	0.28	64	128	2	—	—	—	—
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16.18 (22) Zinc, total, µg/L

16.19	106	117	234	5,000	—	—	—	—
16.20				(S)				

16.21 Class 2A zinc standards are hardness dependent. Zinc values shown are for a total hardness
 16.22 of 100 mg/L only. See part 7050.0222, subpart 2, for examples at other hardness values
 16.23 and equations to calculate zinc standards for any hardness value not to exceed 400 mg/L.

16.24 C. ORGANIC POLLUTANTS OR CHARACTERISTICS

16.25	2A	2A	2A	1B	3A/3B	4A	4B	5
16.26	CS	MS	FAV	DC	IC	IR	LS	AN

16.27

16.28 (1) Acenaphthene, µg/L

16.29	20	56	112	—	—	—	—	—
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17.1	(2) Acetochlor, µg/L							
17.2	3.6	86	173	—	—	—	—	—
17.3	(3) Acrylonitrile (c), µg/L							
17.4	0.38	1,140*	2,281*	—	—	—	—	—
17.5	(4) Alachlor (c), µg/L							
17.6	3.8	800*	1,600*	2	—	—	—	—
17.7	(5) Aldicarb, µg/L							
17.8	—	—	—	3	—	—	—	—
17.9	2A	2A	2A	1B	3A/3B	4A	4B	5
17.10	CS	MS	FAV	DC	IC	IR	LS	AN
17.11	<hr/>							
17.12	(6) Aldicarb sulfone, µg/L							
17.13	—	—	—	2	—	—	—	—
17.14	(7) Aldicarb sulfoxide, µg/L							
17.15	—	—	—	4	—	—	—	—
17.16	(8) Anthracene, µg/L							
17.17	0.035	0.32	0.63	—	—	—	—	—
17.18	(9) Atrazine (c), µg/L							
17.19	3.4	323	645	3	—	—	—	—
17.20	(10) Benzene (c), µg/L							
17.21	5.1	4,487*	8,974*	5	—	—	—	—
17.22	2A	2A	2A	1B	3A/3B	4A	4B	5
17.23	CS	MS	FAV	DC	IC	IR	LS	AN
17.24	<hr/>							
17.25	(11) Benzo(a)pyrene, µg/L							

18.1	—	—	—	0.2	—	—	—	—
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18.2	(12) Bromoform, µg/L							
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18.3	33	2,900	5,800	See sub-	—	—	—	—
18.4	item (73)							

18.5	(13) Carbofuran, µg/L							
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18.6	—	—	—	40	—	—	—	—
------	---	---	---	----	---	---	---	---

18.7	(14) Carbon tetrachloride (c), µg/L							
------	-------------------------------------	--	--	--	--	--	--	--

18.8	1.9	1,750*	3,500*	5	—	—	—	—
------	-----	--------	--------	---	---	---	---	---

18.9	(15) Chlordane (c), ng/L							
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18.10	0.073	1,200*	2,400*	2,000	—	—	—	—
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18.11	2A	2A	2A	1B	3A/3B	4A	4B	5
18.12	CS	MS	FAV	DC	IC	IR	LS	AN

18.13	<hr/>							
-------	-------	--	--	--	--	--	--	--

18.14	(16) Chlorobenzene, µg/L (Monochlorobenzene)							
-------	--	--	--	--	--	--	--	--

18.15	20	423	846	100	—	—	—	—
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18.16	(17) Chloroform (c), µg/L							
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18.17	53	1,392	2,784	See sub-	—	—	—	—
18.18	item (73)							

18.19	(18) Chlorpyrifos, µg/L							
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18.20	0.041	0.083	0.17	—	—	—	—	—
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18.21	(19) Dalapon, µg/L							
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18.22	—	—	—	200	—	—	—	—
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18.23	(20) DDT (c), ng/L							
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18.24	0.11	550*	1,100*	—	—	—	—	—
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19.1	2A	2A	2A	1B	3A/3B	4A	4B	5
19.2	CS	MS	FAV	DC	IC	IR	LS	AN

19.3

19.4 (21) 1,2-Dibromo-3-chloropropane (c), µg/L

19.5	—	—	—	0.2	—	—	—	—
------	---	---	---	-----	---	---	---	---

19.6 (22) Dichlorobenzene (ortho), µg/L

19.7	—	—	—	600	—	—	—	—
------	---	---	---	-----	---	---	---	---

19.8 (23) 1,4-Dichlorobenzene (para) (c), µg/L

19.9	—	—	—	75	—	—	—	—
------	---	---	---	----	---	---	---	---

19.10 (24) 1,2-Dichloroethane (c), µg/L

19.11	3.5	45,050*	90,100*	5	—	—	—	—
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19.12 (25) 1,1-Dichloroethylene, µg/L

19.13	—	—	—	7	—	—	—	—
-------	---	---	---	---	---	---	---	---

19.14	2A	2A	2A	1B	3A/3B	4A	4B	5
19.15	CS	MS	FAV	DC	IC	IR	LS	AN

19.16

19.17 (26) 1,2-Dichloroethylene (cis), µg/L

19.18	—	—	—	70	—	—	—	—
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19.19 (27) 1,2-Dichloroethylene (trans), µg/L

19.20	—	—	—	100	—	—	—	—
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19.21 (28) 2,4-Dichlorophenoxyacetic acid (2,4-D), µg/L

19.22	—	—	—	70	—	—	—	—
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19.23 (29) 1,2-Dichloropropane (c), µg/L

19.24	—	—	—	5	—	—	—	—
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19.25 (30) Dieldrin (c), ng/L

20.1	0.0065	1,300*	2,500*	—	—	—	—	—
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20.2	2A	2A	2A	1B	3A/3B	4A	4B	5
20.3	CS	MS	FAV	DC	IC	IR	LS	AN

20.4

20.5 (31) Di-2-ethylhexyl adipate, µg/L

20.6	—	—	—	400	—	—	—	—
------	---	---	---	-----	---	---	---	---

20.7 (32) Di-2-ethylhexyl phthalate (c), µg/L

20.8	1.9	—*	—*	6	—	—	—	—
------	-----	----	----	---	---	---	---	---

20.9 (33) Di-n-Octyl phthalate, µg/L

20.10	30	825	1,650	—	—	—	—	—
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20.11 (34) Dinoseb, µg/L

20.12	—	—	—	7	—	—	—	—
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20.13 (35) Diquat, µg/L

20.14	—	—	—	20	—	—	—	—
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20.15	2A	2A	2A	1B	3A/3B	4A	4B	5
20.16	CS	MS	FAV	DC	IC	IR	LS	AN

20.17

20.18 (36) Endosulfan, µg/L

20.19	0.0076	0.084	0.17	—	—	—	—	—
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20.20 (37) Endothall, µg/L

20.21	—	—	—	100	—	—	—	—
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20.22 (38) Endrin, µg/L

20.23	0.0039	0.090	0.18	2	—	—	—	—
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20.24 (39) Ethylbenzene (c), µg/L

21.1	68	1,859	3,717	700	—	—	—	—
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21.2	(40) Ethylene dibromide, µg/L							
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21.3	—	—	—	0.05	—	—	—	—
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21.4	2A	2A	2A	1B	3A/3B	4A	4B	5
21.5	CS	MS	FAV	DC	IC	IR	LS	AN

21.6	<hr/>							
------	-------	--	--	--	--	--	--	--

21.7	(41) Fluoranthene, µg/L							
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21.8	1.9	3.5	6.9	—	—	—	—	—
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21.9	(42) Glyphosate, µg/L							
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21.10	—	—	—	700	—	—	—	—
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21.11	(43) Haloacetic acids (c), µg/L (Bromoacetic acid, Dibromoacetic acid, Dichloroacetic acid, Monochloroacetic acid, and Trichloroacetic acid)							
21.12								

21.13	—	—	—	60	—	—	—	—
-------	---	---	---	----	---	---	---	---

21.14	(44) Heptachlor (c), ng/L							
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21.15	0.10	260*	520*	400	—	—	—	—
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21.16	(45) Heptachlor epoxide (c), ng/L							
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21.17	0.12	270*	530*	200	—	—	—	—
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21.18	2A	2A	2A	1B	3A/3B	4A	4B	5
21.19	CS	MS	FAV	DC	IC	IR	LS	AN

21.20	<hr/>							
-------	-------	--	--	--	--	--	--	--

21.21	(46) Hexachlorobenzene (c), ng/L							
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21.22	0.061	—*	—*	1,000	—	—	—	—
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21.23	(47) Hexachlorocyclopentadiene, µg/L							
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21.24	—	—	—	50	—	—	—	—
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21.25	(48) Lindane (c), µg/L (Hexachlorocyclohexane, gamma-)							
-------	--	--	--	--	--	--	--	--

22.1	0.0087	1.0*	2.0*	0.2	—	—	—	—
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22.2	(49) Methoxychlor, µg/L							
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22.3	—	—	—	40	—	—	—	—
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22.4	(50) Methylene chloride (c), µg/L (Dichloromethane)							
------	---	--	--	--	--	--	--	--

22.5	45	13,875*	27,749*	5	—	—	—	—
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22.6	2A	2A	2A	1B	3A/3B	4A	4B	5
22.7	CS	MS	FAV	DC	IC	IR	LS	AN

22.8	<hr/>							
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22.9	(51) Metolachlor							
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22.10	23	271	543	—	—	—	—	—
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22.11	(52) Naphthalene, µg/L							
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22.12	65	409	818	—	—	—	—	—
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22.13	(53) Oxamyl, µg/L (Vydate)							
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22.14	—	—	—	200	—	—	—	—
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22.15	(54) Parathion, µg/L							
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22.16	0.013	0.07	0.13	—	—	—	—	—
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22.17	(55) Pentachlorophenol, µg/L							
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22.18	0.93	15	30	1	—	—	—	—
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22.19	Class 2A MS and FAV are pH dependent. Pentachlorophenol values shown are for a pH of 7.5 only. See part 7050.0222, subpart 2, for examples at other pH values and equations to calculate pentachlorophenol standards for any pH value.							
22.20								
22.21								

22.22	2A	2A	2A	1B	3A/3B	4A	4B	5
22.23	CS	MS	FAV	DC	IC	IR	LS	AN

22.24	<hr/>							
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22.25	(56) Phenanthrene, µg/L							
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23.1	3.6	32	64	—	—	—	—	—
23.2	(57) Phenol, µg/L							
23.3	123	2,214	4,428	—	—	—	—	—
23.4	(58) Picloram, µg/L							
23.5	—	—	—	500	—	—	—	—
23.6	(59) Polychlorinated biphenyls (c), ng/L (PCBs, total)							
23.7	0.014	1,000*	2,000*	500	—	—	—	—
23.8	(60) Simazine, µg/L							
23.9	—	—	—	4	—	—	—	—
23.10	2A	2A	2A	1B	3A/3B	4A	4B	5
23.11	CS	MS	FAV	DC	IC	IR	LS	AN
23.12	<hr/>							
23.13	(61) Styrene (c), µg/L							
23.14	—	—	—	100	—	—	—	—
23.15	(62) 2,3,7,8-Tetrachlorodibenzo-p-dioxin, ng/L (TCDD-dioxin)							
23.16	—	—	—	0.03	—	—	—	—
23.17	(63) 1,1,2,2-Tetrachloroethane (c), µg/L							
23.18	1.1	1,127*	2,253*	—	—	—	—	—
23.19	(64) Tetrachloroethylene (c), µg/L							
23.20	3.8	428*	857*	5	—	—	—	—
23.21	(65) Toluene, µg/L							
23.22	253	1,352	2,703	1,000	—	—	—	—

24.1	2A	2A	2A	1B	3A/3B	4A	4B	5
24.2	CS	MS	FAV	DC	IC	IR	LS	AN

24.3

24.4 (66) Toxaphene (c), ng/L

24.5	0.31	730*	1,500*	3,000	—	—	—	—
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24.6 (67) 2,4,5-TP, µg/L (Silvex)

24.7	—	—	—	50	—	—	—	—
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24.8 (68) 1,2,4-Trichlorobenzene, µg/L

24.9	—	—	—	70	—	—	—	—
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24.10 (69) 1,1,1-Trichloroethane, µg/L

24.11	329	2,957	5,913	200	—	—	—	—
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24.12 (70) 1,1,2-Trichloroethane, µg/L

24.13	—	—	—	5	—	—	—	—
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24.14	2A	2A	2A	1B	3A/3B	4A	4B	5
24.15	CS	MS	FAV	DC	IC	IR	LS	AN

24.16

24.17 (71) 1,1,2-Trichloroethylene (c), µg/L

24.18	25	6,988	13,976*	5	—	—	—	—
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24.19 (72) 2,4,6-Trichlorophenol, µg/L

24.20	2.0	102	203	—	—	—	—	—
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24.21 (73) Trihalomethanes, total (c), µg/L (Bromodichloromethane, Bromoform,
24.22 Chlorodibromomethane, and Chloroform)

24.23	—	—	—	80	—	—	—	—
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24.24 (74) Vinyl chloride (c), µg/L

24.25	0.17	—*	—*	2	—	—	—	—
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25.1 (75) Xylenes, total, µg/L

25.2 166 1,407 2,814 10,000 – – – –

25.3 [For text of items D and E, see M.R.]

25.4 Subp. 4. [Repealed, 24 SR 1105]

25.5 Subp. 4a. **Cool and warm water sport fish, drinking water, and associated use**

25.6 **classes.** Water quality standards applicable to use Classes 1B or 1C, 2Bd, 3A or 3B,

25.7 4A and 4B, and 5 surface waters.

25.8 A. MISCELLANEOUS SUBSTANCE, CHARACTERISTIC, OR POLLUTANT

25.9	2Bd	2Bd	2Bd	1B/1C	3A/3B	4A	4B	5
25.10	CS	MS	FAV	DC	IC	IR	LS	AN

25.12 (1) Ammonia, un-ionized as N, µg/L

25.13 40 – – – – – – –

25.14 (2) Asbestos, >10 µm (c), fibers/L

25.15 – – – 7.0e+06 – – – –

25.16 (3) Bicarbonates (HCO₃), meq/L

25.17 – – – – – 5 – –

25.18 (4) Bromate, µg/L

25.19 – – – 10 – – – –

25.20 (5) Chloride, mg/L

25.21 230 860 1,720 250(S) 50/100 – – –

25.22	2Bd	2Bd	2Bd	1B/1C	3A/3B	4A	4B	5
25.23	CS	MS	FAV	DC	IC	IR	LS	AN

25.25 (6) Chlorine, total residual, µg/L

26.1	11	19	38	—	—	—	—	—
26.2	(7) Chlorite, µg/L							
26.3	—	—	—	1,000	—	—	—	—
26.4	(8) Color, Pt-Co							
26.5	—	—	—	15(S)	—	—	—	—
26.6	(9) Cyanide, free, µg/L							
26.7	5.2	22	45	200	—	—	—	—
26.8	(10) <i>Escherichia (E.) coli</i> bacteria, organisms/100 mL							
26.9	See	—	—	—	—	—	—	—
26.10	item D							
26.11	2Bd	2Bd	2Bd	1B/1C	3A/3B	4A	4B	5
26.12	CS	MS	FAV	DC	IC	IR	LS	AN
26.13								
26.14	(11) Eutrophication standards for lakes, shallow lakes, and reservoirs (phosphorus, total,							
26.15	µg/L; chlorophyll-a, µg/L; Secchi depth <u>disk</u> transparency, meters):							
26.16	See part	—	—	—	—	—	—	—
26.17	7050.0222,							
26.18	subparts							
26.19	3 and 3a							
26.20	(12) Eutrophication standards for rivers, streams, and navigational pools (phosphorus,							
26.21	<u>total µg/L; chlorophyll-a (seston), µg/L; five-day biochemical oxygen demand (BOD₅),</u>							
26.22	<u>mg/L; diel dissolved oxygen flux, mg/L; chlorophyll-a (periphyton), mg/m²)</u>							
26.23	See part	=	=	=	=	=	=	=
26.24	<u>7050.0222,</u>							
26.25	<u>subparts 3</u>							
26.26	<u>and 3b</u>							
26.27	(12) (13) Fluoride, mg/L							
26.28	—	—	—	4	—	—	—	—

27.1	(13) <u>(14)</u> Fluoride, mg/L							
27.2	—	—	—	2(S)	—	—	—	—
27.3	(14) <u>(15)</u> Foaming agents, µg/L							
27.4	—	—	—	500(S)	—	—	—	—
27.5	(15) <u>(16)</u> Hardness, Ca+Mg as CaCO ₃ , mg/L							
27.6	—	—	—	—	50/250	—	—	—
27.7	2Bd	2Bd	2Bd	1B/1C	3A/3B	4A	4B	5
27.8	CS	MS	FAV	DC	IC	IR	LS	AN
27.9	<hr/>							
27.10	(16) <u>(17)</u> Hydrogen sulfide, mg/L							
27.11	—	—	—	—	—	—	—	0.02
27.12	(17) <u>(18)</u> Nitrate as N, mg/L							
27.13	—	—	—	10	—	—	—	—
27.14	(18) <u>(19)</u> Nitrite as N, mg/L							
27.15	—	—	—	1	—	—	—	—
27.16	(19) <u>(20)</u> Nitrate + Nitrite as N, mg/L							
27.17	—	—	—	10	—	—	—	—
27.18	(20) <u>(21)</u> Odor, TON							
27.19	—	—	—	3(S)	—	—	—	—
27.20	2Bd	2Bd	2Bd	1B/1C	3A/3B	4A	4B	5
27.21	CS	MS	FAV	DC	IC	IR	LS	AN
27.22	<hr/>							
27.23	(21) <u>(22)</u> Oil, µg/L							
27.24	500	5,000	10,000	—	—	—	—	—
27.25	(22) <u>(23)</u> Oxygen, dissolved, mg/L							

28.1	See part	—	—	—	—	—	—	—
28.2	7050.0222,							
28.3	subpart 3							
28.4	(23) <u>(24)</u> pH minimum, su							
28.5	6.5	—	—	6.5(S)	6.5/6.0	6.0	6.0	6.0
28.6	(24) <u>(25)</u> pH maximum, su							
28.7	9.0	—	—	8.5(S)	8.5/9.0	8.5	9.0	9.0
28.8	(25) <u>(26)</u> Radioactive materials							
28.9	See	—	—	See	—	See	See	—
28.10	item E			item E		item E	item E	
28.11	2Bd	2Bd	2Bd	1B/1C	3A/3B	4A	4B	5
28.12	CS	MS	FAV	DC	IC	IR	LS	AN
28.13	<hr/>							
28.14	(26) <u>(27)</u> Salinity, total, mg/L							
28.15	—	—	—	—	—	—	1,000	—
28.16	(27) <u>(28)</u> Sodium, meq/L							
28.17	—	—	—	—	—	60% of	—	—
28.18						total		
28.19						cations		
28.20	(28) <u>(29)</u> Specific conductance at 25°C, µmhos/cm							
28.21	—	—	—	—	—	1,000	—	—
28.22	(29) <u>(30)</u> Sulfate, mg/L							
28.23	—	—	—	250(S)	—	—	—	—
28.24	(30) <u>(31)</u> Sulfates, wild rice present, mg/L							
28.25	—	—	—	—	—	10	—	—

29.1	2Bd	2Bd	2Bd	1B/1C	3A/3B	4A	4B	5
29.2	CS	MS	FAV	DC	IC	IR	LS	AN

29.3

29.4 ~~(31)~~ (32) Temperature, °F

29.5	See	—	—	—	—	—	—	—
29.6	item F							

29.7 ~~(32)~~ (33) Total dissolved salts, mg/L

29.8	—	—	—	—	—	700	—	—
------	---	---	---	---	---	-----	---	---

29.9 ~~(33)~~ (34) Total dissolved solids, mg/L

29.10	—	—	—	500(S)	—	—	—	—
-------	---	---	---	--------	---	---	---	---

29.11 ~~(34)~~ (35) ~~Turbidity, NTU~~ Total suspended solids (TSS), mg/L29.12 ~~25~~ See part29.13 7050.0222,29.14 subpart 3 — — ~~NA~~ — — — — —

29.15 [For text of items B to F, see M.R.]

29.16 Subp. 5. [Repealed, 24 SR 1105]

29.17 Subp. 5a. **Cool and warm water sport fish and associated use classes.** Water

29.18 quality standards applicable to use Classes 2B, 2C, or 2D; 3A, 3B, or 3C; 4A and 4B; and

29.19 5 surface waters. See parts 7050.0223, subpart 5; 7050.0224, subpart 4; and 7050.0225,

29.20 subpart 2, for Class 3D, 4C, and 5 standards applicable to wetlands, respectively.

29.21 A. MISCELLANEOUS SUBSTANCE, CHARACTERISTIC, OR POLLUTANT

29.22	2B,C&D	2B,C&D	2B,C&D	3A/3B/3C	4A	4B	5
29.23	CS	MS	FAV	IC	IR	LS	AN

29.24

29.25 (1) Ammonia, un-ionized as N, µg/L

29.26	40	—	—	—	—	—	—
-------	----	---	---	---	---	---	---

30.1	(2) Bicarbonates (HCO ₃), meq/L						
30.2	—	—	—	—	5	—	—
30.3	(3) Chloride, mg/L						
30.4	230	860	1,720	50/100/250	—	—	—
30.5	(4) Chlorine, total residual, µg/L						
30.6	11	19	38	—	—	—	—
30.7	(5) Cyanide, free, µg/L						
30.8	5.2	22	45	—	—	—	—
30.9	2B,C&D	2B,C&D	2B,C&D	3A/3B/3C	4A	4B	5
30.10	CS	MS	FAV	IC	IR	LS	AN
30.11	<hr/>						
30.12	(6) <i>Escherichia (E.) coli</i> bacteria, organisms/100 mL						
30.13	See	—	—	—	—	—	—
30.14	item D						
30.15	(7) Eutrophication standards for lakes, shallow lakes, and reservoirs (phosphorus, total,						
30.16	µg/L; chlorophyll-a, µg/L; Secchi depth <u>disk</u> transparency, meters)						
30.17	See part	—	—	—	—	—	—
30.18	7050.0222,						
30.19	subparts						
30.20	4, 4a, and						
30.21	5						
30.22	(8) <u>Eutrophication standards for rivers, streams, and navigational pools (phosphorus, total</u>						
30.23	<u>µg/L; chlorophyll-a (seston), µg/L; five-day biochemical oxygen demand (BOD₅), mg/L;</u>						
30.24	<u>diel dissolved oxygen flux, mg/L; chlorophyll-a (periphyton), mg/m²)</u>						
30.25	<u>See part</u>	=	=	=	=	=	=
30.26	<u>7050.0222,</u>						
30.27	<u>subparts 4</u>						
30.28	<u>and 4b</u>						

31.1	(8) <u>(9)</u> Hardness, Ca+Mg as CaCO ₃ , mg/L						
31.2	—	—	—	50/250/500	—	—	—
31.3	(9) <u>(10)</u> Hydrogen sulfide, mg/L						
31.4	—	—	—	—	—	—	0.02
31.5	(10) <u>(11)</u> Oil, µg/L						
31.6	500	5,000	10,000	—	—	—	—
31.7	2B,C&D	2B,C&D	2B,C&D	3A/3B/3C	4A	4B	5
31.8	CS	MS	FAV	IC	IR	LS	AN
31.9	<hr/>						
31.10	(11) <u>(12)</u> Oxygen, dissolved, mg/L						
31.11	See part	—	—	—	—	—	—
31.12	7050.0222,						
31.13	subparts						
31.14	4 to 6						
31.15	(12) <u>(13)</u> pH minimum, su						
31.16	6.5	—	—	6.5/6.0/6.0	6.0	6.0	6.0
31.17	See						
31.18	item E						
31.19	(13) <u>(14)</u> pH maximum, su						
31.20	9.0	—	—	8.5/9.0/9.0	8.5	9.0	9.0
31.21	See						
31.22	item E						
31.23	(14) <u>(15)</u> Radioactive materials						
31.24	See	—	—	—	See	See	—
31.25	item F				item F	item F	
31.26	(15) <u>(16)</u> Salinity, total, mg/L						
31.27	—	—	—	—	—	1,000	—

32.1	2B,C&D	2B,C&D	2B,C&D	3A/3B/3C	4A	4B	5
32.2	CS	MS	FAV	IC	IR	LS	AN

32.3

32.4 ~~(16)~~ (17) Sodium, meq/L

32.5	—	—	—	—	60% of	—	—
32.6					total		
32.7					cations		

32.8 ~~(17)~~ (18) Specific conductance at 25°C, μ mhos/cm

32.9	—	—	—	—	1,000	—	—
------	---	---	---	---	-------	---	---

32.10 ~~(18)~~ (19) Sulfates, wild rice present, mg/L

32.11	—	—	—	—	10	—	—
-------	---	---	---	---	----	---	---

32.12 ~~(19)~~ (20) Temperature, °F

32.13	See	—	—	—	—	—	—
32.14	item G						

32.15 ~~(20)~~ (21) Total dissolved salts, mg/L

32.16	—	—	—	—	700	—	—
-------	---	---	---	---	-----	---	---

32.17 ~~(21)~~ (22) ~~Turbidity, NTU~~ Total suspended solids (TSS), mg/L32.18 2532.19 See part32.20 7050.0222,

32.21	<u>subpart 4</u>	—	—	—	—	—	—
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32.22 [For text of items B to G, see M.R.]

32.23 Subp. 6. [Repealed, 24 SR 1105]

32.24 Subp. 6a. **Limited resource value waters and associated use classes.**

32.25 A. WATER QUALITY STANDARDS APPLICABLE TO USE CLASSES 3C, 4A, 4B,

32.26 5, AND 7 SURFACE WATERS

33.1	7	3C	4A	4B	5
33.2	LIMITED	1C	1R	LS	AN
33.3	RESOURCE				
33.4	VALUE				
33.5	<hr/>				
33.6	(1) Bicarbonates (HCO ₃), meq/L				
33.7	—	—	5	—	—
33.8	(2) Boron, µg/L				
33.9	—	—	500	—	—
33.10	(3) Chloride, mg/L				
33.11	—	250	—	—	—
33.12	(4) <i>Escherichia (E.) coli</i> bacteria, organisms/100 mL				
33.13	See item € <u>B</u>	—	—	—	—
33.14	(5) Hardness, Ca+Mg as CaCO ₃ , mg/L				
33.15	—	500	—	—	—
33.16	7	3C	4A	4B	5
33.17	LIMITED	1C	1R	LS	AN
33.18	RESOURCE				
33.19	VALUE				
33.20	<hr/>				
33.21	(6) Hydrogen sulfide, mg/L				
33.22	—	—	—	—	0.02
33.23	(7) Oxygen, dissolved, mg/L				
33.24	See item C	—	—	—	—
33.25	(8) pH minimum, su				
33.26	6.0	6.0	6.0	6.0	6.0

34.1	(9) pH maximum, su				
34.2	9.0	9.0	8.5	9.0	9.0
34.3	(10) Radioactive materials				
34.4	—	—	See item D	See item D	—
34.5	7	3C	4A	4B	5
34.6	LIMITED	1C	1R	LS	AN
34.7	RESOURCE				
34.8	VALUE				
34.9	<hr/>				
34.10	(11) Salinity, total, mg/L				
34.11	—	—	—	1,000	—
34.12	(12) Sodium, meq/L				
34.13	—	—	60% of	—	—
34.14			total		
34.15			cations		
34.16	(13) Specific conductance at 25°C, µmhos/cm				
34.17	—	—	1,000	—	—
34.18	(14) Sulfates, wild rice present, mg/L				
34.19	—	—	10	—	—
34.20	(15) Total dissolved salts, mg/L				
34.21	—	—	700	—	—
34.22	(16) Toxic pollutants				
34.23	See item E	—	—	—	—
34.24	<u>[For text of items B to E, see M.R.]</u>				
34.25	Subp. 7. Site-specific modifications of standards.				
34.26	<u>[For text of items A to C, see M.R.]</u>				

35.1 D. Through the procedures established in items A to C, the following
35.2 site-specific reservoir eutrophication standards apply to Lake Pepin (25-0001-00) in lieu
35.3 of the water quality standards listed in this part and part 7050.0222:

35.4 (1) Phosphorus, total µg/L less than or equal to 100

35.5 (2) Chlorophyll-a (seston) µg/L less than or equal to 28

35.6 **7050.0221 SPECIFIC WATER QUALITY STANDARDS FOR CLASS 1 WATERS**
35.7 **OF THE STATE; DOMESTIC CONSUMPTION.**

35.8 Subpart 1. **General.**

35.9 [For text of item A, see M.R.]

35.10 B. The Class 1 standards in this part are the United States Environmental
35.11 Protection Agency primary (maximum contaminant levels) and secondary drinking water
35.12 standards, as contained in Code of Federal Regulations, title 40, parts 141 and 143, as
35.13 amended ~~through July 1, 2006~~. These Environmental Protection Agency drinking water
35.14 standards are adopted and incorporated by reference with the exceptions in this item. The
35.15 following standards are not applicable to Class 1 ground waters: the primary drinking
35.16 water standards for acrylamide, epichlorohydrin, copper, and lead (treatment technique
35.17 standards) and standards in the disinfectants and disinfection by-products categories. The
35.18 following standards are not applicable to Class 1 surface waters: the primary drinking water
35.19 standards for acrylamide, epichlorohydrin, copper, lead, and turbidity (treatment technique
35.20 standards) and the standards in the disinfectants and microbiological organisms categories.

35.21 [For text of subps 2 to 6, see M.R.]

35.22 **7050.0222 SPECIFIC WATER QUALITY STANDARDS FOR CLASS 2 WATERS**
35.23 **OF THE STATE; AQUATIC LIFE AND RECREATION.**

35.24 [For text of subp 1, see M.R.]

35.25 Subp. 2. **Class 2A waters; aquatic life and recreation.** The quality of Class 2A
35.26 surface waters shall be such as to permit the propagation and maintenance of a healthy

36.1 community of cold water sport or commercial fish and associated aquatic life, and their
 36.2 habitats. These waters shall be suitable for aquatic recreation of all kinds, including
 36.3 bathing, for which the waters may be usable. This class of surface waters is also protected
 36.4 as a source of drinking water. Abbreviations, acronyms, and symbols are explained in
 36.5 subpart 1.

36.6	Substance,						Basis
36.7	Characteristic,			Basis			for
36.8	or Pollutant			for CS	MS	FAV	MS,
36.9	(Class 2A)	Units	CS				FAV
36.10							
36.11	Acenaphthene	µg/L	20	HH	56	112	Tox
36.12	Acetochlor	µg/L	3.6	Tox	86	173	Tox
36.13	Acrylonitrile (c)	µg/L	0.38	HH	1,140*	2,281*	Tox
36.14	Alachlor (c)	µg/L	3.8	HH	800*	1,600*	Tox
36.15	Aluminum, total	µg/L	87	Tox	748	1,496	Tox
36.16	Ammonia un-ionized as N	µg/L	16	Tox	—	—	NA

36.17 The percent un-ionized ammonia can be calculated for any temperature and pH by
 36.18 using the following equation taken from Emerson, K., R.C. Russo, R.E. Lund, and R.V.
 36.19 Thurston, Aqueous ammonia equilibrium calculations; effect of pH and temperature.
 36.20 Journal of the Fisheries Research Board of Canada 32: 2379-2383 (1975):

$$f = \frac{1}{10^{(pk_a - pH)} + 1} \times 100$$

$$10^{(pk_a - pH)} + 1$$

36.25 where: f = the percent of total ammonia in the un-ionized state

36.26 $pk_a = 0.09 + (2730/T)$ (dissociation constant for ammonia)

36.27 T = temperature in degrees Kelvin (273.16° Kelvin = 0° Celsius)

37.1	Substance,						Basis
37.2	Characteristic,						for
37.3	or Pollutant			Basis			MS,
37.4	(Class 2A)	Units	CS	for CS	MS	FAV	FAV
37.5							
37.6	Anthracene	µg/L	0.035	Tox	0.32	0.63	Tox
37.7	Antimony, total	µg/L	5.5	HH	90	180	Tox
37.8	Arsenic, total	µg/L	2.0	HH	360	720	Tox
37.9	Atrazine (c)	µg/L	3.4	HH	323	645	Tox
37.10	Benzene (c)	µg/L	5.1	HH	4,487*	8,974*	Tox
37.11	Bromoform	µg/L	33	HH	2,900	5,800	Tox
37.12	Cadmium, total	µg/L	equation	Tox	equation	equation	Tox
37.13	The CS, MS, and FAV vary with total hardness and are calculated using the following						
37.14	equations:						
37.15	The CS in µg/L shall not exceed: $\exp.(0.7852[\ln(\text{total hardness mg/L})]-3.490)$						
37.16	The MS in µg/L shall not exceed: $\exp.(1.128[\ln(\text{total hardness mg/L})]-3.828)$						
37.17	The FAV in µg/L shall not exceed: $\exp.(1.128[\ln(\text{total hardness mg/L})]-3.1349)$						
37.18	Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.						
37.19	For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate						
37.20	the standard.						
37.21	Example of total cadmium standards for five hardness values:						
37.22	TH in mg/L	50	100	200	300	400	
37.23							
37.24	Cadmium, total						
37.25	CS µg/L	0.66	1.1	2.0	2.7	3.4	
37.26	MS µg/L	1.8	3.9	8.6	14	19	
37.27	FAV µg/L	3.6	7.8	17	27	37	

38.1	38.2	38.3	38.4	38.5	38.6	38.7	38.8
Substance, Characteristic, or Pollutant (Class 2A)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV	
Carbon tetrachloride (c)	µg/L	1.9	HH	1750*	3500*	Tox	
Chlordane (c)	ng/L	0.073	HH	1200*	2400*	Tox	
Chloride	mg/L	230	Tox	860	1720	Tox	
Chlorine, total residual	µg/L	11	Tox	19	38	Tox	
Chlorine standard applies to conditions of continuous exposure, where continuous exposure refers to chlorinated effluents that are discharged for more than a total of two hours in any 24-hour period.							
Chlorobenzene (Monochlorobenzene)	µg/L	20	HH	423	846	Tox	
Chloroform (c)	µg/L	53	HH	1,392	2,784	Tox	
Chlorpyrifos	µg/L	0.041	Tox	0.083	0.17	Tox	
Chromium +3, total	µg/L	equation	Tox	equation	equation	Tox	
The CS, MS, and FAV vary with total hardness and are calculated using the following equations:							
The CS in µg/L shall not exceed: $\exp.(0.819[\ln(\text{total hardness mg/L})]+1.561)$							
The MS in µg/L shall not exceed: $\exp.(0.819[\ln(\text{total hardness mg/L})]+3.688)$							
The FAV in µg/L shall not exceed: $\exp.(0.819[\ln(\text{total hardness mg/L})]+4.380)$							
Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.							
For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.							
Example of total chromium +3 standards for five total hardness values:							
TH in mg/L	50	100	200	300	400		
Chromium +3, total							

39.1	CS g/L <u>µg/L</u>	117	207	365	509	644
39.2	MS µg/L	984	1,737	3,064	4,270	5,405
39.3	FAV µg/L	1,966	3,469	6,120	8,530	10,797

39.4	Substance,						Basis
39.5	Characteristic,						for
39.6	or Pollutant			Basis			MS,
39.7	(Class 2A)	Units	CS	for CS	MS	FAV	FAV

39.8	<hr/>						
39.9	Chromium +6, total	µg/L	11	Tox	16	32	Tox
39.10	Cobalt, total	µg/L	2.8	HH	436	872	Tox
39.11	Color value	Pt/Co	30	NA	—	—	NA
39.12	Copper, total	µg/L	equation	Tox	equation	equation	Tox

39.13 The CS, MS, and FAV vary with total hardness and are calculated using the following
39.14 equations:

39.15 The CS in µg/L shall not exceed: $\exp.(0.620[\ln(\text{total hardness mg/L})]-0.570)$

39.16 The MS in µg/L shall not exceed: $\exp.(0.9422[\ln(\text{total hardness mg/L})]-1.464)$

39.17 The FAV in µg/L shall not exceed: $\exp.(0.9422[\ln(\text{total hardness mg/L})]-0.7703)$

39.18 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

39.19 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
39.20 the standard.

39.21 Example of total copper standards for five total hardness values:

39.22	TH in mg/L	50	100	200	300	400
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39.23

39.24 Copper, total

39.25	CS µg/L	6.4	9.8	15	19	23
39.26	MS µg/L	9.2	18	34	50	65
39.27	FAV µg/L	18	35	68	100	131

40.1	Substance,						Basis
40.2	Characteristic,						for
40.3	or Pollutant			Basis			MS,
40.4	(Class 2A)	Units	CS	for CS	MS	FAV	FAV
40.5							
40.6	Cyanide, free	µg/L	5.2	Tox	22	45	Tox
40.7	DDT (c)	ng/L	0.11	HH	550*	1100*	Tox
40.8	1,2-Dichloroethane (c)	µg/L	3.5	HH	45,050*	90,100*	Tox
40.9	Dieldrin (c)	ng/L	0.0065	HH	1,300*	2,500*	Tox
40.10	Di-2-ethylhexyl phthalate (c)	µg/L	1.9	HH	—*	—*	NA
40.11	Di-n-octyl phthalate	µg/L	30	Tox	825	1,650	Tox
40.12	Endosulfan	µg/L	0.0076	HH	0.084	0.17	Tox
40.13	Endrin	µg/L	0.0039	HH	0.090	0.18	Tox
40.14	<i>Escherichia (E.) coli</i>	See	See	HH	See	See	NA
40.15		below	below		below	below	
40.16	Not to exceed 126 organisms per 100 milliliters as a geometric mean of not less						
40.17	than five samples representative of conditions within any calendar month, nor shall						
40.18	more than ten percent of all samples taken during any calendar month individually						
40.19	exceed 1,260 organisms per 100 milliliters. The standard applies only between April						
40.20	1 and October 31.						
40.21	Ethylbenzene	µg/L	68	Tox	1,859	3,717	Tox
40.22	Substance,						Basis
40.23	Characteristic,						for
40.24	or Pollutant			Basis			MS,
40.25	(Class 2A)	Units	CS	for CS	MS	FAV	FAV
40.26							
40.27	Eutrophication standards for Class 2A lakes and reservoirs. See definitions in part						
40.28	7050.0150, subpart 4, and ecoregion map in part 7050.0467.						
40.29	Designated lake trout lakes in all ecoregions (lake trout lakes support natural populations						
40.30	of lake trout, <i>Salvelinus namaycush</i>):						

41.1	Phosphorus, total	µg/L	12	NA	—	—	NA
41.2	Chlorophyll-a	µg/L	3	NA	—	—	NA
41.3	Secchi disk transparency	meters	No less	NA	—	—	NA
41.4			than 4.8				

41.5 Designated trout lakes in all ecoregions, except lake trout lakes:

41.6	Phosphorus, total	µg/L	20	NA	—	—	NA
41.7	Chlorophyll-a	µg/L	6	NA	—	—	NA
41.8	Secchi disk transparency	meters	No less	NA	—	—	NA
41.9			than 2.5				

41.10 Additional narrative eutrophication standards for Class 2A lakes and reservoirs are found
41.11 under subpart 2a.

41.12 Eutrophication standards for Class 2A rivers and streams.

41.13 North River Nutrient Region:

41.14	<u>Phosphorus, total</u>			<u>µg/L</u>		<u>less than or equal to 50</u>
41.15	<u>Chlorophyll-a (seston)</u>			<u>µg/L</u>		<u>less than or equal to 7</u>
41.16	<u>Diel dissolved oxygen flux</u>			<u>mg/L</u>		<u>less than or equal to 3.0</u>
41.17	<u>Biochemical oxygen demand (BOD₅)</u>			<u>mg/L</u>		<u>less than or equal to 1.5</u>

41.18 Central River Nutrient Region:

41.19	<u>Phosphorus, total</u>			<u>µg/L</u>		<u>less than or equal to 100</u>
41.20	<u>Chlorophyll-a (seston)</u>			<u>µg/L</u>		<u>less than or equal to 18</u>
41.21	<u>Diel dissolved oxygen flux</u>			<u>mg/L</u>		<u>less than or equal to 3.5</u>
41.22	<u>Biochemical oxygen demand (BOD₅)</u>			<u>mg/L</u>		<u>less than or equal to 2.0</u>

41.23 South River Nutrient Region:

41.24	<u>Phosphorus, total</u>			<u>µg/L</u>		<u>less than or equal to 150</u>
41.25	<u>Chlorophyll-a (seston)</u>			<u>µg/L</u>		<u>less than or equal to 35</u>
41.26	<u>Diel dissolved oxygen flux</u>			<u>mg/L</u>		<u>less than or equal to 4.5</u>
41.27	<u>Biochemical oxygen demand (BOD₅)</u>			<u>mg/L</u>		<u>less than or equal to 3.0</u>

42.1 Additional narrative eutrophication standards for Class 2A rivers and streams are found
 42.2 under subpart 2b.

42.3	Substance,						Basis
42.4	Characteristic,						for
42.5	or Pollutant			Basis			MS,
42.6	(Class 2A)	Units	CS	for CS	MS	FAV	FAV
42.7							
42.8	Fluoranthene	µg/L	1.9	Tox	3.5	6.9	Tox
42.9	Heptachlor (c)	ng/L	0.10	HH	260*	520*	Tox
42.10	Heptachlor epoxide (c)	ng/L	0.12	HH	270*	530*	Tox
42.11	Hexachlorobenzene (c)	ng/L	0.061	HH	—*	—*	Tox
42.12	Lead, total	µg/L	equation	Tox	equation	equation	Tox

42.13 The CS, MS, and FAV vary with total hardness and are calculated using the following
 42.14 equations:

42.15 The CS in µg/L shall not exceed: $\exp.(1.273[\ln(\text{total hardness mg/L})]-4.705)$

42.16 The MS in µg/L shall not exceed: $\exp.(1.273[\ln(\text{total hardness mg/L})]-1.460)$

42.17 The FAV in µg/L shall not exceed: $\exp.(1.273[\ln(\text{total hardness mg/L})]-0.7643)$

42.18 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

42.19 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
 42.20 the standard.

42.21 Example of total lead standards for five total hardness values:

42.22	TH in mg/L	50	100	200	300	400
42.23						
42.24	Lead, total					
42.25	CS µg/L	1.3	3.2	7.7	13	19
42.26	MS µg/L	34	82	197	331	477
42.27	FAV µg/L	68	164	396	663	956

43.1	43.2	43.3	43.4	43.5	43.6	43.7	43.8
Substance, Characteristic, or Pollutant (Class 2A)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV	
Lindane (c) (Hexachlorocyclohexane, gamma-)	µg/L	0.0087	HH	1.0*	2.0*	Tox	
Mercury, total in water	ng/L	6.9	HH	2,400*	4,900*	Tox	
Mercury, total in edible fish	mg/kg ppm	0.2	HH	NA	NA	NA	
Methylene chloride (c) Dichloromethane)	µg/L	45	HH	13,875*	27,749*	Tox	
Metolachlor	µg/L	23	Tox	271	543	Tox	
Naphthalene	µg/L	65	HH	409	818	Tox	
Nickel, total	µg/L	equation	Tox/HH	equation	equation	Tox	
The CS, MS, and FAV vary with total hardness and are calculated using the following equations:							
The CS shall not exceed the human health-based standard of 297 µg/L. For waters with total hardness values less than 212 mg/L, the CS in µg/L is toxicity-based and shall not exceed: $\exp.(0.846[\ln(\text{total hardness mg/L})]+1.1645)$							
The MS in µg/L shall not exceed: $\exp.(0.846[\ln(\text{total hardness mg/L})]+3.3612)$							
The FAV in µg/L shall not exceed: $\exp.(0.846[\ln(\text{total hardness mg/L})]+4.0543)$							
Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.							
For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.							
Example of total nickel standards for five total hardness values:							
TH in mg/L	50	100	200	300	400		
Nickel, total							
CS µg/L	88	158	283	297	297		

44.1	MS µg/L	789	1,418	2,549	3,592	4,582
44.2	FAV µg/L	1,578	2,836	5,098	7,185	9,164

44.3	Substance, Characteristic, or Pollutant (Class 2A)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
44.4							
44.5							
44.6							
44.7							

44.8	Oil	µg/L	500	NA	5,000	10,000	NA
44.9	Oxygen, dissolved	mg/L	See	NA	—	—	NA
44.10			below				

44.11 7.0 mg/L as a daily minimum. This dissolved oxygen standard requires compliance
44.12 with the standard 50 percent of the days at which the flow of the receiving water is
44.13 equal to the $7Q_{10}$.

44.14	Parathion	µg/L	0.013	Tox	0.07	0.13	Tox
44.15	Pentachlorophenol	µg/L	0.93	HH	equation	equation	Tox

44.16 The MS and FAV vary with pH and are calculated using the following equations:

44.17 The MS in µg/L shall not exceed: $\exp.(1.005[pH]-4.830)$

44.18 The FAV in µg/L shall not exceed: $\exp.(1.005[pH]-4.1373)$

44.19 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

44.20 For pH values less than 6.0, 6.0 shall be used to calculate the standard and for pH
44.21 values greater than 9.0, 9.0 shall be used to calculate the standard.

44.22 Example of pentachlorophenol standards for five pH values:

44.23	pH su	6.5	7.0	7.5	8.0	8.5
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44.24

44.25 Pentachlorophenol

44.26	CS µg/L	0.93	0.93	0.93	0.93	0.93
44.27	MS µg/L	5.5	9.1	15	25	41
44.28	FAV µg/L	11	18	30	50	82

45.1	45.2	45.3	45.4	45.5			
Substance, Characteristic, or Pollutant (Class 2A)		Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
<hr/>							
45.6	pH, minimum	su	6.5	NA	—	—	NA
45.7	pH, maximum	su	8.5	NA	—	—	NA
45.8	Phenanthrene	µg/L	3.6	Tox	32	64	Tox
45.9	Phenol	µg/L	123	Tox	2,214	4,428	Tox
45.10	Polychlorinated biphenyls,	ng/L	0.014	HH	1,000*	2,000*	Tox
45.11	total (c)						
45.12	Radioactive materials	NA	See	NA	See	See	NA
45.13			below		below	below	
45.14	Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled						
45.15	environment as permitted by the appropriate authority having control over their use.						
45.16	Selenium, total	µg/L	5.0	Tox	20	40	Tox
45.17	Silver, total	µg/L	0.12	Tox	equation	equation	Tox
45.18	The MS and FAV vary with total hardness and are calculated using the following						
45.19	equations:						
45.20	The MS in µg/L shall not exceed: $\exp.(1.720[\ln(\text{total hardness mg/L})]-7.2156)$						
45.21	The FAV in µg/L shall not exceed: $\exp.(1.720[\ln(\text{total hardness mg/L})]-6.520)$						
45.22	Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.						
45.23	For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate						
45.24	the standard.						
45.25	Example of silver standards for five total hardness values:						
45.26	TH in mg/L	50	100	200	300	400	
45.27	<hr/>						
45.28	Silver, total						
45.29	CS µg/L	0.12	0.12	0.12	0.12	0.12	

46.1	MS µg/L	1.0	2.0	6.7	13	22
46.2	FAV µg/L	1.2	4.1	13	27	44

46.3	Substance,						Basis
46.4	Characteristic,						for
46.5	or Pollutant			Basis			MS,
46.6	(Class 2A)	Units	CS	for CS	MS	FAV	FAV
46.7	<hr/>						

46.8	Temperature	°C or	No	NA	—	—	NA
46.9		°F	material				
46.10			increase				

46.11	1,1,2,2-Tetrachloroethane (c)	µg/L	1.1	HH	1,127*	2,253*	Tox
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46.12	Tetrachloroethylene (c)	µg/L	3.8	HH	428*	857*	Tox
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46.13	Thallium, total	µg/L	0.28	HH	64	128	Tox
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46.14	Toluene	µg/L	253	Tox	1,352	2,703	Tox
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46.15	Toxaphene (c)	ng/L	0.31	HH	730*	1,500*	Tox
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46.16	1,1,1-Trichloroethane	µg/L	329	Tox	2,957	5,913	Tox
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46.17	1,1,2-Trichloroethylene (c)	µg/L	25	HH	6,988*	13,976*	Tox
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46.18	2,4,6-Trichlorophenol	µg/L	2.0	HH	102	203	Tox
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46.19	Turbidity value <u>Total</u>	NTU					
46.20	<u>suspended solids (TSS)</u>	<u>mg/L</u>	10	NA	—	—	NA

46.21 TSS standards for Class 2A
 46.22 may be exceeded for no more
 46.23 than ten percent of the time.
 46.24 This standard applies April 1
 46.25 through September 30

46.26	Vinyl chloride (c)	µg/L	0.17	HH	—*	—*	NA
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46.27	Xylene, total m,p,o	µg/L	166	Tox	1,407	2,814	Tox
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46.28	Zinc, total	µg/L	equation	Tox	equation	equation	Tox
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46.29 The CS, MS, and FAV vary with total hardness and are calculated using the following
 46.30 equations:

46.31 The CS in µg/L shall not exceed: $\exp.(0.8473[\ln(\text{total hardness mg/L})]+0.7615)$

46.32 The MS in µg/L shall not exceed: $\exp.(0.8473[\ln(\text{total hardness mg/L})]+0.8604)$

47.1 The FAV in µg/L shall not exceed: $\exp.(0.8473[\ln(\text{total hardness mg/L})]+1.5536)$
 47.2 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.
 47.3 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
 47.4 the standard.

47.5 Example of zinc standards for five total hardness values:

47.6	TH in mg/L	50	100	200	300	400
47.7	<hr/>					
47.8	Zinc, total					
47.9	CS µg/L	59	106	191	269	343
47.10	MS µg/L	65	117	211	297	379
47.11	FAV µg/L	130	234	421	594	758

47.12 Subp. 2a. **Narrative eutrophication standards for Class 2A lakes and reservoirs.**

47.13 A. Eutrophication standards for lakes and reservoirs are compared to
 47.14 summer-average data averaged over the summer season (June through September).
 47.15 Exceedance of the total phosphorus and either the chlorophyll-a or Secchi disk
 47.16 transparency standard is required to indicate a polluted condition.

47.17 [For text of item B, see M.R.]

47.18 C. Lakes and reservoirs with a baseline quality that is poorer than the numeric
 47.19 eutrophication standards in subpart 2 must be considered to be in compliance with the
 47.20 standards if the baseline quality is the result of natural causes. The commissioner shall
 47.21 determine baseline quality and compliance with these standards using summer-average
 47.22 data and the procedures in part 7050.0150, subpart 5. "Natural causes" is defined in part
 47.23 7050.0150, subpart 4, item N.

47.24 [For text of item D, see M.R.]

47.25 E. Eutrophication standards applicable to lakes and reservoirs that lie on the
 47.26 border between two ecoregions or that are in the Red River Valley (also referred to as
 47.27 Lake Agassiz Plains), Northern Minnesota Wetlands, or Driftless Area Ecoregion must be

48.1 applied on a case-by-case basis. The commissioner shall use the standards applicable to
48.2 adjacent ecoregions as a guide.

48.3 **Subp. 2b. Narrative eutrophication standards for rivers and streams.**

48.4 A. Eutrophication standards for rivers and streams are compared to
48.5 summer-average data or as specified in subpart 2. Exceedance of the total phosphorus
48.6 levels and chlorophyll-a (seston), five-day biochemical oxygen demand (BOD₅), diel
48.7 dissolved oxygen flux, or pH levels is required to indicate a polluted condition.

48.8 B. Rivers and streams that exceed the phosphorus levels but do not exceed the
48.9 chlorophyll-a (seston), five-day biochemical oxygen demand (BOD₅), diel dissolved
48.10 oxygen flux, or pH levels meet the eutrophication standard.

48.11 C. For chlorophyll-a (periphyton), the standard is exceeded if concentrations
48.12 exceed 150 mg/m² more than one year in ten.

48.13 D. It is the policy of the agency to protect all rivers and streams from the
48.14 undesirable effects of cultural eutrophication. Rivers and streams with a baseline quality
48.15 better than the numeric eutrophication standards in subpart 3 must be maintained in that
48.16 condition through the strict application of all relevant federal, state, and local requirements
48.17 governing nondegradation, the discharge of nutrients from point and nonpoint sources,
48.18 including:

48.19 (1) the nondegradation requirements in parts 7050.0180 and 7050.0185;

48.20 (2) the phosphorus effluent limits for point sources, where applicable, in
48.21 chapter 7053;

48.22 (3) the requirements for feedlots in chapter 7020;

48.23 (4) the requirements for individual sewage treatment systems in chapter
48.24 7080;

48.25 (5) the requirements for control of storm water in chapter 7090;

49.1 (6) county shoreland ordinances; and

49.2 (7) implementation of mandatory and voluntary best management practices
 49.3 to minimize point and nonpoint sources of nutrients.

49.4 E. Rivers and streams with a baseline quality that does not meet the numeric
 49.5 eutrophication standards in part 7050.0150, subpart 5b, are in compliance with the
 49.6 standards if the baseline quality is the result of natural causes. The commissioner must
 49.7 determine baseline quality and compliance with these standards using data and the
 49.8 procedures in part 7050.0150, subpart 5.

49.9 Subp. 3. **Class 2Bd waters.** The quality of Class 2Bd surface waters shall be such
 49.10 as to permit the propagation and maintenance of a healthy community of cool or warm
 49.11 water sport or commercial fish and associated aquatic life and their habitats. These waters
 49.12 shall be suitable for aquatic recreation of all kinds, including bathing, for which the waters
 49.13 may be usable. This class of surface waters is also protected as a source of drinking
 49.14 water. The applicable standards are given below. Abbreviations, acronyms, and symbols
 49.15 are explained in subpart 1.

49.16	Substance,						Basis
49.17	Characteristic,						for
49.18	or Pollutant						MS,
49.19	(Class 2Bd)	Units	CS	Basis	MS	FAV	FAV

		Units	CS	Basis	MS	FAV	
49.21	Acenaphthene	µg/L	20	HH	56	112	Tox
49.22	Acetochlor	µg/L	3.6	Tox	86	173	Tox
49.23	Acrylonitrile (c)	µg/L	0.38	HH	1,140*	2,281*	Tox
49.24	Alachlor (c)	µg/L	4.2	HH	800*	1,600*	Tox
49.25	Aluminum, total	µg/L	125	Tox	1,072	2,145	Tox
49.26	Ammonia un-ionized as N	µg/L	40	Tox	—	—	NA

49.27 The percent un-ionized ammonia can be calculated for any temperature and pH by
 49.28 using the following equation taken from Emerson, K., R.C. Russo, R.E. Lund, and R.V.

50.1 Thurston, Aqueous ammonia equilibrium calculations; effect of pH and temperature.
 50.2 Journal of the Fisheries Research Board of Canada 32: 2379-2383 (1975):

50.3
$$f = 1/(10^{(pK_a - pH)} + 1) \times 100$$

50.4 where: f = the percent of total ammonia in the un-ionized state

50.5 $pK_a = 0.09 + (2730/T)$ (dissociation constant for ammonia)

50.6 T = temperature in degrees Kelvin (273.16° Kelvin = 0° Celsius)

50.7	Substance,						Basis
50.8	Characteristic,			Basis			for
50.9	or Pollutant			for			MS,
50.10	(Class 2Bd)	Units	CS	CS	MS	FAV	FAV
50.11							
50.12	Anthracene	µg/L	0.035	Tox	0.32	0.63	Tox
50.13	Antimony, total	µg/L	5.5	HH	90	180	Tox
50.14	Arsenic, total	µg/L	2.0	HH	360	720	Tox
50.15	Atrazine (c)	µg/L	3.4	HH	323	645	Tox
50.16	Benzene (c)	µg/L	6.0	HH	4,487*	8,974*	Tox
50.17	Bromoform	µg/L	41	HH	2,900	5,800	Tox
50.18	Cadmium, total	µg/L	equation	Tox	equation	equation	Tox

50.19 The CS, MS, and FAV vary with total hardness and are calculated using the following
 50.20 equations:

50.21 The CS in µg/L shall not exceed: $\exp.(0.7852[\ln(\text{total hardness mg/L})]-3.490)$

50.22 The MS in µg/L shall not exceed: $\exp.(1.128[\ln(\text{total hardness mg/L})]-1.685)$

50.23 The FAV in µg/L shall not exceed: $\exp.(1.128[\ln(\text{total hardness mg/L})]-0.9919)$

50.24 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

50.25 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
 50.26 the standard.

50.27 Example of total cadmium standards for five hardness values:

50.28 TH in mg/L 50 100 200 300 400

50.29

50.30 Cadmium, total

51.1	CS µg/L	0.66	1.1	2.0	2.7	3.4
51.2	MS µg/L	15	33	73	116	160
51.3	FAV µg/L	31	67	146	231	319

51.4	Substance,						Basis
51.5	Characteristic,			Basis			for
51.6	or Pollutant			for			MS,
51.7	(Class 2Bd)	Units	CS	CS	MS	FAV	FAV
51.8							

51.9	Carbon tetrachloride (c)	µg/L	1.9	HH	1,750*	3,500*	Tox
51.10	Chlordane (c)	ng/L	0.29	HH	1,200*	2,400*	Tox
51.11	Chloride	mg/L	230	Tox	860	1,720	Tox

51.12	Chlorine, total residual	µg/L	11	Tox	19	38	Tox
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51.13 Chlorine standard applies to conditions of continuous exposure, where continuous
51.14 exposure refers to chlorinated effluents that are discharged for more than a total of
51.15 two hours in any 24-hour period.

51.16	Chlorobenzene	µg/L	20	HH	423	846	Tox
51.17	(Monochlorobenzene)						
51.18	Chloroform (c)	µg/L	53	HH	1,392	2,784	Tox
51.19	Chlorpyrifos	µg/L	0.041	Tox	0.083	0.17	Tox
51.20	Chromium +3, total	µg/L	equation	Tox	equation	equation	Tox

51.21 The CS, MS, and FAV vary with total hardness and are calculated using the following
51.22 equations:

51.23 The CS in µg/L shall not exceed: $\exp.(0.819[\ln(\text{total hardness mg/L})]+1.561)$

51.24 The MS in µg/L shall not exceed: $\exp.(0.819[\ln(\text{total hardness mg/L})]+3.688)$

51.25 The FAV in µg/L shall not exceed: $\exp.(0.819[\ln(\text{total hardness mg/L})]+4.380)$

51.26 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

51.27 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
51.28 the standard.

51.29 Example of total chromium +3 standards for five total hardness values:

52.1	TH in mg/L	50	100	200	300	400
52.2	<hr/>					
52.3	Chromium +3, total					
52.4	CS µg/L	117	207	365	509	644
52.5	MS µg/L	984	1,737	3,064	4,270	5,405
52.6	FAV µg/L	1,966	3,469	6,120	8,530	10,797

52.7	Substance,						Basis
52.8	Characteristic,			Basis			for
52.9	or Pollutant			for			MS,
52.10	(Class 2Bd)	Units	CS	CS	MS	FAV	FAV
52.11	<hr/>						

52.12	Chromium +6, total	µg/L	11	Tox	16	32	Tox
52.13	Cobalt, total	µg/L	2.8	HH	436	872	Tox
52.14	Copper, total	µg/L	equation	Tox	equation	equation	Tox

52.15 The CS, MS, and FAV vary with total hardness and are calculated using the following
 52.16 equations:

52.17 The CS in µg/L shall not exceed: $\exp.(0.620[\ln(\text{total hardness mg/L})]-0.570)$

52.18 The MS in µg/L shall not exceed: $\exp.(0.9422[\ln(\text{total hardness mg/L})]-1.464)$

52.19 The FAV in µg/L shall not exceed: $\exp.(0.9422[\ln(\text{total hardness mg/L})]-0.7703)$

52.20 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

52.21 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
 52.22 the standard.

52.23 Example of total copper standards for five total hardness values:

52.24	TH in mg/L	50	100	200	300	400
52.25	<hr/>					
52.26	Copper, total					
52.27	CS µg/L	6.4	9.8	15	19	23
52.28	MS µg/L	9.2	18	34	50	65
52.29	FAV µg/L	18	35	68	100	131

53.1	Substance,						Basis
53.2	Characteristic,			Basis			for
53.3	or Pollutant			for			MS,
53.4	(Class 2Bd)	Units	CS	CS	MS	FAV	FAV
53.5							
53.6	Cyanide, free	µg/L	5.2	Tox	22	45	Tox
53.7	DDT (c)	ng/L	1.7	HH	550*	1,100*	Tox
53.8	1,2-Dichloroethane (c)	µg/L	3.8	HH	45,050*	90,100*	Tox
53.9	Dieldrin (c)	ng/L	0.026	HH	1,300*	2,500*	Tox
53.10	Di-2-ethylhexyl phthalate (c)	µg/L	1.9	HH	—*	—*	NA
53.11	Di-n-octyl phthalate	µg/L	30	Tox	825	1,650	Tox
53.12	Endosulfan	µg/L	0.029	HH	0.28	0.56	Tox
53.13	Endrin	µg/L	0.016	HH	0.090	0.18	Tox
53.14	<i>Escherichia (E.) coli</i>	See	See	HH	See	See	NA
53.15		below	below		below	below	
53.16	Not to exceed 126 organisms per 100 milliliters as a geometric mean of not less						
53.17	than five samples representative of conditions within any calendar month, nor shall						
53.18	more than ten percent of all samples taken during any calendar month individually						
53.19	exceed 1,260 organisms per 100 milliliters. The standard applies only between April						
53.20	1 and October 31.						
53.21	Ethylbenzene	µg/L	68	Tox	1,859	3,717	Tox
53.22	Substance,						Basis
53.23	Characteristic,			Basis			for
53.24	or Pollutant			for			MS,
53.25	(Class 2Bd)	Units	CS	CS	MS	FAV	FAV
53.26							
53.27	Eutrophication standards for Class 2Bd lakes, shallow lakes, and reservoirs. See						
53.28	definitions in part 7050.0150, subpart 4, and ecoregion map in part 7050.0467.						
53.29	Lakes, Shallow Lakes, and Reservoirs in Northern Lakes and Forest Ecoregion						

54.1	Phosphorus, total	µg/L	30	NA	—	—	NA
54.2	Chlorophyll-a	µg/L	9	NA	—	—	NA
54.3	Secchi disk transparency	meters	Not less	NA	—	—	NA
54.4			than 2.0				
54.5	Lakes and Reservoirs in North Central Hardwood Forest Ecoregion						
54.6	Phosphorus, total	µg/L	40	NA	—	—	NA
54.7	Chlorophyll-a	µg/L	14	NA	—	—	NA
54.8	Secchi disk transparency	meters	Not less	NA	—	—	NA
54.9			than 1.4				
54.10	Lakes and Reservoirs in Western Corn Belt Plains and Northern Glaciated Plains						
54.11	Ecoregions						
54.12	Phosphorus, total	µg/L	65	NA	—	—	NA
54.13	Chlorophyll-a	µg/L	22	NA	—	—	NA
54.14	Secchi disk transparency	meters	Not less	NA	—		
54.15			than 0.9			—	NA
54.16	Shallow Lakes in North Central Hardwood Forest Ecoregion						
54.17	Phosphorus, total	µg/L	60	NA	—	—	NA
54.18	Chlorophyll-a	µg/L	20	NA	—	—	NA
54.19	Secchi disk transparency	meters	Not less	NA	—	—	NA
54.20			than 1.0				
54.21	Shallow Lakes in Western Corn Belt Plains and Northern Glaciated Plains Ecoregions						
54.22	Phosphorus, total	µg/L	90	NA	—	—	NA
54.23	Chlorophyll-a	µg/L	30	NA	—	—	NA
54.24	Secchi disk transparency	meters	Not less	NA	—	—	NA
54.25			than 0.7				
54.26	Additional narrative eutrophication standards for Class 2Bd lakes, shallow lakes, and						
54.27	reservoirs are found under subpart 3a.						
54.28	<u>Eutrophication standards for Class 2Bd rivers and streams.</u>						

55.1 North River Nutrient Region

55.2	<u>Phosphorus, total</u>	<u>µg/L</u>	<u>less than or equal to 50</u>
55.3	<u>Chlorophyll-a (seston)</u>	<u>µg/L</u>	<u>less than or equal to 7</u>
55.4	<u>Diel dissolved oxygen flux</u>	<u>mg/L</u>	<u>less than or equal to 3.0</u>
55.5	<u>Biochemical oxygen demand (BOD₅)</u>	<u>mg/L</u>	<u>less than or equal to 1.5</u>

55.6 Central River Nutrient Region

55.7	<u>Phosphorus, total</u>	<u>µg/L</u>	<u>less than or equal to 100</u>
55.8	<u>Chlorophyll-a (seston)</u>	<u>µg/L</u>	<u>less than or equal to 18</u>
55.9	<u>Diel dissolved oxygen flux</u>	<u>mg/L</u>	<u>less than or equal to 3.5</u>
55.10	<u>Biochemical oxygen demand (BOD₅)</u>	<u>mg/L</u>	<u>less than or equal to 2.0</u>

55.11 South River Nutrient Region

55.12	<u>Phosphorus, total</u>	<u>µg/L</u>	<u>less than or equal to 150</u>
55.13	<u>Chlorophyll-a (seston)</u>	<u>µg/L</u>	<u>less than or equal to 35</u>
55.14	<u>Diel dissolved oxygen flux</u>	<u>mg/L</u>	<u>less than or equal to 4.5</u>
55.15	<u>Biochemical oxygen demand (BOD₅)</u>	<u>mg/L</u>	<u>less than or equal to 3.0</u>

55.16 Additional narrative eutrophication standards for Class 2Bd rivers and streams are found
 55.17 under subpart 3b.

55.18	Substance,						Basis
55.19	Characteristic,			Basis			for
55.20	or Pollutant			for			MS,
55.21	(Class 2Bd)	Units	CS	CS	MS	FAV	FAV
55.22							

55.23	Fluoranthene	µg/L	1.9	Tox	3.5	6.9	Tox
55.24	Heptachlor (c)	ng/L	0.39	HH	260*	520*	Tox
55.25	Heptachlor epoxide (c)	ng/L	0.48	HH	270*	530*	Tox
55.26	Hexachlorobenzene (c)	ng/L	0.24	HH	—*	—*	Tox
55.27	Lead, total	µg/L	equation	Tox	equation	equation	Tox

56.1 The CS, MS, and FAV vary with total hardness and are calculated using the following
 56.2 equations:

56.3 The CS in µg/L shall not exceed: $\exp.(1.273[\ln(\text{total hardness mg/L})]-4.705)$

56.4 The MS in µg/L shall not exceed: $\exp.(1.273[\ln(\text{total hardness mg/L})]-1.460)$

56.5 The FAV in µg/L shall not exceed: $\exp.(1.273[\ln(\text{total hardness mg/L})]-0.7643)$

56.6 Where: $\exp.$ is the natural antilogarithm (base e) of the expression in parenthesis.

56.7 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
 56.8 the standard.

56.9 Example of total lead standards for five total hardness values:

56.10	TH in mg/L	50	100	200	300	400
56.11	<hr/>					
56.12	Lead, total					
56.13	CS µg/L	1.3	3.2	7.7	13	19
56.14	MS µg/L	34	82	197	331	477
56.15	FAV µg/L	68	164	396	663	956

56.16	Substance, Characteristic, or Pollutant (Class 2Bd)						Basis
56.17							for
56.18							MS,
56.19		Units	CS	CS	MS	FAV	FAV
56.20							
56.21	Lindane (c)	µg/L	0.032	HH	4.4*	8.8*	Tox
56.22	(Hexachlorocyclohexane,						
56.23	gamma-)						
56.24	Mercury, total in water	ng/L	6.9	HH	2,400*	4,900*	Tox
56.25	Mercury, total	mg/kg	0.2	HH	NA	NA	NA
56.26	in edible fish tissue	ppm					
56.27	Methylene chloride (c)	µg/L	46	HH	13,875*	27,749*	Tox
56.28	(Dichloromethane)						
56.29	Metolachlor	µg/L	23	Tox	271	543	Tox
56.30	Naphthalene	µg/L	81	Tox	409	818	Tox
56.31	Nickel, total	µg/L	equation	Tox/HH	equation	equation	Tox

57.1 The CS, MS, and FAV vary with total hardness and are calculated using the following
57.2 equations:

57.3 The CS shall not exceed the human health-based standard of 297 µg/L. For waters
57.4 with total hardness values less than 212 mg/L, the CS in µg/L is toxicity-based and
57.5 shall not exceed: $\exp.(0.846[\ln(\text{total hardness mg/L})]+1.1645)$

57.6 The MS in µg/L shall not exceed: $\exp.(0.846[\ln(\text{total hardness mg/L})]+3.3612)$

57.7 The FAV in µg/L shall not exceed: $\exp.(0.846[\ln(\text{total hardness mg/L})]+4.0543)$

57.8 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

57.9 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
57.10 the standard.

57.11 Example of total nickel standards for five total hardness values:

57.12	TH in mg/L	50	100	200	300	400
57.13	<hr/>					
57.14	Nickel, total					
57.15	CS µg/L	88	158	283	297	297
57.16	MS µg/L	789	1,418	2,549	3,592	4,582
57.17	FAV µg/L	1,578	2,836	5,098	7,185	9,164

57.18	Substance, Characteristic, or Pollutant (Class 2Bd)						Basis for MS, FAV
57.19				Basis			
57.20				for			
57.21		Units	CS	CS	MS	FAV	
57.22							

57.23	Oil	µg/L	500	NA	5,000	10,000	NA
57.24	Oxygen, dissolved	mg/L	See	NA	—	—	NA
57.25			below				

57.26 5.0 mg/L as a daily minimum. This dissolved oxygen standard may be modified on a
57.27 site-specific basis according to part 7050.0220, subpart 7, except that no site-specific
57.28 standard shall be less than 5 mg/L as a daily average and 4 mg/L as a daily minimum.
57.29 Compliance with this standard is required 50 percent of the days at which the flow of
57.30 the receiving water is equal to the $7Q_{10}$.

58.1	Parathion	µg/L	0.013	Tox	0.07	0.13	Tox
58.2	Pentachlorophenol	µg/L	1.9	HH	equation	equation	Tox

58.3 The MS and FAV vary with pH and are calculated using the following equations:

58.4 The MS in µg/L shall not exceed: $\exp.(1.005[\text{pH}]-4.830)$

58.5 The FAV in µg/L shall not exceed: $\exp.(1.005[\text{pH}]-4.1373)$

58.6 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

58.7 For pH values less than 6.0, 6.0 shall be used to calculate the standard and for pH
58.8 values greater than 9.0, 9.0 shall be used to calculate the standard.

58.9 Example of pentachlorophenol standards for five pH values:

58.10	pH su	6.5	7.0	7.5	8.0	8.5
58.11	<hr/>					
58.12	Pentachlorophenol					
58.13	CS µg/L	1.9	1.9	1.9	1.9	1.9
58.14	MS µg/L	5.5	9.1	15	25	41
58.15	FAV µg/L	11	18	30	50	82

58.16	Substance,						Basis
58.17	Characteristic,			Basis			for
58.18	or Pollutant			for			MS,
58.19	(Class 2Bd)	Units	CS	CS	MS	FAV	FAV
58.20	<hr/>						
58.21	pH, minimum	su	6.5	NA	—	—	NA
58.22	pH, maximum	su	9.0	NA	—	—	NA
58.23	Phenanthrene	µg/L	3.6	Tox	32	64	Tox
58.24	Phenol	µg/L	123	Tox	2,214	4,428	Tox
58.25	Polychlorinated biphenyls, ng/L		0.029	HH	1,000*	2,000*	Tox
58.26	total (c)						
58.27	Radioactive materials	NA	See	NA	See	See	NA
58.28			below		below	below	

58.29 Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled
58.30 environment as permitted by the appropriate authority having control over their use.

59.1	Selenium, total	µg/L	5.0	Tox	20	40	Tox
59.2	Silver, total	µg/L	1.0	Tox	equation	equation	Tox

59.3 The MS and FAV vary with total hardness and are calculated using the following
 59.4 equations:

59.5 The MS in µg/L shall not exceed: $\exp.(1.720[\ln(\text{total hardness mg/L})]-7.2156)$

59.6 The FAV in µg/L shall not exceed: $\exp.(1.720[\ln(\text{total hardness mg/L})]-6.520)$

59.7 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

59.8 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
 59.9 the standard.

59.10 Example of total silver standards for five total hardness values:

59.11	TH in mg/L	50	100	200	300	400
59.12	<hr/>					
59.13	Silver, total					
59.14	CS µg/L	1.0	1.0	1.0	1.0	1.0
59.15	MS µg/L	1.0	2.0	6.7	13	22
59.16	FAV µg/L	1.2	4.1	13	27	44

59.17	Substance,						Basis
59.18	Characteristic,			Basis			for
59.19	or Pollutant			for			MS,
59.20	(Class 2Bd)	Units	CS	CS	MS	FAV	FAV
59.21	<hr/>						

59.22	Temperature	°F	See	NA	—	—	NA
59.23			below				

59.24 5°F above natural in streams and 3°F above natural in lakes, based on monthly
 59.25 average of the maximum daily temperatures, except in no case shall it exceed the
 59.26 daily average temperature of 86°F.

59.27	1,1,2,2-Tetrachloroethane	µg/L	1.5	HH	1,127*	2,253*	Tox
59.28	(c)						
59.29	Tetrachloroethylene (c)	µg/L	3.8	HH	428*	857*	Tox
59.30	Thallium, total	µg/L	0.28	HH	64	128	Tox

60.1	Toluene	µg/L	253	Tox	1,352	2,703	Tox
60.2	Toxaphene (c)	ng/L	1.3	HH	730*	1,500*	Tox
60.3	1,1,1-Trichloroethane	µg/L	329	Tox	2,957	5,913	Tox
60.4	1,1,2-Trichloroethylene (c)	µg/L	25	HH	6,988*	13,976*	Tox
60.5	2,4,6-Trichlorophenol	µg/L	2.0	HH	102	203	Tox
60.6	Turbidity value	NTU	25	NA	—	—	NA
60.7	<u>Total suspended solids</u>						
60.8	<u>(TSS)</u>						
60.9	<u>North River Nutrient</u>						
60.10	<u>Region</u>	<u>mg/L</u>	<u>15</u>	<u>NA</u>	<u>—</u>	<u>—</u>	<u>NA</u>
60.11	<u>Central River Nutrient</u>						
60.12	<u>Region</u>	<u>mg/L</u>	<u>30</u>	<u>NA</u>	<u>—</u>	<u>—</u>	<u>NA</u>
60.13	<u>South River Nutrient</u>						
60.14	<u>Region</u>	<u>mg/L</u>	<u>65</u>	<u>NA</u>	<u>—</u>	<u>—</u>	<u>NA</u>
60.15	<u>Red River mainstem -</u>						
60.16	<u>headwaters to border</u>	<u>mg/L</u>	<u>100</u>	<u>NA</u>	<u>—</u>	<u>—</u>	<u>NA</u>
60.17	<u>TSS standards for the</u>						
60.18	<u>Class 2Bd North, Central,</u>						
60.19	<u>and South River Nutrient</u>						
60.20	<u>Regions and the Red</u>						
60.21	<u>River mainstem may be</u>						
60.22	<u>exceeded for no more than</u>						
60.23	<u>ten percent of the time.</u>						
60.24	<u>This standard applies April</u>						
60.25	<u>1 through September 30</u>						
60.26	<u>Total suspended solids</u>						
60.27	<u>(TSS), summer average</u>						
60.28	<u>Lower Mississippi River</u>						
60.29	<u>mainstem - Pools 2 through</u>						
60.30	<u>4</u>	<u>mg/L</u>	<u>32</u>	<u>NA</u>	<u>—</u>	<u>—</u>	<u>NA</u>
60.31	<u>Lower Mississippi River</u>						
60.32	<u>mainstem below Lake</u>						
60.33	<u>Pepin</u>	<u>mg/L</u>	<u>30</u>	<u>NA</u>	<u>—</u>	<u>—</u>	<u>NA</u>

61.1 TSS standards for the Class
 61.2 2Bd Lower Mississippi
 61.3 River may be exceeded for
 61.4 no more than 50 percent
 61.5 of the time. This standard
 61.6 applies June 1 through
 61.7 September 30

61.8	<u>Substance,</u>						<u>Basis</u>
61.9	<u>Characteristic,</u>			<u>Basis</u>			<u>for</u>
61.10	<u>or Pollutant</u>			<u>for</u>			<u>MS,</u>
61.11	<u>(Class 2Bd)</u>	<u>Units</u>	<u>CS</u>	<u>CS</u>	<u>MS</u>	<u>FAV</u>	<u>FAV</u>

61.12							
61.13	Vinyl chloride (c)	µg/L	0.18	HH	—*	—*	NA
61.14	Xylene, total m,p,o	µg/L	166	Tox	1,407	2,814	Tox
61.15	Zinc, total	µg/L	equation	Tox	equation	equation	Tox

61.16 The CS, MS, and FAV vary with total hardness and are calculated using the following
 61.17 equations:

61.18 The CS in µg/L shall not exceed: $\exp.(0.8473[\ln(\text{total hardness mg/L})]+0.7615)$

61.19 The MS in µg/L shall not exceed: $\exp.(0.8473[\ln(\text{total hardness mg/L})]+0.8604)$

61.20 The FAV in µg/L shall not exceed: $\exp.(0.8473[\ln(\text{total hardness mg/L})]+1.5536)$

61.21 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

61.22 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
 61.23 the standard.

61.24 Example of total zinc standards for five total hardness values:

61.25	TH in mg/L	50	100	200	300	400
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61.26						
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61.27	Zinc, total					
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61.28	CS µg/L	59	106	191	269	343
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61.29	MS µg/L	65	117	211	297	379
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61.30	FAV µg/L	130	23 <u>234</u>	421	594	758
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62.1 Subp. 3a. **Narrative eutrophication standards for Class 2Bd lakes, shallow lakes,**
62.2 **and reservoirs.**

62.3 A. Eutrophication standards applicable to lakes, shallow lakes, and reservoirs
62.4 that lie on the border between two ecoregions or that are in the Red River Valley (also
62.5 referred to as Lake Agassiz Plains), Northern Minnesota Wetlands, or Driftless Area
62.6 ~~Ecoregions~~ Ecoregion must be applied on a case-by-case basis. The commissioner shall
62.7 use the standards applicable to adjacent ecoregions as a guide.

62.8 B. Eutrophication standards are compared to summer-average data ~~averaged~~
62.9 ~~over the summer season (June through September)~~. Exceedance of the total phosphorus
62.10 and either the chlorophyll-a or Secchi disk transparency standard is required to indicate a
62.11 polluted condition.

62.12 [For text of item C, see M.R.]

62.13 D. Lakes, shallow lakes, and reservoirs with a baseline quality that is poorer
62.14 than the numeric eutrophication standards in subpart 3 must be considered to be in
62.15 compliance with the standards if the baseline quality is the result of natural causes. The
62.16 commissioner shall determine baseline quality and compliance with these standards using
62.17 ~~summer-average~~ data and the procedures in part 7050.0150, subpart 5. ~~"Natural causes" is~~
62.18 ~~defined in part 7050.0150, subpart 4, item N.~~

62.19 [For text of item E, see M.R.]

62.20 Subp. 3b. **Narrative eutrophication standards for rivers, streams, and**
62.21 **navigational pools.**

62.22 A. Eutrophication standards for rivers, streams, and navigational pools are
62.23 compared to summer-average data or as specified in subpart 3. Exceedance of the total
62.24 phosphorus levels and chlorophyll-a (seston), five-day biochemical oxygen demand
62.25 (BOD₅), diel dissolved oxygen flux, or pH levels is required to indicate a polluted condition.

63.1 B. Rivers, streams, and navigational pools that exceed the phosphorus levels but
63.2 do not exceed the chlorophyll-a (seston), five-day biochemical oxygen demand (BOD₅),
63.3 diel dissolved oxygen flux, or pH levels meet the eutrophication standard.

63.4 C. A polluted condition also exists when the chlorophyll-a (periphyton)
63.5 concentration exceeds 150 mg/m² more than one year in ten.

63.6 D. It is the policy of the agency to protect all rivers, streams, and navigational
63.7 pools from the undesirable effects of cultural eutrophication. Rivers, streams, and
63.8 navigational pools with a baseline quality better than the numeric eutrophication standards
63.9 in subpart 3 must be maintained in that condition through the strict application of all
63.10 relevant federal, state, and local requirements governing nondegradation, the discharge
63.11 of nutrients from point and nonpoint sources including:

63.12 (1) the nondegradation requirements in parts 7050.0180 and 7050.0185;

63.13 (2) the phosphorus effluent limits for point sources, where applicable, in
63.14 chapter 7053;

63.15 (3) the requirements for feedlots in chapter 7020;

63.16 (4) the requirements for individual sewage treatment systems in chapter
63.17 7080;

63.18 (5) the requirements for control of storm water in chapter 7090;

63.19 (6) county shoreland ordinances; and

63.20 (7) implementation of mandatory and voluntary best management practices
63.21 to minimize point and nonpoint sources of nutrients.

63.22 E. Rivers, streams, and navigational pools with a baseline quality that does
63.23 not meet the numeric eutrophication standards in part 7050.0150, subpart 5b, are in
63.24 compliance with the standards if the baseline quality is the result of natural causes. The

64.1 commissioner must determine baseline quality and compliance with these standards using
 64.2 data and the procedures in part 7050.0150, subpart 5.

64.3 Subp. 4. **Class 2B waters.** The quality of Class 2B surface waters shall be such as
 64.4 to permit the propagation and maintenance of a healthy community of cool or warm
 64.5 water sport or commercial fish and associated aquatic life, and their habitats. These
 64.6 waters shall be suitable for aquatic recreation of all kinds, including bathing, for which
 64.7 the waters may be usable. This class of surface water is not protected as a source of
 64.8 drinking water. The applicable standards are given below. Abbreviations, acronyms,
 64.9 and symbols are explained in subpart 1.

64.10 Substance,							
64.11 Characteristic,			Basis				Basis
64.12 or Pollutant			for				for MS,
64.13 (Class 2B)	Units	CS	CS	MS	FAV		FAV
64.14							
64.15 Acenaphthene	µg/l	20	HH	56	112		Tox
64.16 Acetochlor	µg/L	3.6	Tox	86	173		Tox
64.17 Acrylonitrile (c)	µg/l	0.89	HH	1,140*	2,281*		Tox
64.18 Alachlor (c)	µg/L	59	Tox	800	1,600		Tox
64.19 Aluminum, total	µg/L	125	Tox	1,072	2,145		Tox
64.20 Ammonia un-ionized as N	µg/L	40	Tox	—	—		NA

64.21 The percent un-ionized ammonia can be calculated for any temperature and pH by
 64.22 using the following equation taken from Emerson, K., R.C. Russo, R.E. Lund, and R.V.
 64.23 Thurston, Aqueous ammonia equilibrium calculations; effect of pH and temperature.
 64.24 Journal of the Fisheries Research Board of Canada 32: 2379-2383 (1975):

$$64.25 \quad f = 1 / (10^{(pK_a - pH)} + 1) \times 100$$

64.26 where: f = the percent of total ammonia in the un-ionized state

64.27 $pK_a = 0.09 + (2730/T)$ (dissociation constant for ammonia)

64.28 T = temperature in degrees Kelvin (273.16° Kelvin = 0° Celsius)

65.1	65.2	65.3	65.4	65.5			
	Substance, Characteristic, or Pollutant (Class 2B)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
65.6	Anthracene	µg/L	0.035	Tox	0.32	0.63	Tox
65.7	Antimony, total	µg/L	31	Tox	90	180	Tox
65.8	Arsenic, total	µg/L	53	HH	360	720	Tox
65.9	Atrazine (c)	µg/L	10	Tox	323	645	Tox
65.10	Benzene (c)	µg/L	98	HH	4,487	8,974	Tox
65.11	Bromoform	µg/L	466	HH	2,900	5,800	Tox
65.12	Cadmium, total	µg/L	equation	Tox	equation	equation	Tox

65.13 The CS, MS, and FAV vary with total hardness and are calculated using the following
65.14 equations:

65.15 The CS in µg/L shall not exceed: $\exp.(0.7852[\ln(\text{total hardness mg/L})]-3.490)$

65.16 The MS in µg/L shall not exceed: $\exp.(1.128[\ln(\text{total hardness mg/L})]-1.685)$

65.17 The FAV in µg/L shall not exceed: $\exp.(1.128[\ln(\text{total hardness mg/L})]-0.9919)$

65.18 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

65.19 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
65.20 the standard.

65.21 Example of total cadmium standards for five hardness values:

65.22	TH in mg/L	50	100	200	300	400
65.23						
65.24	Cadmium, total					
65.25	CS µg/L	0.66	1.1	2.0	2.7	3.4
65.26	MS µg/L	15	33	73	116	160
65.27	FAV µg/L	31	67	146	231	319

	Substance, Characteristic, or Pollutant (Class 2B)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
	Carbon tetrachloride (c)	µg/L	5.9	HH	1,750*	3,500*	Tox
	Chlordane (c)	ng/L	0.29	HH	1,200*	2,400*	Tox
	Chloride	mg/L	230	Tox	860	1,720	Tox
	Chlorine, total residual	µg/L	11	Tox	19	38	Tox
	Chlorine standard applies to conditions of continuous exposure, where continuous exposure refers to chlorinated effluents that are discharged for more than a total of two hours in any 24-hour period.						
	Chlorobenzene (Monochlorobenzene)	µg/L	20	HH	423	846	Tox
	Chloroform (c)	µg/L	155	Tox	1,392	2,784	Tox
	Chlorpyrifos	µg/L	0.041	Tox	0.083	0.17	Tox
	Chromium +3, total	µg/L	equation	Tox	equation	equation	Tox

66.18 The CS, MS, and FAV vary with total hardness and are calculated using the following
66.19 equations

66.20 The CS in $\mu\text{g/L}$ shall not exceed: $\exp.(0.819[\ln(\text{total hardness mg/L})]+1.561)$

66.21 The MS in $\mu\text{g/L}$ shall not exceed: $\exp.(0.819[\ln(\text{total hardness mg/L})]+3.688)$

66.22 The FAV in µg/L shall not exceed: $\exp.(0.819[\ln(\text{total hardness mg/L})]+4.380)$

66.23 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

66.24 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
66.25 the standard.

66.26 Example of total chromium +3 standards for five total hardness values:

66.27	TH in mg/L	50	100	200	300	400
66.28	<hr/>					
66.29	Chromium +3, total					

67.1	CS µg/L	117	207	365	509	644
67.2	MS µg/L	984	1,737	3,064	4,270	5,405
67.3	FAV µg/L	1,966	3,469	6,120	8,530	10,797

67.4	Substance,						
67.5	Characteristic,			Basis			Basis
67.6	or Pollutant			for			for MS,
67.7	(Class 2B)	Units	CS	CS	MS	FAV	FAV
67.8							

67.9	Chromium +6, total	µg/L	11	Tox	16	32	Tox
67.10	Cobalt, total	µg/L	5.0	Tox	436	872	Tox
67.11	Copper, total	µg/L	equation	Tox	equation	equation	Tox

67.12 The CS, MS, and FAV vary with total hardness and are calculated using the following
67.13 equations:

67.14 The CS in µg/L shall not exceed: $\exp.(0.6200[\ln(\text{total hardness mg/L})]-0.570)$

67.15 The MS in µg/L shall not exceed: $\exp.(0.9422[\ln(\text{total hardness mg/L})]-1.464)$

67.16 The FAV in µg/L shall not exceed: $\exp.(0.9422[\ln(\text{total hardness mg/L})]-0.7703)$

67.17 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

67.18 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
67.19 the standard.

67.20 Example of total copper standards for five total hardness values:

67.21	TH in mg/L	50	100	200	300	400
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67.22

67.23 Copper, total

67.24	CS µg/L	6.4	9.8	15	19	23
67.25	MS µg/L	9.2	18	34	50	65
67.26	FAV µg/L	18	35	68	100	131

68.1	68.2	68.3	68.4	68.5			
	Substance, Characteristic, or Pollutant (Class 2B)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
68.6	Cyanide, free	µg/L	5.2	Tox	22	45	Tox
68.7	DDT (c)	ng/L	1.7	HH	550*	1,100*	Tox
68.8	1,2-Dichloroethane (c)	µg/L	190	HH	45,050*	90,100*	Tox
68.9	Dieldrin (c)	ng/L	0.026	HH	1,300*	2,500*	Tox
68.10	Di-2-ethylhexyl phthalate	µg/L	2.1	HH	—*	—*	NA
68.11	(c)						
68.12	Di-n-octyl phthalate	µg/L	30	Tox	825	1,650	Tox
68.13	Endosulfan	µg/L	0.031	HH	0.28	0.56	Tox
68.14	Endrin	µg/L	0.016	HH	0.090	0.18	Tox
68.15	<i>Escherichia (E.) coli</i>	See	See	HH	See	See	NA
68.16		below	below		below	below	

68.17 Not to exceed 126 organisms per 100 milliliters as a geometric mean of not less
 68.18 than five samples representative of conditions within any calendar month, nor shall
 68.19 more than ten percent of all samples taken during any calendar month individually
 68.20 exceed 1,260 organisms per 100 milliliters. The standard applies only between April
 68.21 1 and October 31.

68.22	Ethylbenzene	µg/L	68	Tox	1,859	3,717	Tox
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68.23	68.24	68.25	68.26	68.27			
	Substance, Characteristic, or Pollutant (Class 2B)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
68.27							

68.28 Eutrophication standards for Class 2B lakes, shallow lakes, and reservoirs. See definitions
 68.29 in part 7050.0150, subpart 4, and ecoregion map in part 7050.0467.

68.30 Lakes, Shallow Lakes, and Reservoirs in Northern Lakes and Forest Ecoregions

69.1	Phosphorus, total	µg/L	30	NA	—	—	NA
69.2	Chlorophyll-a	µg/L	9	NA	—	—	NA
69.3	Secchi disk transparency	meters	Not less	NA	—	—	NA
69.4			than 2.0				
69.5	Lakes and Reservoirs in North Central Hardwood Forest Ecoregion						
69.6	Phosphorus, total	µg/L	40	NA	—	—	NA
69.7	Chlorophyll-a	µg/L	14	NA	—	—	NA
69.8	Secchi disk transparency	meters	Not less	NA	—	—	NA
69.9			than 1.4				
69.10	Lakes and Reservoirs in Western Corn Belt Plains and Northern Glaciated Plains						
69.11	Ecoregions						
69.12	Phosphorus, total	µg/L	65	NA	—	—	NA
69.13	Chlorophyll-a	µg/L	22	NA	—	—	NA
69.14	Secchi disk transparency	meters	Not less	NA	—	—	NA
69.15			than 0.9				
69.16	Shallow Lakes in North Central Hardwood Forest Ecoregion						
69.17	Phosphorus, total	µg/L	60	NA	—	—	NA
69.18	Chlorophyll-a	µg/L	20	NA	—	—	NA
69.19	Secchi disk transparency	meters	Not less	NA	—	—	NA
69.20			than 1.0				
69.21	Shallow Lakes in Western Corn Belt Plains and Northern Glaciated Plains Ecoregions						
69.22	Phosphorus, total	µg/L	90	NA	—	—	NA
69.23	Chlorophyll-a	µg/L	30	NA	—	—	NA
69.24	Secchi disk transparency	meters	Not less	NA	—	—	NA
69.25			than 0.7				
69.26	Additional narrative eutrophication standards for Class 2B lakes, shallow lakes, and						
69.27	reservoirs are found in subpart 4a.						

70.1	<u>Substance,</u>					
70.2	<u>Characteristic,</u>			<u>Basis</u>		<u>Basis</u>
70.3	<u>or Pollutant</u>			<u>for</u>		<u>for MS,</u>
70.4	<u>(Class 2B)</u>	<u>Units</u>	<u>CS</u>	<u>CS</u>	<u>MS</u>	<u>FAV</u>
70.5						
70.6	<u>Eutrophication standards for Class 2B rivers and streams.</u>					
70.7	<u>North River Nutrient Region</u>					
70.8	<u>Phosphorus, total</u>			<u>µg/L</u>		<u>less than or equal to 50</u>
70.9	<u>Chlorophyll-a (seston)</u>			<u>µg/L</u>		<u>less than or equal to 7</u>
70.10	<u>Diel dissolved oxygen flux</u>			<u>mg/L</u>		<u>less than or equal to 3.0</u>
70.11	<u>Biochemical oxygen demand (BOD₅)</u>			<u>mg/L</u>		<u>less than or equal to 1.5</u>
70.12	<u>Central River Nutrient Region</u>					
70.13	<u>Phosphorus, total</u>			<u>µg/L</u>		<u>less than or equal to 100</u>
70.14	<u>Chlorophyll-a (seston)</u>			<u>µg/L</u>		<u>less than or equal to 18</u>
70.15	<u>Diel dissolved oxygen flux</u>			<u>mg/L</u>		<u>less than or equal to 3.5</u>
70.16	<u>Biochemical oxygen demand (BOD₅)</u>			<u>mg/L</u>		<u>less than or equal to 2.0</u>
70.17	<u>South River Nutrient Region</u>					
70.18	<u>Phosphorus, total</u>			<u>µg/L</u>		<u>less than or equal to 150</u>
70.19	<u>Chlorophyll-a (seston)</u>			<u>µg/L</u>		<u>less than or equal to 40</u>
70.20	<u>Diel dissolved oxygen flux</u>			<u>mg/L</u>		<u>less than or equal to 5.0</u>
70.21	<u>Biochemical oxygen demand (BOD₅)</u>			<u>mg/L</u>		<u>less than or equal to 3.5</u>
70.22	<u>Site-specific standards for specified river reaches or other waters are:</u>					
70.23	<u>Mississippi River Navigational Pool 1 (river miles 854.1 to 847.7 reach from Fridley</u>					
70.24	<u>to Ford Dam in St. Paul)</u>					
70.25	<u>Phosphorus, total</u>			<u>µg/L</u>		<u>less than or equal to 100</u>
70.26	<u>Chlorophyll-a (seston)</u>			<u>µg/L</u>		<u>less than or equal to 35</u>

71.1	<u>Mississippi River Navigational Pool 2 (river miles 847.7 to 815.2 reach from Ford Dam</u>		
71.2	<u>to Hastings Dam)</u>		
71.3	<u>Phosphorus, total</u>	<u>µg/L</u>	<u>less than or equal to 125</u>
71.4	<u>Chlorophyll-a (seston)</u>	<u>µg/L</u>	<u>less than or equal to 35</u>
71.5	<u>Mississippi River Navigational Pool 3 (river miles 815.2 to 796.9 reach from Hastings</u>		
71.6	<u>Dam to Red Wing Dam)</u>		
71.7	<u>Phosphorus, total</u>	<u>µg/L</u>	<u>less than or equal to 100</u>
71.8	<u>Chlorophyll-a (seston)</u>	<u>µg/L</u>	<u>less than or equal to 35</u>
71.9	<u>Mississippi River Navigational Pool 4 (river miles 796.9 to 752.8 reach from Red Wing</u>		
71.10	<u>Dam to Alma Dam). Lake Pepin occupies majority of Pool 4 and Lake Pepin site-specific</u>		
71.11	<u>standards are used for this pool.</u>		
71.12	<u>Mississippi River Navigational Pools 5 to 8 (river miles 752.8 to 679.1 Alma Dam to</u>		
71.13	<u>Genoa Dam)</u>		
71.14	<u>Phosphorus, total</u>	<u>µg/L</u>	<u>less than or equal to 100</u>
71.15	<u>Chlorophyll-a (seston)</u>	<u>µg/L</u>	<u>less than or equal to 35</u>
71.16	<u>Lake Pepin</u>		
71.17	<u>Phosphorus, total</u>	<u>µg/L</u>	<u>less than or equal to 100</u>
71.18	<u>Chlorophyll-a (seston)</u>	<u>µg/L</u>	<u>less than or equal to 28</u>
71.19	<u>Crow Wing River from confluence of Long Prairie River to the mouth of the Crow Wing</u>		
71.20	<u>River at the Mississippi River</u>		
71.21	<u>Phosphorus, total</u>	<u>µg/L</u>	<u>less than or equal to 75</u>
71.22	<u>Chlorophyll-a (seston)</u>	<u>µg/L</u>	<u>less than or equal to 13</u>
71.23	<u>Diel dissolved oxygen flux</u>	<u>mg/L</u>	<u>less than or equal to 3.5</u>
71.24	<u>Biochemical oxygen demand (BOD₅)</u>	<u>mg/L</u>	<u>less than or equal to 1.7</u>
71.25	<u>Crow River from the confluence of the North Fork of the Crow River and South Fork of</u>		
71.26	<u>the Crow River to the mouth of the Crow River at the Mississippi River</u>		

72.1	<u>Phosphorus, total</u>	<u>µg/L</u>	<u>less than or equal to 125</u>
72.2	<u>Chlorophyll-a (seston)</u>	<u>µg/L</u>	<u>less than or equal to 27</u>
72.3	<u>Diel dissolved oxygen flux</u>	<u>mg/L</u>	<u>less than or equal to 4.0</u>
72.4	<u>Biochemical oxygen demand (BOD₅)</u>	<u>mg/L</u>	<u>less than or equal to 2.5</u>

72.5 Additional narrative eutrophication standards for Class 2B rivers and streams are found
 72.6 in subpart 4b.

72.7	Substance,						
72.8	Characteristic,			Basis			Basis
72.9	or Pollutant			for			for MS,
72.10	(Class 2B)	Units	CS	CS	MS	FAV	FAV
72.11	<hr/>						
72.12	Fluoranthene	µg/L	1.9	Tox	3.5	6.9	Tox
72.13	Heptachlor (c)	ng/L	0.39	HH	260*	520*	Tox
72.14	Heptachlor epoxide (c)	ng/L	0.48	HH	270*	530*	Tox
72.15	Hexachlorobenzene (c)	ng/L	0.24	HH	—*	—*	Tox
72.16	Lead, total	µg/L	equation	Tox	equation	equation	Tox

72.17 The CS, MS, and FAV vary with total hardness and are calculated using the following
 72.18 equations:

72.19 The CS in µg/L shall not exceed: $\exp.(1.273[\ln(\text{total hardness mg/L})]-4.705)$

72.20 The MS in µg/L shall not exceed: $\exp.(1.273[\ln(\text{total hardness mg/L})]-1.460)$

72.21 The FAV in µg/L shall not exceed: $\exp.(1.273[\ln(\text{total hardness mg/L})]-0.7643)$

72.22 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

72.23 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
 72.24 the standard.

72.25 Example of total lead standards for five total hardness values:

72.26	TH in mg/L	50	100	200	300	400
72.27	<hr/>					
72.28	Lead, total					
72.29	CS µg/L	1.3	3.2	7.7	13	19

73.1 MS µg/L 34 82 197 331 477

73.2 FAV µg/L 68 164 396 663 956

73.3 **Substance,**
73.4 **Characteristic,**
73.5 **or Pollutant**
73.6 **(Class 2B)**

Units CS Basis for CS MS FAV Basis for MS, FAV

73.7

73.8 Lindane (c) µg/L 0.036 HH 4.4* 8.8* Tox
73.9 (Hexachlorocyclobenzene,
73.10 gamma-)

73.11 Mercury, total in water ng/L 6.9 HH 2,400* 4,900* Tox

73.12 Mercury, total mg/kg 0.2 HH NA NA NA
73.13 in edible fish tissue ppm

73.14 Methylene chloride (c) µg/L 1,940 HH 13,875 27,749 Tox
73.15 (Dichloromethane)

73.16 Metolachlor µg/L 23 Tox 271 543 Tox

73.17 Naphthalene µg/L 81 Tox 409 818 Tox

73.18 Nickel, total µg/L equation Tox equation equation Tox

73.19 The CS, MS, and FAV vary with total hardness and are calculated using the following
73.20 equations:

73.21 The CS in µg/L shall not exceed: $\exp.(0.846[\ln(\text{total hardness mg/L})]+1.1645)$

73.22 The MS in µg/L shall not exceed: $\exp.(0.846[\ln(\text{total hardness mg/L})]+3.3612)$

73.23 The FAV in µg/L shall not exceed: $\exp.(0.846[\ln(\text{total hardness mg/l})]+4.0543)$

73.24 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

73.25 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
73.26 the standard.

73.27 Example of total nickel standards for five total hardness values:

73.28 TH in mg/L 50 100 200 300 400

73.29

73.30 Nickel, total

73.31 CS µg/L 88 158 283 399 509

74.1	MS µg/L	789	1,418	2,549	3,592	4,582
74.2	FAV µg/L	1,578	2,836	5,098	7,185	9,164

74.3	Substance,						
74.4	Characteristic,			Basis			Basis
74.5	or Pollutant			for			for MS,
74.6	(Class 2B)	Units	CS	CS	MS	FAV	FAV
74.7	<hr/>						

74.8	Oil	µg/l	500	NA	5,000	10,000	NA
74.9	Oxygen, dissolved	mg/L	See	NA	—	—	NA
74.10			below				

74.11 5.0 mg/L as a daily minimum. This dissolved oxygen standard may be modified on a
 74.12 site-specific basis according to part 7050.0220, subpart 7, except that no site-specific
 74.13 standard shall be less than 5 mg/L as a daily average and 4 mg/L as a daily minimum.
 74.14 Compliance with this standard is required 50 percent of the days at which the flow
 74.15 of the receiving water is equal to the 7Q₁₀. This standard applies to all Class 2B
 74.16 waters except for those portions of the Mississippi River from the outlet of the Metro
 74.17 Wastewater Treatment Works in Saint Paul (River Mile 835) to Lock and Dam No. 2
 74.18 at Hastings (River Mile 815). For this reach of the Mississippi River, the standard is
 74.19 not less than 5 mg/L as a daily average from April 1 through November 30, and not
 74.20 less than 4 mg/L at other times.

74.21	Parathion	µg/L	0.013	Tox	0.07	0.13	Tox
74.22	Pentachlorophenol	µg/L	equation	Tox/HH equation	equation		Tox

74.23 The CS, MS, and FAV vary with pH and are calculated using the following equations:

74.24 For waters with pH values greater than 6.95, the CS shall not exceed the human
 74.25 health-based standard of 5.5 µg/L.

74.26 For waters with pH values less than 6.96, the CS in µg/L shall not exceed the
 74.27 toxicity-based standard of $\exp.(1.005[\text{pH}]-5.290)$

74.28 The MS in µg/L shall not exceed: $\exp.(1.005[\text{pH}]-4.830)$

74.29 The FAV in µg/L shall not exceed: $\exp.(1.005[\text{pH}]-4.1373)$

74.30 Where: $\exp.$ is the natural antilogarithm (base e) of the expression in parenthesis.

74.31 For pH values less than 6.0, 6.0 shall be used to calculate the standard and for pH
 74.32 values greater than 9.0, 9.0 shall be used to calculate the standard.

75.1 Example of pentachlorophenol standards for five pH values:

75.2 pH su 6.5 7.0 7.5 8.0 8.5

75.3

75.4 Pentachlorophenol

75.5 CS µg/L 3.5 5.5 5.5 5.5 5.5

75.6 MS µg/L 5.5 9.1 15 25 41

75.7 FAV µg/L 11 18 30 50 82

75.8 **Substance,**

75.9 **Characteristic,**

75.10 **or Pollutant**

75.11 **(Class 2B)**

Units

CS

**Basis
for
CS**

MS

FAV

**Basis
for MS,
FAV**

75.12

75.13 pH, minimum su 6.5 NA – – NA

75.14 pH, maximum su 9.0 NA – – NA

75.15 Phenanthrene µg/L 3.6 Tox 32 64 Tox

75.16 Phenol µg/L 123 Tox 2,214 4,428 Tox

75.17 Polychlorinated ng/L 0.029 HH 1,000* 2,000* Tox

75.18 biphenyls, total (c)

75.19 Radioactive materials NA See NA See See NA

75.20 below below below

75.21 Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled

75.22 environment as permitted by the appropriate authority having control over their use.

75.23 Selenium, total µg/L 5.0 Tox 20 40 Tox

75.24 Silver, total µg/L 1.0 Tox equation equation Tox

75.25 The MS and FAV vary with total hardness and are calculated using the following
75.26 equations:

75.27 The MS in µg/L shall not exceed: $\exp.(1.720[\ln(\text{total hardness mg/L})]-7.2156)$

75.28 The FAV in µg/L shall not exceed: $\exp.(1.720[\ln(\text{total hardness mg/L})]-6.520)$

75.29 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

75.30 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
75.31 the standard.

76.1 Example of total silver standards for five total hardness values:

76.2 TH in mg/L 50 100 200 300 400

76.3

76.4 Silver, total

76.5 CS µg/L 1.0 1.0 1.0 1.0 1.0

76.6 MS µg/L 1.0 2.0 6.7 13 22

76.7 FAV µg/L 1.2 4.1 13 27 44

76.8 **Substance,**

76.9 **Characteristic,**

76.10 **or Pollutant**

76.11 **(Class 2B)**

Units

CS

**Basis
for
CS**

MS

FAV

**Basis
for MS,
FAV**

76.12

76.13 Temperature °F See NA – – NA

76.14 below

76.15 5°F above natural in streams and 3°F above natural in lakes, based on monthly
76.16 average of the maximum daily temperatures, except in no case shall it exceed the
76.17 daily average temperature of 86°F.

76.18 1,1,2,2-Tetrachloroethane (c) µg/L 13 HH 1,127 2,253 Tox

76.19 Tetrachloroethylene (c) µg/L 8.9 HH 428 857 Tox

76.20 Thallium, total µg/L 0.56 HH 64 128 Tox

76.21 Toluene µg/L 253 Tox 1,352 2,703 Tox

76.22 Toxaphene (c) ng/L 1.3 HH 730* 1,500* Tox

76.23 1,1,1-Trichloroethane µg/L 329 Tox 2,957 5,913 Tox

76.24 1,1,2-Trichloroethylene (c) µg/L 120 HH 6,988 13,976 Tox

76.25 2,4,6-Trichlorophenol µg/L 2.0 HH 102 203 Tox

76.26 Turbidity value NTU 25 NA – – NA

76.27 Total suspended solids (TSS)

76.28 North River Nutrient Region mg/L 15 NA = = NA

76.29 Central River Nutrient

76.30 Region mg/L 30 NA = = NA

76.31 South River Nutrient Region mg/L 65 NA = = NA

77.1	<u>Red River mainstem -</u>						
77.2	<u>headwaters to border</u>	<u>mg/L</u>	<u>100</u>	<u>NA</u>	<u>=</u>	<u>=</u>	<u>NA</u>
77.3	<u>TSS standards for the Class</u>						
77.4	<u>2B North, Central, and South</u>						
77.5	<u>River Nutrient Regions and</u>						
77.6	<u>the Red River mainstem may</u>						
77.7	<u>be exceeded for no more</u>						
77.8	<u>than ten percent of the time.</u>						
77.9	<u>This standard applies April 1</u>						
77.10	<u>through September 30</u>						
77.11	<u>Total suspended solids (TSS),</u>						
77.12	<u>summer average</u>						
77.13	<u>Lower Mississippi River</u>						
77.14	<u>mainstem - Pools 2 through 4</u>	<u>mg/L</u>	<u>32</u>	<u>NA</u>	<u>=</u>	<u>=</u>	<u>NA</u>
77.15	<u>Lower Mississippi River</u>						
77.16	<u>mainstem below Lake Pepin</u>	<u>mg/L</u>	<u>30</u>	<u>NA</u>	<u>=</u>	<u>=</u>	<u>NA</u>
77.17	<u>TSS standards for the Class</u>						
77.18	<u>2B Lower Mississippi River</u>						
77.19	<u>may be exceeded for no more</u>						
77.20	<u>than 50 percent of the time.</u>						
77.21	<u>This standard applies June 1</u>						
77.22	<u>through September 30</u>						
77.23	<u>Substance,</u>						
77.24	<u>Characteristic,</u>			<u>Basis</u>			<u>Basis</u>
77.25	<u>or Pollutant</u>			<u>for</u>			<u>for MS,</u>
77.26	<u>(Class 2B)</u>	<u>Units</u>	<u>CS</u>	<u>CS</u>	<u>MS</u>	<u>FAV</u>	<u>FAV</u>
77.27							
77.28	Vinyl chloride (c)	µg/L	9.2	HH	—*	—*	NA
77.29	Xylene, total m,p,o	µg/L	166	Tox	1,407	2,814	Tox
77.30	Zinc, total	µg/L	equation	Tox	equation	equation	Tox
77.31	The CS, MS, and FAV vary with total hardness and are calculated using the following						
77.32	equations:						
77.33	The CS in µg/L shall not exceed: $\exp.(0.8473[\ln(\text{total hardness mg/L})]+0.7615)$						
77.34	The MS in µg/L shall not exceed: $\exp.(0.8473[\ln(\text{total hardness mg/L})]+0.8604)$						

78.1 The FAV in µg/L shall not exceed: $\exp.(0.8473[\ln(\text{total hardness mg/L})]+1.5536)$

78.2 Where: $\exp.$ is the natural antilogarithm (base e) of the expression in parenthesis.

78.3 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
78.4 the standard.

78.5 Example of total zinc standards for five total hardness values:

78.6	TH in mg/L	50	100	200	300	400
78.7	<hr/>					
78.8	Zinc, total					
78.9	CS µg/L	59	106	191	269	343
78.10	MS µg/L	65	117	211	297	379
78.11	FAV µg/L	130	234	421	594	758

78.12 Subp. 4a. **Narrative eutrophication standards for Class 2B lakes, shallow lakes,**
78.13 **and reservoirs.**

78.14 A. Eutrophication standards applicable to lakes, shallow lakes, and reservoirs
78.15 that lie on the border between two ecoregions or that are in the Red River Valley (also
78.16 referred to as Lake Agassiz Plains), Northern Minnesota Wetlands, or Driftless Area
78.17 ~~Ecoregions~~ Ecoregion must be applied on a case-by-case basis. The commissioner shall
78.18 use the standards applicable to adjacent ecoregions as a guide.

78.19 B. Eutrophication standards are compared to summer-average data ~~averaged~~
78.20 ~~over the summer season (June through September)~~. Exceedance of the total phosphorus
78.21 and either the chlorophyll-a or Secchi disk transparency standard is required to indicate a
78.22 polluted condition.

78.23 [For text of item C, see M.R.]

78.24 D. Lakes, shallow lakes, and reservoirs with a baseline quality that is poorer
78.25 than the numeric eutrophication standards in subpart 4 must be considered to be in
78.26 compliance with the standards if the baseline quality is the result of natural causes. The
78.27 commissioner shall determine baseline quality and compliance with these standards using

79.1 ~~summer-average~~ data and the procedures in part 7050.0150, subpart 5. ~~"Natural causes" is~~
79.2 ~~defined in part 7050.0150, subpart 4, item N.~~

79.3 [For text of item E, see M.R.]

79.4 Subp. 4b. **Narrative eutrophication standards for Class 2B rivers and streams.**

79.5 A. Eutrophication standards for rivers and streams are compared to
79.6 summer-average data or as specified in subpart 4. Exceedance of the total phosphorus
79.7 levels and chlorophyll-a (seston), five-day biochemical oxygen demand (BOD₅), diel
79.8 dissolved oxygen flux, or pH levels is required to indicate a polluted condition.

79.9 B. Rivers and streams that exceed the phosphorus levels but do not exceed the
79.10 chlorophyll-a (seston), five-day biochemical oxygen demand (BOD₅), diel dissolved
79.11 oxygen flux, or pH levels meet the eutrophication standard.

79.12 C. A polluted condition also exists when the chlorophyll-a (periphyton)
79.13 concentration exceeds 150 mg/m² more than one year in ten

79.14 D. It is the policy of the agency to protect all rivers, streams, and navigational
79.15 pools from the undesirable effects of cultural eutrophication. Rivers, streams, and
79.16 navigational pools with a baseline quality better than the numeric eutrophication standards
79.17 in subpart 4 must be maintained in that condition through the strict application of all
79.18 relevant federal, state, and local requirements governing nondegradation, the discharge
79.19 of nutrients from point and nonpoint sources, including:

79.20 (1) the nondegradation requirements in parts 7050.0180 and 7050.0185;

79.21 (2) the phosphorus effluent limits for point sources, where applicable in
79.22 chapter 7053;

79.23 (3) the requirements for feedlots in chapter 7020;

79.24 (4) the requirements for individual sewage treatment systems in chapter
79.25 7080;

- 80.1 (5) the requirements for control of storm water in chapter 7090;
80.2 (6) county shoreland ordinances; and
80.3 (7) implementation of mandatory and voluntary best management practices
80.4 to minimize point and nonpoint sources of nutrients.

80.5 E. Rivers, streams, and navigational pools with a baseline quality that does
80.6 not meet the numeric eutrophication standards in subpart 4 are in compliance with the
80.7 standards if the baseline quality is the result of natural causes. The commissioner must
80.8 determine baseline quality and compliance with these standards using data and the
80.9 procedures in part 7050.0150, subpart 5.

80.10 [For text of subps 5 to 9, see M.R.]

82.1 stream flows that are equal to or greater than the $7Q_{10}$ for the critical month or months;
82.2 ~~except for the purpose of setting ammonia effluent limits.~~

82.3 B. Discharges of ammonia in sewage, industrial waste, or other wastes must be
82.4 controlled so that the ammonia water quality standard is maintained at all stream flows
82.5 that are equal to or exceeded by the $30Q_{10}$ for the critical month or months.

82.6 C. Discharges of total phosphorus in sewage, industrial waste, or other wastes
82.7 must be controlled so that the eutrophication water quality standard is maintained for
82.8 the long-term summer concentration of total phosphorus, when averaged over all flows,
82.9 except where a specific flow is identified in chapter 7050. When setting the effluent limit
82.10 for total phosphorus, the commissioner shall consider the discharger's efforts to control
82.11 phosphorus as well as reductions from other sources, including nonpoint and runoff from
82.12 permitted municipal storm water discharges.

82.13 B D. Allowance must not be made in the design of treatment works for low
82.14 stream flow augmentation unless the flow augmentation of minimum flow is dependable
82.15 and controlled under applicable laws or regulations.

82.16 [For text of subps 8 and 9, see M.R.]

82.17 Subp. 9a. **Water quality standard-based TSS effluent limits.**

82.18 A. When the agency establishes effluent limits to meet a total suspended solids
82.19 (TSS) water quality standard and the water quality standard of the receiving water is:

82.20 (1) less than 30 mg/L and a continuous discharger is involved; or

82.21 (2) less than 45 mg/L and either an aerated pond or a controlled discharger
82.22 is involved,

82.23 the agency shall establish an appropriate water quality-based effluent limit (WQBEL)
82.24 considering the discharger's nonvolatile suspended solids (NVSS) concentration.

