

1.1 **Pollution Control Agency**

1.2 **Adopted Permanent Rule Relating to Water Quality Standards and Tiered Aquatic**  
1.3 **Life Use**

1.4 **7050.0140 USE CLASSIFICATIONS FOR WATERS OF THE STATE.**

1.5 [For text of subps 1 and 2, see M.R.]

1.6 Subp. 3. **Class 2 waters, aquatic life and recreation.** Aquatic life and recreation  
1.7 includes all waters of the state that support or may support aquatic biota, bathing, boating,  
1.8 or other recreational purposes and for which quality control is or may be necessary to protect  
1.9 aquatic or terrestrial life or their habitats or the public health, safety, or welfare.

1.10 [For text of subps 4 to 8, see M.R.]

1.11 **7050.0150 DETERMINATION OF WATER QUALITY, BIOLOGICAL AND**  
1.12 **PHYSICAL CONDITIONS, AND COMPLIANCE WITH STANDARDS.**

1.13 [For text of subps 1 and 2, see M.R.]

1.14 Subp. 3. **Narrative standards.** For all Class 2 waters, the aquatic habitat, which  
1.15 includes the waters of the state and stream bed, shall not be degraded in any material manner,  
1.16 there shall be no material increase in undesirable slime growths or aquatic plants, including  
1.17 algae, nor shall there be any significant increase in harmful pesticide or other residues in  
1.18 the waters, sediments, and aquatic flora and fauna; the normal aquatic biota and the use  
1.19 thereof shall not be seriously impaired or endangered, the species composition shall not be  
1.20 altered materially, and the propagation or migration of aquatic biota normally present shall  
1.21 not be prevented or hindered by the discharge of any sewage, industrial waste, or other  
1.22 wastes to the waters.

1.23 ~~Subp. 3a. **Assessment criteria.** The criteria by which water bodies are assessed to~~  
1.24 ~~determine if beneficial uses are supported, and definitions of the data and information~~  
1.25 ~~required for that assessment, is in Guidance Manual for Assessing the Quality of Minnesota~~  
1.26 ~~Surface Waters for Determination of Impairment: 305(b) Report and 303(d) List (2014 and~~

2.1 ~~as subsequently amended), which is incorporated by reference. The guidance manual is not~~  
2.2 ~~subject to frequent change and is available at <http://www.pca.state.mn.us/lupg1125>.~~

2.3 Subp. 4. **Definitions.** For the purposes of this chapter and chapter 7053, the following  
2.4 terms have the meanings given them.

2.5 A. "122-day ten-year low flow" or "122Q<sub>10</sub>" means the lowest average 122-day  
2.6 flow with a once in ten-year recurrence interval. A 122Q<sub>10</sub> is derived using the same methods  
2.7 used to derive a 7Q<sub>10</sub>, and the guidelines regarding period of record for flow data and  
2.8 estimating a 7Q<sub>10</sub> apply equally to determining a 122Q<sub>10</sub>, as described in part 7050.0130,  
2.9 subpart 3.

2.10 B. "Altered materially," "material increase," "material manner," "seriously  
2.11 impaired," and "significant increase," as used in subparts 3, 5, and 6, mean that pollution  
2.12 of the waters of the state has resulted in degradation of the physical, chemical, or biological  
2.13 qualities of the water body to the extent that attainable or previously existing beneficial uses  
2.14 are actually or potentially lost.

2.15 C. "Aquatic biota" means the aquatic community composed of game and nongame  
2.16 fish, minnows and other small fish, mollusks, insects, crustaceans and other invertebrates,  
2.17 submerged or emergent rooted vegetation, suspended or floating algae, substrate-attached  
2.18 algae, microscopic organisms, and other aquatic-dependent organisms that require aquatic  
2.19 systems for food or to fulfill any part of their life cycle, such as amphibians and certain  
2.20 wildlife species.

2.21 D. "Assemblage" means a taxonomic subset of a biological community such as  
2.22 fish in a stream community.

2.23 E. "Biological condition gradient" means a concept describing how aquatic  
2.24 communities change in response to increasing levels of stressors. In application, the biological

3.1 condition gradient is an empirical, descriptive model that rates biological communities on  
3.2 a scale from natural to highly degraded.

3.3 F. "Biological criteria, narrative" or "biocriteria, narrative" means written  
3.4 statements describing the attributes of the structure and function of aquatic assemblages in  
3.5 a water body necessary to protect the designated aquatic life beneficial use. The singular  
3.6 form "biological criterion, narrative" or "biocriterion, narrative" may also be used.

3.7 G. "Biological criteria, numeric" or "biocriteria, numeric" means specific  
3.8 quantitative measures of the attributes of the structure and function of aquatic communities  
3.9 in a water body necessary to protect the designated aquatic life beneficial use. The singular  
3.10 form "biological criterion, numeric" or "biocriterion, numeric" may also be used.

3.11 H. "BOD<sub>5</sub>" or "five-day biochemical oxygen demand" means the amount of  
3.12 dissolved oxygen needed by aerobic biological organisms to break down organic material  
3.13 present in a given water sample at a certain temperature over a five-day period.

3.14 I. "Chlorophyll-a" means a pigment in green plants including algae. The  
3.15 concentration of chlorophyll-a, expressed in weight per unit volume of water, is a  
3.16 measurement of the abundance of algae.

3.17 J. "Diel flux" means the daily change in a constituent, such as dissolved oxygen  
3.18 or pH, when there is a distinct daily cycle in the measurement. Diel dissolved oxygen flux  
3.19 means the difference between the maximum daily dissolved oxygen concentration and the  
3.20 minimum daily dissolved oxygen concentration.

3.21 K. "Ecoregion" means an area of relative homogeneity in ecological systems based  
3.22 on similar soils, land use, land surface form, and potential natural vegetation. Minnesota  
3.23 ecoregions are shown on the map in part 7050.0468.

3.24 L. "Eutrophication" means the increased productivity of the biological community  
3.25 in water bodies in response to increased nutrient loading. Eutrophication is characterized

4.1 by increased growth and abundance of algae and other aquatic plants, reduced water  
4.2 transparency, reduction or loss of dissolved oxygen, and other chemical and biological  
4.3 changes. The acceleration of eutrophication due to excess nutrient loading from human  
4.4 sources and activities, called cultural eutrophication, causes a degradation of water quality  
4.5 and possible loss of beneficial uses.

4.6 M. "Eutrophication standard" means the combination of indicators of enrichment  
4.7 and indicators of response as described in subpart 5. The indicators upon which the  
4.8 eutrophication standard for specific water bodies are based are as provided under subparts  
4.9 5a to 5c.

4.10 N. "Hydraulic residence time" means the time water resides in a basin or,  
4.11 alternately, the time it would take to fill the basin if it were empty.

4.12 O. "Impaired water" or "impaired condition" means a water body that does not  
4.13 meet applicable water quality standards or fully support applicable beneficial uses, due in  
4.14 whole or in part to water pollution from point or nonpoint sources, or any combination  
4.15 thereof.

4.16 P. "Index of biotic integrity," "index of biological integrity, " or "IBI" means an  
4.17 index developed by measuring attributes of an aquatic community that change in quantifiable  
4.18 and predictable ways in response to human disturbance, representing the health of that  
4.19 community.

4.20 Q. "Lake" means an enclosed basin filled or partially filled with standing fresh  
4.21 water with a maximum depth greater than 15 feet. Lakes may have no inlet or outlet, an  
4.22 inlet or outlet, or both an inlet and outlet.

4.23 R. "Lake morphometry" means the physical characteristics of the lake basin that  
4.24 are reasonably necessary to determine the shape of a lake, such as maximum length and  
4.25 width, maximum and mean depth, area, volume, and shoreline configuration.

5.1 S. "Lotic water" means a flowing or moving water body such as a stream, river,  
5.2 or ditch.

5.3 ~~S.~~ T. "Mixing status" means the frequency of complete mixing of the lake water  
5.4 from surface to bottom, which is determined by whether temperature gradients are established  
5.5 and maintained in the water column during the summer season.

5.6 ~~F.~~ U. "Measurable increase" or "measurable impact" means a change in trophic  
5.7 status that can be discerned above the normal variability in water quality data using a weight  
5.8 of evidence approach. The change in trophic status does not require a demonstration of  
5.9 statistical significance to be considered measurable. Mathematical models may be used as  
5.10 a tool in the data analysis to help predict changes in trophic status.

5.11 ~~U.~~ V. "Natural causes" means the multiplicity of factors that determine the physical,  
5.12 chemical, or biological conditions that would exist in a water body in the absence of  
5.13 measurable impacts from human activity or influence.

5.14 ~~V.~~ W. "Normal aquatic biota" and "normally present" mean a healthy aquatic  
5.15 community expected to be present in the water body in the absence of pollution of the water,  
5.16 consistent with any variability due to natural hydrological, substrate, habitat, or other physical  
5.17 and chemical characteristics. Expected presence is based on comparing the aquatic  
5.18 community in the water body of interest to the aquatic community in representative reference  
5.19 water bodies.

5.20 ~~W.~~ X. "Nuisance algae bloom" means an excessive population of algae that is  
5.21 characterized by obvious green or blue-green pigmentation in the water, floating mats of  
5.22 algae, reduced light transparency, aesthetic degradation, loss of recreational use, possible  
5.23 harm to the aquatic community, or possible toxicity to animals and humans. Algae blooms  
5.24 are measured through tests for chlorophyll-a, observations of Secchi disk transparency, and  
5.25 observations of impaired recreational and aesthetic conditions by the users of the water

6.1 body, or any other reliable data that identifies the population of algae in an aquatic  
6.2 community.

6.3 ~~X.~~ Y. "Periphyton" means algae on the bottom of a water body. In rivers or streams,  
6.4 these forms are typically found attached to logs, rocks, or other substrates, but when dislodged  
6.5 the algae will become part of the seston.

6.6 ~~Y.~~ Z. "Readily available and reliable data and information" means chemical,  
6.7 biological, and physical data and information determined by the commissioner to meet the  
6.8 quality assurance and quality control requirements in subpart 8, that are not more than ten  
6.9 years old from the time they are used for the assessment. A subset of data in the ten-year  
6.10 period, or data more than ten years old can be used if credible scientific evidence shows  
6.11 that these data are representative of current conditions.

6.12 ~~Z.~~ AA. "Reference water body" means a water body minimally or least impacted  
6.13 by point or nonpoint sources of pollution that is representative of water bodies of a similar  
6.14 surface water body type and within a geographic region such as an ecoregion or watershed.  
6.15 Reference water bodies are used as a base for comparing the quality of similar water bodies  
6.16 in the same geographic region.

6.17 ~~AA.~~ BB. "Reservoir" means a body of water in a natural or artificial basin or  
6.18 watercourse where the outlet or flow is artificially controlled by a structure such as a dam.  
6.19 Reservoirs are distinguished from river systems by having a hydraulic residence time of at  
6.20 least 14 days. For purposes of this item, residence time is determined using a flow equal to  
6.21 the 122Q<sub>10</sub> for the months of June through September.

6.22 ~~BB.~~ CC. "River nutrient region" means the geographic basis for regionalizing the  
6.23 river eutrophication criteria as described in Heiskary, S. and K. Parson, Regionalization of  
6.24 Minnesota's Rivers for Application of River Nutrient Criteria, Minnesota Pollution Control  
6.25 Agency (2013), which is incorporated by reference. The document is not subject to frequent  
6.26 change and is available through the Minitex interlibrary loan system.

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

7.6 ~~DD.~~ EE. "Secchi disk transparency" means the transparency of water as measured  
7.7 by a Secchi disk, a Secchi tube, or a transparency tube.

7.8 ~~EE.~~ FF. "Secchi tube" means a tool that is used to measure the transparency of  
7.9 stream or river water. A Secchi tube is a clear plastic tube, one meter in length and 1-3/4  
7.10 inch in diameter, with a mini-Secchi disk on a string. To measure water transparency, the  
7.11 tube is filled with water collected from a stream or river and, looking into the tube from the  
7.12 top, the weighted Secchi disk is lowered into the tube by a string until it disappears and then  
7.13 raised until it reappears, allowing the user to raise and lower the disk within the same water  
7.14 sample numerous times. The depth of the water at the midpoint between disappearance and  
7.15 reappearance of the disk is recorded in centimeters, which are marked on the side of the  
7.16 tube. If the Secchi disk is visible when it is lowered to the bottom of the tube, the transparency  
7.17 reading is recorded as "greater than 100 centimeters."

7.18 ~~FF.~~ GG. "Seston" means particulate matter suspended in water bodies and includes  
7.19 plankton and organic and inorganic matter.

7.20 ~~GG.~~ HH. "Shallow lake" means an enclosed basin filled or partially filled with  
7.21 standing fresh water with a maximum depth of 15 feet or less or with 80 percent or more  
7.22 of the lake area shallow enough to support emergent and submerged rooted aquatic plants  
7.23 (the littoral zone). It is uncommon for shallow lakes to thermally stratify during the summer.  
7.24 The quality of shallow lakes will permit the propagation and maintenance of a healthy  
7.25 indigenous aquatic community and they will be suitable for boating and other forms of  
7.26 aquatic recreation for which they may be usable. Shallow lakes are differentiated from

8.1 wetlands and lakes on a case-by-case basis. Wetlands are defined in part 7050.0186, subpart  
8.2 1a.

8.3 ~~HH.~~ II. "Summer-average" means a representative average of concentrations or  
8.4 measurements of nutrient enrichment factors, taken over one summer season.

8.5 ~~H.~~ JJ. "Summer season" means a period annually from June 1 through September  
8.6 30.

8.7 ~~JJ.~~ KK. "Transparency tube" means a tool that is used to measure the transparency  
8.8 of stream or river water. A transparency tube is a graduated clear plastic tube, 24 inches or  
8.9 more in length by 1-1/2 inches in diameter, with a stopper at the bottom end. The inside  
8.10 surface of the stopper is painted black and white. To measure water transparency, the tube  
8.11 is filled with water from a surface water; the water is released through a valve at the bottom  
8.12 end until the painted surface of the stopper is just visible through the water column when  
8.13 viewed from the top of the tube. The depth, in centimeters, is noted. More water is released  
8.14 until the screw in the middle of the painted symbol on the stopper is clearly visible; this  
8.15 depth is noted. The two observed depths are averaged to obtain a transparency measurement.

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

8.18 ~~LL.~~ MM. "Use attainability analysis" means a structured scientific assessment of  
8.19 the physical, chemical, biological, and economic factors affecting attainment of the uses of  
8.20 water bodies. A use attainability analysis is required to remove a designated use specified  
8.21 in section 101(a)(2) of the Clean Water Act that is not an existing use. The allowable reasons  
8.22 for removing a designated use are described in Code of Federal Regulations, title 40, section  
8.23 131.10 (g).

8.24 ~~MM.~~ NN. "Water body" means a lake, reservoir, wetland, or a geographically  
8.25 defined portion of a river or stream.



9.1 ~~NN. OO.~~ "Water body type" means a group of water bodies with similar natural  
9.2 physical, chemical, and biological attributes, where the characteristics are similar among  
9.3 water bodies within each type and distinct from water bodies of other types.

9.4 [For text of subps 5 to 5c, see M.R.]

9.5 Subp. 6. **Impairment of biological community and aquatic habitat.** In evaluating  
9.6 whether the narrative standards in subpart 3, which prohibit serious impairment of the normal  
9.7 aquatic biota and the use thereof, material alteration of the species composition, material  
9.8 degradation of stream beds, and the prevention or hindrance of the propagation and migration  
9.9 of aquatic biota normally present, are being met, the commissioner will consider all readily  
9.10 available and reliable data and information for the following factors of use impairment:

9.11 [For text of items A to D, see M.R.]

9.12 E. any other scientifically objective, credible, and supportable factors.

9.13 A finding of an impaired condition must be supported by data for the factors listed in  
9.14 at least one of items A to C. The biological quality of any given surface water body will be  
9.15 assessed by comparison to the biological conditions determined by the commissioner using  
9.16 a biological condition gradient model or a set of reference water bodies which best represents  
9.17 the most natural condition for that surface water body type within a geographic region.

9.18 [For text of subps 7 and 8, see M.R.]

9.19 **7050.0155 PROTECTION OF DOWNSTREAM USES.**

9.20 All waters must maintain a level of water quality that provides for the attainment and  
9.21 maintenance of the water quality standards of downstream waters, including the waters of  
9.22 another state.

10.1 **7050.0217 OBJECTIVES FOR PROTECTION OF SURFACE WATERS FROM**  
10.2 **TOXIC POLLUTANTS.**

10.3 Subpart 1. **Purpose and applicability.** The purpose of this part is to establish the  
10.4 objectives for developing numeric water quality standards listed in parts 7050.0220,  
10.5 7050.0222, 7050.0227, and 7052.0100 and site-specific water quality criteria for toxic  
10.6 pollutants or chemicals developed in the absence of numeric standards. The listed numeric  
10.7 standards for toxics and site-specific numeric criteria established by methods in parts  
10.8 7050.0218 and 7050.0219 protect Class 2 waters for the propagation and maintenance of  
10.9 aquatic biota, the consumption of fish and edible aquatic life by humans, the use of surface  
10.10 waters for public and private domestic consumption where applicable, and the consumption  
10.11 of aquatic organisms by wildlife. These criteria also protect the uses assigned to Class 7,  
10.12 limited resource value, waters as described in parts 7050.0140 and 7050.0227.

10.13 [For text of subp 2, see M.R.]

10.14 **7050.0218 FOR TOXIC POLLUTANTS: DEFINITIONS AND METHODS FOR**  
10.15 **DETERMINATION OF HUMAN HEALTH-BASED NUMERIC STANDARDS AND**  
10.16 **SITE-SPECIFIC NUMERIC CRITERIA FOR AQUATIC LIFE, HUMAN HEALTH,**  
10.17 **AND FISH-EATING WILDLIFE.**

10.18 [For text of subps 1 and 2, see M.R.]

10.19 Subp. 3. **Definitions.** For the purposes of parts 7050.0217 to 7050.0227, the following  
10.20 terms have the meanings given them.

10.21 [For text of items A to R, see M.R.]

10.22 S. "Criterion" means a number or numbers established for a pollutant derived  
10.23 under this part or part 7050.0219 or 7052.0110, or issued by the USEPA, to protect aquatic  
10.24 life, humans, or wildlife.

10.25 T. "Developmental health endpoint" or "developmental toxicity" means an adverse  
10.26 effect on the developing organism that may result from parental exposure prior to conception,

11.1 maternal exposure during prenatal development, or direct exposure postnatally until the  
11.2 time of sexual maturation. Developmental toxicity may be detected at any point in the  
11.3 lifespan of the organism. The major manifestations of developmental toxicity include:

11.4 (1) death of the developing organism;

11.5 (2) structural abnormality;

11.6 (3) altered growth; or

11.7 (4) functional deficiency.

11.8 U. "Duration" means the time over which the instream concentration of a pollutant  
11.9 is averaged for comparison with the standard or criterion.

11.10 V. "Durations for human health-based algorithms" or "D" means the length of the  
11.11 exposure period under consideration for noncancer and linear cancer algorithms.

11.12 (1) The four default D used in developing reference doses and corresponding  
11.13 intake rates are:

11.14 (a) acute: a period of 24 hours or less;

11.15 (b) short-term: a period of more than 24 hours, up to 30 days;

11.16 (c) subchronic: a period of more than 30 days, up to eight years based  
11.17 on application of the less than ten percent standard life expectancy of 70 years for humans;  
11.18 or

11.19 (d) chronic: a period of more than eight years.

11.20 (2) The default durations for use in the linear cancer algorithms with age  
11.21 dependent adjustment factors are:

11.22 (a) two years for the birth up to two-year age group;

11.23 (b) 14 years for the two- up to 16-year age group; and

12.1 (c) 54 years for the 16- up to 70-year age group.

12.2 For any algorithm, use of chemical-specific data to define durations for noncancer or linear  
12.3 cancer algorithms are preferred when acceptable data are available.

12.4 W. "Effect concentration" or "EC50" means the toxicant concentration that causes  
12.5 equilibrium loss, immobilization, mortality, or other debilitating effects in 50 percent of the  
12.6 exposed organisms during a specific time of observation.

12.7 X. "Endocrine" or "E" means a change in circulating hormone levels or interactions  
12.8 with hormone receptors, regardless of the organ or organ system affected. Health endpoints  
12.9 with or without the E designation are deemed equivalent, for example, thyroid (E) = thyroid,  
12.10 and must be included in the same health risk index equation.

12.11 Y. "Final acute value" or "FAV" means an estimate of the concentration of a  
12.12 pollutant corresponding to the cumulative probability of 0.05 in the distribution of all the  
12.13 acute toxicity values for the genera or species from the acceptable acute toxicity tests  
12.14 conducted on a pollutant. The FAV is the acute toxicity limitation applied to mixing zones  
12.15 in part 7050.0210, subpart 5; and to dischargers in parts 7053.0215, subpart 1; 7053.0225,  
12.16 subpart 6; and 7053.0245, subpart 1.

12.17 Z. "Food chain multiplier" or "FCM" means the ratio of a bioaccumulation factor  
12.18 by trophic level to an appropriate bioconcentration factor. FCM refers to values developed  
12.19 using USEPA models or from available and reliable field studies.

12.20 AA. "Frequency" means the number of times a standard can be exceeded in a  
12.21 specified period of time without causing acute or chronic toxic effects on the aquatic  
12.22 community, human health, or fish-eating wildlife.

12.23 BB. "Genus mean acute value" or "GMAV" means the geometric mean of the  
12.24 SMAVs available for the genus.

13.1 CC. "Health risk index" means the sum of the quotients calculated by identifying  
13.2 all chemicals that share a common health endpoint or are based on linear carcinogenicity  
13.3 and dividing the water or fish tissue concentration for each chemical (measured or statistically  
13.4 derived) by its applicable chronic standard or chronic criterion. To meet the objectives in  
13.5 part 7050.0217, the health risk index must not exceed a value of one. The equations for the  
13.6 risk indices are found in part 7050.0222, subpart 7, items D and E.

13.7 DD. "Health risk index endpoint" or "health endpoint" means the general  
13.8 description of toxic effects used to group chemicals for the purpose of calculating a health  
13.9 risk index.

13.10 EE. "Intake rate" or "IR" means rate of ingestion, inhalation, or dermal contact,  
13.11 depending on the route of exposure, expressed as the amount of a media taken in, on a per  
13.12 body weight and daily basis, for a specified duration.

13.13 FF. "Lethal concentration" or "LC50" means the toxicant concentration killing  
13.14 50 percent of the exposed organisms in a specific time of observation.

13.15 GG. "Lowest observable adverse effect level" or "LOAEL" means the lowest  
13.16 exposure level that caused a statistically or biologically significant increase in the frequency  
13.17 or severity of adverse effects observed between the exposed population and its appropriate  
13.18 control group.

13.19 HH. "Magnitude" means the acceptable amount of a toxic pollutant in water or  
13.20 fish tissue expressed as a concentration.

13.21 II. "Maximum criterion" or "MC" means the highest concentration of a toxicant  
13.22 in water to which aquatic organisms can be exposed for a brief time with zero to slight  
13.23 mortality. The MC equals the FAV divided by two.

13.24 JJ. "Maximum standard" or "MS" means the highest concentration of a toxicant  
13.25 in water to which aquatic organisms can be exposed for a brief time with zero to slight

14.1 mortality. The MS equals the FAV divided by two. Maximum standards are listed in part  
14.2 7050.0222.

14.3 KK. "MDH" means the Minnesota Department of Health.

14.4 LL. "Mode of action" or "MOA" means the sequence of key events following  
14.5 pollutant or chemical exposure upon which the toxic outcome depends.

14.6 MM. "National methods" means the methods the USEPA uses to develop aquatic  
14.7 life criteria as described in Stephan, C.E., D.J. Mount, D.J. Hansen, J.H. Gentile, G.A.  
14.8 Chapman, and W.A. Brungs, 1985, "Guidelines for Deriving Numerical National Water  
14.9 Quality Criteria for the Protection of Aquatic Organisms and Their Uses," USEPA, Office  
14.10 of Research and Development, Environmental Research Laboratories, Duluth MN;  
14.11 Narragansett, RI, Corvallis, OR. 98 p; available through the National Technical Information  
14.12 Service, Springfield, VA. (Publication PB85-227049)

14.13 NN. "No observable adverse effect level" or "NOAEL" means the highest exposure  
14.14 level at which there is no statistically or biologically significant increase in the frequency  
14.15 or severity of adverse effects between the exposed population and its appropriate control  
14.16 group.

14.17 OO. "Octanol to water partition coefficient" or " $K_{ow}$ " means the ratio of the  
14.18 concentration of a chemical in the octanol phase to its concentration in the aqueous phase  
14.19 of a two-phase octanol to water system after equilibrium of the chemical between the two  
14.20 phases has been achieved. The base 10 logarithm of the  $K_{ow}$  or  $\log K_{ow}$  is used in the  
14.21 calculation of bioaccumulation factors. The  $\log K_{ow}$  has been shown to be proportional to  
14.22 the bioconcentration potential of lipophilic organic chemicals.

14.23 PP. "Percent effluent" means the representation of acute or chronic toxicity of an  
14.24 effluent as a percent of whole effluent mixed in dilution water, where acute toxicity is  
14.25 expressed by LC50s or EC50s and chronic toxicity is expressed by NOAEL.

15.1 QQ. "Reference dose" or "RfD" means an estimate of a dose for a given duration  
15.2 to the human population, including susceptible subgroups such as infants, that is likely to  
15.3 be without an appreciable risk of adverse effects during a lifetime. It is derived from a  
15.4 suitable dose level at which there are few or no statistically or biologically significant  
15.5 increases in the frequency or severity of an adverse effect between the dosed population  
15.6 and its associated control group. The RfD includes one or more divisors, applied to the  
15.7 suitable dose level, accounting for:

15.8 (1) uncertainty in extrapolating from mammalian laboratory animal data to  
15.9 humans;

15.10 (2) variation in toxicological sensitivity among individuals in the human  
15.11 population;

15.12 (3) uncertainty in extrapolating from effects observed in a short-term study  
15.13 to effects of long-term exposure;

15.14 (4) uncertainty in using a study in which health effects were found at all doses  
15.15 tested; and

15.16 (5) uncertainty associated with deficiencies in the available data.

15.17 The product of the divisors is not to exceed 3,000 in an RfD used for a chronic standard.

15.18 The RfD is expressed in units of daily dose as milligrams of chemical per kilogram of body  
15.19 weight-day or mg/kg-day.

15.20 RR. "Relative source contribution factor" or "RSC" means the percentage or  
15.21 apportioned amount (subtraction method) of the reference dose for a pollutant allocated to  
15.22 surface water exposures from drinking or incidental water ingestion and fish consumption.  
15.23 In the absence of sufficient data to establish a pollutant- or chemical-specific RSC value,  
15.24 the default RSC is 0.2 or 0.5 as described in part 7050.0219, subpart 5.

16.1 SS. "Species mean acute value" or "SMAV" means the geometric mean of all the  
16.2 available and acceptable acute values for a species.

16.3 TT. "Standard" means a number or numbers established for a pollutant or water  
16.4 quality characteristic to protect a specified beneficial use as listed in parts 7050.0221 to  
16.5 7050.0227. The standard for a toxic pollutant includes the CS, MS, and FAV. Some pollutants  
16.6 do not have an MS or an FAV due to insufficient data. For these pollutants, the CS alone  
16.7 is the standard.

16.8 UU. "Toxic effect" means an observable or measurable adverse biological event  
16.9 in an organ, tissue, or system. The designation of health endpoints does not exclude other  
16.10 possible observable or measurable biological events. For the purpose of grouping chemicals  
16.11 and creating a health risk index when multiple chemicals are present, toxic effects may be  
16.12 ascribed to more general health risk index endpoints or health endpoints.

16.13 VV. "Toxic pollutant" has the meaning given it in part 7050.0185, subpart 2, item  
16.14 F. Toxic pollutant is used interchangeably in this part and parts 7050.0217, 7050.0219, and  
16.15 7050.0222, subpart 7, items B to G, with the terms "pollutant" and "chemical."

16.16 WW. "Toxic unit" means a measure of acute or chronic toxicity in an effluent.  
16.17 One acute toxic unit (TUa) is the reciprocal of the effluent concentration that causes 50  
16.18 percent effect or mortality to organisms for acute exposures (100/LC50); one chronic toxic  
16.19 unit (TUc) is the reciprocal of the effluent concentration that causes no observable adverse  
16.20 effect level on test organisms for chronic exposures (100/NOAEL).

16.21 XX. "Trophic level" or "TL" means the food web level in an ecosystem that is  
16.22 occupied by an organism or group of organisms because of what they eat and how they are  
16.23 related to the rest of the food web. For example, trophic level 3 in an aquatic ecosystem  
16.24 consists of small fish such as bluegills, crappies, and smelt and trophic level 4 consists of  
16.25 larger carnivorous fish such as walleye, northern pike, and most trout species.



17.1 YY. "USEPA" means the United States Environmental Protection Agency.

17.2 ZZ. "Water quality characteristic" means a characteristic of natural waters, such  
17.3 as total hardness or pH. Some water quality characteristics can affect the toxicity of pollutants  
17.4 to aquatic organisms.

17.5 AAA. "Whole effluent toxicity test" means the aggregate toxic effect of an effluent  
17.6 measured directly by a toxicity test. Effects on tested organisms are measured and expressed  
17.7 as toxic units or percent effluent for both acute and chronic whole effluent toxicity tests.

17.8 Subp. 4. **Adoption of USEPA national criteria.** The USEPA establishes aquatic life  
17.9 and human health-based criteria under section 304(a)(1) of the Clean Water Act, United  
17.10 States Code, title 33, section 1314. The USEPA criteria, subject to modification as described  
17.11 in this subpart, are applicable to Class 2 waters of the state. The USEPA has described the  
17.12 national methods for developing aquatic life criteria in "Guidelines for Deriving Numerical  
17.13 National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses."

17.14 USEPA criteria that vary with an ambient water quality characteristic such as total  
17.15 hardness or pH will be established for specific waters or reaches using data available to the  
17.16 commissioner. Central values such as the means or medians for the characteristic will be  
17.17 used unless there is evidence to support using different values. Values for water quality  
17.18 characteristics can be estimated for specific waters or reaches that have no data by using  
17.19 data from a nearby watershed with similar chemical properties.

17.20 A. The USEPA aquatic life criteria are adopted unchanged by the agency, unless  
17.21 modified under item C, as the criteria applicable to designated Class 2A waters in parts  
17.22 7050.0420 and 7050.0470.

17.23 B. The USEPA criteria are adopted, subject to modification as described in this  
17.24 item or item C, for application to cool and warm water habitats and wetlands. Cool and  
17.25 warm water habitats (Class 2Bd and 2B) are defined in part 7050.0430 or listed in part

18.1 7050.0470. Wetlands (Class 2D) waters are defined in part 7050.0425 or listed in part  
18.2 7050.0470.

18.3 (1) Acute data, in the form of the ranked genus mean acute values used by  
18.4 the USEPA to determine the national criteria, are the data used to determine the Class 2Bd,  
18.5 2B, and 2D criteria.

18.6 [For text of subitems (2) to (4), see M.R.]

18.7 (5) If, as a result of the recalculation of the USEPA criterion for application  
18.8 to Class 2Bd, 2B, and 2D waters, the FAV for these water classes is lower than the FAV  
18.9 for Class 2A waters, the Class 2Bd, 2B, or 2D FAV will be changed to equal the Class 2A  
18.10 FAV, unless the lower Class 2Bd, 2B, or 2D FAV is justified based on the available  
18.11 toxicological data.

18.12 [For text of subitems (6) and (7), see M.R.]

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

18.14 [For text of subps 5 to 8, see M.R.]

18.15 Subp. 9. **Wildlife-based criteria.** The agency shall use the procedures in this subpart  
18.16 to establish wildlife-based criteria. Wildlife criteria shall protect wildlife consumers of  
18.17 freshwater aquatic organisms from adverse effects of toxic pollutants. Wildlife criteria are  
18.18 applicable to all surface waters, subject to the exceptions in subpart 10, item B, subitem (1).

18.19 [For text of items A to C, see M.R.]

18.20 D. A final BAF for calculating a wildlife chronic criterion ( $CC_w$ ) is determined  
18.21 as in subpart 7, except that the BCFs and BAFs are adjusted to represent whole body BCFs  
18.22 and BAFs.

18.23 [For text of subitem (1), see M.R.]

19.1 (2) Normalized BCFs and BAFs are multiplied by five percent lipid for  $CC_w$   
19.2 applicable to Class 2Bd and 2B waters.

19.3 [For text of subitem (3), see M.R.]

19.4 (4) BCFs estimated using the relationship between BCFs and the  $\log K_{ow}$  are  
19.5 normalized by dividing the estimated BCF by 7.6 and then multiplying by 12 for Class 2A  
19.6 waters or by five for Class 2Bd and 2B waters.

19.7 [For text of subitem (5), see M.R.]

19.8 Subp. 10. **Applicable criteria or human health-based standard.** The final criteria  
19.9 or chronic standard for human health for toxic pollutants for surface waters must be the  
19.10 lowest of the applicable criteria or standards for human health derived under this part and  
19.11 part 7050.0219.

19.12 A. Applicable criteria or standards for human health by use for Class 2A, 2Bd,  
19.13 2B, and 2D surface waters are listed for each applicable population protected (aquatic life,  
19.14 humans, and fish-eating wildlife). The applicable criteria or standards for human health  
19.15 must be the lowest of the CC or CS as described in subitems (1) to (3):

19.16 [For text of subitems (1) to (3), see M.R.]

19.17 [For text of items B to D, see M.R.]

19.18 **7050.0219 HUMAN HEALTH-BASED CRITERIA AND STANDARDS.**

19.19 [For text of subps 1 to 10, see M.R.]

19.20 Subp. 11. **Final baseline BAF by trophic level.** Determine the final baseline BAF  
19.21 by trophic level (TL):

19.22 A. Calculate geometric mean baseline BAF for  $TL_3$  and  $TL_4$  using available  
19.23 species-means for each baseline BAF method. For Class 2A water, preference is given for  
19.24 *Salmonidae* data and developed as a single representative  $TL_4$  baseline BAF.

20.1 [For text of items B and C, see M.R.]

20.2 [For text of subps 12 to 15, see M.R.]

20.3 **7050.0220 SPECIFIC WATER QUALITY STANDARDS BY ASSOCIATED USE**  
20.4 **CLASSES.**

20.5 Subpart 1. **Purpose and scope.** The numeric and narrative water quality standards in  
20.6 this chapter prescribe the qualities or properties of the waters of the state that are necessary  
20.7 for the designated public uses and benefits. If the standards in this chapter are exceeded, it  
20.8 is considered indicative of a polluted condition which is actually or potentially deleterious,  
20.9 harmful, detrimental, or injurious with respect to designated uses or established classes of  
20.10 the waters of the state.

20.11 All surface waters are protected for multiple beneficial uses. Numeric water quality  
20.12 standards are tabulated in this part for all uses applicable to four common categories of  
20.13 surface waters, so that all applicable standards for each category are listed together in  
20.14 subparts 3a to 6a. The four categories are:

20.15 A. cold water aquatic life and habitat, also protected for drinking water: Classes  
20.16 1B; 2A, 2Ae<sub>2</sub>, or 2Ag; 3A or 3B; 4A and 4B; and 5 (subpart 3a);

20.17 B. cool and warm water aquatic life and habitat, also protected for drinking water:  
20.18 Classes 1B or 1C; 2Bd, 2Bde, 2Bdg, or 2Bdm; 3A or 3B; 4A and 4B; and 5 (subpart 4a);

20.19 C. cool and warm water aquatic life and habitat and wetlands: Classes 2B, 2Be,  
20.20 2Bg, 2Bm, or 2D; 3A, 3B, 3C, or 3D; 4A and 4B or 4C; and 5 (subpart 5a); and

20.21 D. limited resource value waters: Classes 3C; 4A and 4B; 5; and 7 (subpart 6a).

20.22 Subp. 2. **Explanation of tables.**

20.23 [For text of items A to C, see M.R.]

21.1 D. The tables of standards in subparts 3a to 6a include the following abbreviations  
21.2 and acronyms:

- 21.3 AN means aesthetic enjoyment and navigation, Class 5 waters
- 21.4 \* an asterisk following the FAV and MS values or double dashes (–) means part  
21.5 7050.0222, subpart 7, item G, applies
- 21.6 (c) means the chemical is assumed to be a human carcinogen
- 21.7 CS means chronic standard, defined in part 7050.0218, subpart 3
- 21.8 DC means domestic consumption (drinking water), Class 1 waters
- 21.9 – double dashes means there is no standard
- 21.10 exp. () means the natural antilogarithm (base e) of the expression in parenthesis
- 21.11 FAV means final acute value, defined in part 7050.0218, subpart 3
- 21.12 IC means industrial consumption, Class 3 waters
- 21.13 IR means agriculture irrigation use, Class 4A waters
- 21.14 LS means agriculture livestock and wildlife use, Class 4B waters
- 21.15 MS means maximum standard, defined in part 7050.0218, subpart 3
- 21.16 NA means not applicable
- 21.17 (S) means the associated value is a secondary drinking water standard
- 21.18 su means standard unit. It is the reporting unit for pH
- 21.19 TH means total hardness in mg/L, which is the sum of the calcium and magnesium  
21.20 concentrations expressed as CaCO<sub>3</sub>
- 21.21 TON means threshold odor number

21.22 [For text of items E and F, see M.R.]

21.23 Subp. 3. [Repealed, 24 SR 1105]

21.24 Subp. 3a. **Cold water aquatic life and habitat, drinking water, and associated use**  
21.25 **classes.** Water quality standards applicable to use Classes 1B; 2A, 2Ae<sub>2</sub> or 2Ag; 3A or 3b;  
21.26 4A and 4B; and 5 surface waters. The water quality standards in part 7050.0222, subpart

22.1 2, that apply to Class 2A also apply to Classes 2Ae and 2Ag. In addition to the water quality  
22.2 standards in part 7050.0222, subpart 2, the biological criteria defined in part 7050.0222,  
22.3 subpart 2d, apply to Classes 2Ae and 2Ag.

22.4 [For text of items A to E, see M.R.]

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

22.6 Subp. 4a. **Cool and warm water aquatic life and habitat, drinking water, and**  
22.7 **associated use classes.** Water quality standards applicable to use Classes 1B or 1C; 2Bd,  
22.8 2Bde, 2Bdg, or 2Bdm; 3A or 3B; 4A and 4B; and 5 surface waters. The water quality  
22.9 standards in part 7050.0222, subpart 3, that apply to Class 2Bd also apply to Classes 2Bde,  
22.10 2Bdg, and 2Bdm. In addition to the water quality standards in part 7050.0222, subpart 3,  
22.11 the biological criteria defined in part 7050.0222, subpart 3d, apply to Classes 2Bde, 2Bdg,  
22.12 and 2Bdm.

22.13 [For text of items A to F, see M.R.]

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

22.15 Subp. 5a. **Cool and warm water aquatic life and habitat and associated use**  
22.16 **classes.** Water quality standards applicable to use Classes 2B, 2Be, 2Bg, 2Bm, or 2D; 3A,  
22.17 3B, or 3C; 4A and 4B; and 5 surface waters. See parts 7050.0223, subpart 5; 7050.0224,  
22.18 subpart 4; and 7050.0225, subpart 2, for Class 3D, 4C, and 5 standards applicable to wetlands,  
22.19 respectively. The water quality standards in part 7050.0222, subpart 4, that apply to Class  
22.20 2B also apply to Classes 2Be, 2Bg, and 2Bm. In addition to the water quality standards in  
22.21 part 7050.0222, subpart 4, the biological criteria defined in part 7050.0222, subpart 4d,  
22.22 apply to Classes 2Be, 2Bg, and 2Bm.

22.23 A. MISCELLANEOUS SUBSTANCE, CHARACTERISTIC, OR POLLUTANT

23.1	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>3A/3B/3C</b>	<b>4A</b>	<b>4B</b>	<b>5</b>
23.2	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>IC</b>	<b>IR</b>	<b>LS</b>	<b>AN</b>

23.3

23.4 [For text of subitems (1) to (5), see M.R.]

23.5	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>3A/3B/3C</b>	<b>4A</b>	<b>4B</b>	<b>5</b>
23.6	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>IC</b>	<b>IR</b>	<b>LS</b>	<b>AN</b>

23.7

23.8 [For text of subitem (6), see M.R.]

23.9 (7) Eutrophication standards for lakes, shallow lakes, and reservoirs (phosphorus, total,  $\mu\text{g/L}$ ; chlorophyll-a,  $\mu\text{g/L}$ ; Secchi disk transparency, meters)

23.11	See part	--	--	--	--	--	--
23.12	7050.0222,						
23.13	subparts						
23.14	4 and 4a						

23.15 [For text of subitems (8) to (11), see M.R.]

23.16	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>3A/3B/3C</b>	<b>4A</b>	<b>4B</b>	<b>5</b>
23.17	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>IC</b>	<b>IR</b>	<b>LS</b>	<b>AN</b>

23.18

23.19 (12) Oxygen, dissolved, mg/L

23.20	See part	--	--	--	--	--	--
23.21	7050.0222,						
23.22	subparts						
23.23	4 and 6						

23.24 [For text of subitems (13) to (16), see M.R.]

23.25	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>3A/3B/3C</b>	<b>4A</b>	<b>4B</b>	<b>5</b>
23.26	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>IC</b>	<b>IR</b>	<b>LS</b>	<b>AN</b>

23.27

23.28 [For text of subitems (17) to (22), see M.R.]

## 24.1 B. METALS AND ELEMENTS

24.2	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>3A/3B/3C</b>	<b>4A</b>	<b>4B</b>	<b>5</b>
24.3	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>IC</b>	<b>IR</b>	<b>LS</b>	<b>AN</b>

24.4

24.5 [For text of subitems (1) to (4), see M.R.]

## 24.6 (5) Cadmium, total, µg/L

24.7	1.1	33	67	--	--	--	--
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24.8 Class 2B and 2D cadmium standards are hardness dependent. Cadmium values shown are  
 24.9 for a total hardness of 100 mg/L only. See part 7050.0222, subpart 4, for examples at other  
 24.10 hardness values and equations to calculate cadmium standards for any hardness value not  
 24.11 to exceed 400 mg/L.

24.12	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>3A/3B/3C</b>	<b>4A</b>	<b>4B</b>	<b>5</b>
24.13	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>IC</b>	<b>IR</b>	<b>LS</b>	<b>AN</b>

24.14

## 24.15 (6) Chromium +3, total, µg/L

24.16	207	1,737	3,469	--	--	--	--
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24.17 Class 2B and 2D trivalent chromium standards are hardness dependent. Chromium +3 values  
 24.18 shown are for a total hardness of 100 mg/L only. See part 7050.0222, subpart 4, for examples  
 24.19 at other hardness values and equations to calculate trivalent chromium standards for any  
 24.20 hardness value not to exceed 400 mg/L.

24.21 [For text of subitems (7) and (8), see M.R.]

## 24.22 (9) Copper, total, µg/L

24.23	9.8	18	35	--	--	--	--
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24.24 Class 2B and 2D copper standards are hardness dependent. Copper values shown are for a  
 24.25 total hardness of 100 mg/L only. See part 7050.0222, subpart 4, for examples at other  
 24.26 hardness values and equations to calculate copper standards for any hardness value not to  
 24.27 exceed 400 mg/L.



25.1 (10) Lead, total, µg/L

25.2 3.2 82 164 -- -- -- --

25.3 Class 2B and 2D lead standards are hardness dependent. Lead values shown are for a total  
 25.4 hardness of 100 mg/L only. See part 7050.0222, subpart 4, for examples at other hardness  
 25.5 values and equations to calculate lead standards for any hardness value not to exceed 400  
 25.6 mg/L.

25.7	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>3A/3B/3C</b>	<b>4A</b>	<b>4B</b>	<b>5</b>
25.8	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>IC</b>	<b>IR</b>	<b>LS</b>	<b>AN</b>

25.9 \_\_\_\_\_

25.10 [For text of subitems (11) and (12), see M.R.]

25.11 (13) Nickel, total, µg/L

25.12 158 1,418 2,836 -- -- -- --

25.13 Class 2B and 2D nickel standards are hardness dependent. Nickel values shown are for a  
 25.14 total hardness of 100 mg/L only. See part 7050.0222, subpart 4, for examples at other  
 25.15 hardness values and equations to calculate nickel standards for any hardness value not to  
 25.16 exceed 400 mg/L.

25.17 [For text of subitem (14), see M.R.]

25.18 (15) Silver, total, µg/L

25.19 1.0 2.0 4.1 -- -- -- --

25.20 Class 2B and 2D silver MS and FAV are hardness dependent. Silver values shown are for  
 25.21 a total hardness of 100 mg/L only. See part 7050.0222, subpart 4, for examples at other  
 25.22 hardness values and equations to calculate silver standards for any hardness value not to  
 25.23 exceed 400 mg/L.

25.24	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>3A/3B/3C</b>	<b>4A</b>	<b>4B</b>	<b>5</b>
25.25	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>IC</b>	<b>IR</b>	<b>LS</b>	<b>AN</b>

25.26 \_\_\_\_\_

25.27 [For text of subitem (16), see M.R.]

26.1 (17) Zinc, total, µg/L

26.2 106 117 234 -- -- -- --

26.3 Class 2B and 2D zinc standards are hardness dependent. Zinc values shown are for a total  
26.4 hardness of 100 mg/L only. See part 7050.0222, subpart 4, for examples at other hardness  
26.5 values and equations to calculate zinc standards for any hardness value not to exceed 400  
26.6 mg/L.

26.7 C. ORGANIC POLLUTANTS OR CHARACTERISTICS

26.8	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>3A/3B/3C</b>	<b>4A</b>	<b>4B</b>	<b>5</b>
26.9	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>IC</b>	<b>IR</b>	<b>LS</b>	<b>AN</b>

26.10 \_\_\_\_\_

26.11 [For text of subitems (1) to (5), see M.R.]

26.12	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>3A/3B/3C</b>	<b>4A</b>	<b>4B</b>	<b>5</b>
26.13	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>IC</b>	<b>IR</b>	<b>LS</b>	<b>AN</b>

26.14 \_\_\_\_\_

26.15 [For text of subitems (6) to (10), see M.R.]

26.16	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>3A/3B/3C</b>	<b>4A</b>	<b>4B</b>	<b>5</b>
26.17	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>IC</b>	<b>IR</b>	<b>LS</b>	<b>AN</b>

26.18 \_\_\_\_\_

26.19 [For text of subitems (11) to (15), see M.R.]

26.20	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>3A/3B/3C</b>	<b>4A</b>	<b>4B</b>	<b>5</b>
26.21	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>IC</b>	<b>IR</b>	<b>LS</b>	<b>AN</b>

26.22 \_\_\_\_\_

26.23 [For text of subitems (16) to (20), see M.R.]

26.24	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>3A/3B/3C</b>	<b>4A</b>	<b>4B</b>	<b>5</b>
26.25	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>IC</b>	<b>IR</b>	<b>LS</b>	<b>AN</b>

26.26 \_\_\_\_\_

26.27 [For text of subitems (21) to (25), see M.R.]

27.1	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>3A/3B/3C</b>	<b>4A</b>	<b>4B</b>	<b>5</b>
27.2	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>IC</b>	<b>IR</b>	<b>LS</b>	<b>AN</b>

27.3

27.4 [For text of subitems (26) to (30), see M.R.]

27.5	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>3A/3B/3C</b>	<b>4A</b>	<b>4B</b>	<b>5</b>
27.6	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>IC</b>	<b>IR</b>	<b>LS</b>	<b>AN</b>

27.7

27.8 (31) Pentachlorophenol, µg/L

27.9	5.5	15	30	--	--	--	--
------	-----	----	----	----	----	----	----

27.10 Class 2B and 2D standards are pH dependent, except that the CS will not exceed 5.5 µg/L.  
 27.11 Pentachlorophenol values shown are for a pH of 7.5 only. See part 7050.0222, subpart 4,  
 27.12 for examples at other pH values and equations to calculate pentachlorophenol standards for  
 27.13 any pH value.

27.14 [For text of subitems (32) to (35), see M.R.]

27.15	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>3A/3B/3C</b>	<b>4A</b>	<b>4B</b>	<b>5</b>
27.16	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>IC</b>	<b>IR</b>	<b>LS</b>	<b>AN</b>

27.17

27.18 [For text of subitems (36) to (40), see M.R.]

27.19	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>2B&amp;D</b>	<b>3A/3B/3C</b>	<b>4A</b>	<b>4B</b>	<b>5</b>
27.20	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>IC</b>	<b>IR</b>	<b>LS</b>	<b>AN</b>

27.21

27.22 [For text of subitems (41) to (43), see M.R.]

27.23 [For text of items D to F, see M.R.]

27.24 G. Temperature must not exceed:

27.25 (1) Class 2B standard: five degrees Fahrenheit above natural in streams and  
 27.26 three degrees Fahrenheit above natural in lakes, based on monthly average of maximum

28.1 daily temperature, except in no case shall it exceed the daily average temperature of 86  
28.2 degrees Fahrenheit; and

28.3 (2) Class 2D standard: maintain background as defined in part 7050.0222,  
28.4 subpart 6.

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

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

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

28.8 C. The level of dissolved oxygen must be maintained at concentrations:

28.9 (1) that will avoid odors or putrid conditions in the receiving water;

28.10 (2) at not less than one milligram per liter (daily average); and

28.11 (3) above zero milligrams per liter at all times.

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

28.13 [For text of subp 7, see M.R.]

28.14 **7050.0222 SPECIFIC WATER QUALITY STANDARDS FOR CLASS 2 WATERS**  
28.15 **OF THE STATE; AQUATIC LIFE AND RECREATION.**

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

28.17 Subp. 2. **Class 2A waters; aquatic life and recreation.** The quality of Class 2A  
28.18 surface waters shall be such as to permit the propagation and maintenance of a healthy  
28.19 community of cold water aquatic biota, and their habitats according to the definitions in  
28.20 subpart 2c. These waters shall be suitable for aquatic recreation of all kinds, including  
28.21 bathing, for which the waters may be usable. This class of surface waters is also protected  
28.22 as a source of drinking water. Abbreviations, acronyms, and symbols are explained in subpart  
28.23 1.

29.1	<b>Substance, Characteristic, or Pollutant (Class 2A)</b>	<b>Units</b>	<b>CS</b>	<b>Basis for CS</b>	<b>MS</b>	<b>FAV</b>	<b>Basis for MS, FAV</b>
29.2							
29.6	Acenaphthene	µg/L	20	HH	56	112	Tox
29.7	Acetochlor	µg/L	3.6	Tox	86	173	Tox
29.8	Acrylonitrile (c)	µg/L	0.38	HH	1,140*	2,281*	Tox
29.9	Alachlor (c)	µg/L	3.8	HH	800*	1,600*	Tox
29.10	Aluminum, total	µg/L	87	Tox	748	1,496	Tox
29.11	Ammonia un-ionized as N	µg/L	16	Tox	--	--	NA

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

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

29.20 where: f = the percent of total ammonia in the un-ionized state  
 29.21  $pk_a = 0.09 + (2730/T)$  (dissociation constant for ammonia)  
 29.22 T = temperature in degrees Kelvin (273.16° Kelvin = 0° Celsius)

29.23	<b>Substance, Characteristic, or Pollutant (Class 2A)</b>	<b>Units</b>	<b>CS</b>	<b>Basis for CS</b>	<b>MS</b>	<b>FAV</b>	<b>Basis for MS, FAV</b>
29.24							

30.1	Anthracene	µg/L	0.035	Tox	0.32	0.63	Tox
30.2	Antimony, total	µg/L	5.5	HH	90	180	Tox
30.3	Arsenic, total	µg/L	2.0	HH	360	720	Tox
30.4	Atrazine (c)	µg/L	3.4	HH	323	645	Tox
30.5	Benzene (c)	µg/L	5.1	HH	4,487*	8,974*	Tox
30.6	Bromoform	µg/L	33	HH	2,900	5,800	Tox
30.7	Cadmium, total	µg/L	equation	Tox	equation	equation	Tox

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

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

30.11 The MS in µg/L shall not exceed:  $\exp.(1.128[\ln(\text{total hardness mg/L})]-3.828)$

30.12 The FAV in µg/L shall not exceed:  $\exp.(1.128[\ln(\text{total hardness mg/L})]-3.1349)$

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

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

30.16 Example of total cadmium standards for five hardness values:

30.17	TH in mg/L	50	100	200	300	400
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30.19 Cadmium, total

30.20	CS µg/L	0.66	1.1	2.0	2.7	3.4
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30.21	MS µg/L	1.8	3.9	8.6	14	19
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30.22	FAV µg/L	3.6	7.8	17	27	37
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30.23	Substance, 30.24 Characteristic, 30.25 or Pollutant 30.26 (Class 2A)	Units	CS	Basis 30.27 for CS	MS	FAV	Basis for MS, FAV
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31.1	Carbon tetrachloride (c)	µg/L	1.9	HH	1750*	3500*	Tox
31.2	Chlordane (c)	ng/L	0.073	HH	1200*	2400*	Tox
31.3	Chloride	mg/L	230	Tox	860	1720	Tox
31.4	Chlorine, total residual	µg/L	11	Tox	19	38	Tox
31.5	Chlorine standard applies to conditions of continuous exposure, where continuous						
31.6	exposure refers to chlorinated effluents that are discharged for more than a total of two						
31.7	hours in any 24-hour period.						
31.8	Chlorobenzene	µg/L	20	HH	423	846	Tox
31.9	(Monochlorobenzene)						
31.10	Chloroform (c)	µg/L	53	HH	1,392	2,784	Tox
31.11	Chlorpyrifos	µg/L	0.041	Tox	0.083	0.17	Tox
31.12	Chromium +3, total	µg/L	equation	Tox	equation	equation	Tox

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

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

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

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

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

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

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

31.22	TH in mg/L	50	100	200	300	400
31.23	<hr/>					
31.24	Chromium +3, total					
31.25	CS µg/L	117	207	365	509	644
31.26	MS µg/L	984	1,737	3,064	4,270	5,405
31.27	FAV µg/L	1,966	3,469	6,120	8,530	10,797

32.1	<b>Substance, Characteristic, or Pollutant (Class 2A)</b>	<b>Units</b>	<b>CS</b>	<b>Basis for CS</b>	<b>MS</b>	<b>FAV</b>	<b>Basis for MS, FAV</b>
32.2							

32.6	Chromium +6, total	µg/L	11	Tox	16	32	Tox
32.7	Cobalt, total	µg/L	2.8	HH	436	872	Tox
32.8	Color value	Pt/Co	30	NA	--	--	NA
32.9	Copper, total	µg/L	equation	Tox	equation	equation	Tox

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

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

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

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

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

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

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

32.19	TH in mg/L	50	100	200	300	400
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32.20

32.21 Copper, total

32.22	CS µg/L	6.4	9.8	15	19	23
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32.23	MS µg/L	9.2	18	34	50	65
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32.24	FAV µg/L	18	35	68	100	131
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32.25	<b>Substance, Characteristic, or Pollutant (Class 2A)</b>	<b>Units</b>	<b>CS</b>	<b>Basis for CS</b>	<b>MS</b>	<b>FAV</b>	<b>Basis for MS, FAV</b>
32.26							



33.1	Cyanide, free	µg/L	5.2	Tox	22	45	Tox
33.2	DDT (c)	ng/L	0.11	HH	550*	1100*	Tox
33.3	1,2-Dichloroethane (c)	µg/L	3.5	HH	45,050*	90,100*	Tox
33.4	Dieldrin (c)	ng/L	0.0065	HH	1,300*	2,500*	Tox
33.5	Di-2-ethylhexyl phthalate (c)	µg/L	1.9	HH	--*	--*	NA
33.6	Di-n-octyl phthalate	µg/L	30	Tox	825	1,650	Tox
33.7	Endosulfan	µg/L	0.0076	HH	0.084	0.17	Tox
33.8	Endrin	µg/L	0.0039	HH	0.090	0.18	Tox
33.9	<i>Escherichia (E.) coli</i>	See	See	HH	See	See	NA
33.10		below	below		below	below	

33.11 Not to exceed 126 organisms per 100 milliliters as a geometric mean of not less than  
 33.12 five samples representative of conditions within any calendar month, nor shall more  
 33.13 than ten percent of all samples taken during any calendar month individually exceed  
 33.14 1,260 organisms per 100 milliliters. The standard applies only between April 1 and  
 33.15 October 31.

33.16	Ethylbenzene	µg/L	68	Tox	1,859	3,717	Tox
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33.17	<b>Substance, Characteristic, or Pollutant (Class 2A)</b>	<b>Units</b>	<b>CS</b>	<b>Basis for CS</b>	<b>MS</b>	<b>FAV</b>	<b>Basis for MS, FAV</b>
33.18							
33.19							
33.20							

33.21

33.22 Eutrophication standards for Class 2A lakes and reservoirs.

33.23 Designated lake trout lakes in all ecoregions (lake trout lakes support natural populations  
 33.24 of lake trout, *Salvelinus namaycush*):

33.25	Phosphorus, total	µg/L	12	NA	--	--	NA
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33.26	Chlorophyll-a	µg/L	3	NA	--	--	NA
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33.27	Secchi disk transparency	meters	No less	NA	--	--	NA
33.28			than 4.8				

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

34.1	Phosphorus, total	µg/L	20	NA	--	--	NA
34.2	Chlorophyll-a	µg/L	6	NA	--	--	NA
34.3	Secchi disk transparency	meters	No less	NA	--	--	NA
34.4			than 2.5				

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

34.7 Eutrophication standards for Class 2A rivers and streams.

34.8 North River Nutrient Region:

34.9	Phosphorus, total		µg/L				less than or equal to 50
34.10	Chlorophyll-a (seston)		µg/L				less than or equal to 7
34.11	Diel dissolved oxygen flux		mg/L				less than or equal to 3.0
34.12	Biochemical oxygen demand (BOD <sub>5</sub> )		mg/L				less than or equal to 1.5

34.13 Central River Nutrient Region:

34.14	Phosphorus, total		µg/L				less than or equal to 100
34.15	Chlorophyll-a (seston)		µg/L				less than or equal to 18
34.16	Diel dissolved oxygen flux		mg/L				less than or equal to 3.5
34.17	Biochemical oxygen demand (BOD <sub>5</sub> )		mg/L				less than or equal to 2.0

34.18 South River Nutrient Region:

34.19	Phosphorus, total		µg/L				less than or equal to 150
34.20	Chlorophyll-a (seston)		µg/L				less than or equal to 35
34.21	Diel dissolved oxygen flux		mg/L				less than or equal to 4.5
34.22	Biochemical oxygen demand (BOD <sub>5</sub> )		mg/L				less than or equal to 3.0

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

35.1	<b>Substance, Characteristic, or Pollutant (Class 2A)</b>	<b>Units</b>	<b>CS</b>	<b>Basis for CS</b>	<b>MS</b>	<b>FAV</b>	<b>Basis for MS, FAV</b>
35.2							

35.6	Fluoranthene	µg/L	1.9	Tox	3.5	6.9	Tox
35.7	Heptachlor (c)	ng/L	0.10	HH	260*	520*	Tox
35.8	Heptachlor epoxide (c)	ng/L	0.12	HH	270*	530*	Tox
35.9	Hexachlorobenzene (c)	ng/L	0.061	HH	--*	--*	Tox
35.10	Lead, total	µg/L	equation	Tox	equation	equation	Tox

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

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

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

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

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

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

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

35.20	TH in mg/L	50	100	200	300	400
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35.21	<hr/>					
35.22	Lead, total					
35.23	CS µg/L	1.3	3.2	7.7	13	19
35.24	MS µg/L	34	82	197	331	477
35.25	FAV µg/L	68	164	396	663	956

35.26	<b>Substance, Characteristic,</b>	<b>Units</b>	<b>CS</b>	<b>Basis for CS</b>	<b>MS</b>	<b>FAV</b>	<b>Basis for</b>
35.27							

36.1 **or Pollutant** **MS,**  
 36.2 **(Class 2A)** **FAV**

36.3 \_\_\_\_\_

36.4	Lindane (c)	µg/L	0.0087	HH	1.0*	2.0*	Tox
36.5	(Hexachlorocyclohexane,						
36.6	gamma-)						
36.7	Mercury, total in water	ng/L	6.9	HH	2,400*	4,900*	Tox
36.8	Mercury, total	mg/kg	0.2	HH	NA	NA	NA
36.9	in edible fish	ppm					
36.10	Methylene chloride (c)	µg/L	45	HH	13,875*	27,749*	Tox
36.11	Dichloromethane)						
36.12	Metolachlor	µg/L	23	Tox	271	543	Tox
36.13	Naphthalene	µg/L	65	HH	409	818	Tox
36.14	Nickel, total	µg/L	equation	Tox/HH	equation	equation	Tox

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

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

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

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

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

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

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

36.26	TH in mg/L	50	100	200	300	400
36.27	_____					
36.28	Nickel, total					
36.29	CS µg/L	88	158	283	297	297

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

37.3	Substance, Characteristic, or Pollutant (Class 2A)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
37.4							
37.5	37.6						

37.7

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37.8	Oil	µg/L	500	NA	5,000	10,000	NA
37.9	Oxygen, dissolved	mg/L	See	NA	--	--	NA
37.10			below				

37.11 7.0 mg/L as a daily minimum. This dissolved oxygen standard requires compliance  
 37.12 with the standard 50 percent of the days at which the flow of the receiving water is  
 37.13 equal to the 7Q<sub>10</sub>.

37.14	Parathion	µg/L	0.013	Tox	0.07	0.13	Tox
37.15	Pentachlorophenol	µg/L	0.93	HH	equation	equation	Tox

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

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

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

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

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

37.22 Example of pentachlorophenol standards for five pH values:

37.23	pH su	6.5	7.0	7.5	8.0	8.5
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37.24

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37.25 Pentachlorophenol

37.26	CS µg/L	0.93	0.93	0.93	0.93	0.93
37.27	MS µg/L	5.5	9.1	15	25	41
37.28	FAV µg/L	11	18	30	50	82

38.1	<b>Substance,</b>						<b>Basis</b>
38.2	<b>Characteristic,</b>						<b>for</b>
38.3	<b>or Pollutant</b>			<b>Basis</b>			<b>MS,</b>
38.4	<b>(Class 2A)</b>	<b>Units</b>	<b>CS</b>	<b>for CS</b>	<b>MS</b>	<b>FAV</b>	<b>FAV</b>
38.5							
38.6	pH, minimum	su	6.5	NA	--	--	NA
38.7	pH, maximum	su	8.5	NA	--	--	NA
38.8	Phenanthrene	µg/L	3.6	Tox	32	64	Tox
38.9	Phenol	µg/L	123	Tox	2,214	4,428	Tox
38.10	Polychlorinated biphenyls,	ng/L	0.014	HH	1,000*	2,000*	Tox
38.11	total (c)						
38.12	Radioactive materials	NA	See	NA	See	See	NA
38.13			below		below	below	
38.14	Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled						
38.15	environment as permitted by the appropriate authority having control over their use.						
38.16	Selenium, total	µg/L	5.0	Tox	20	40	Tox
38.17	Silver, total	µg/L	0.12	Tox	equation	equation	Tox
38.18	The MS and FAV vary with total hardness and are calculated using the following						
38.19	equations:						
38.20	The MS in µg/L shall not exceed: $\exp.(1.720[\ln(\text{total hardness mg/L})]-7.2156)$						
38.21	The FAV in µg/L shall not exceed: $\exp.(1.720[\ln(\text{total hardness mg/L})]-6.520)$						
38.22	Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.						
38.23	For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the						
38.24	standard.						
38.25	Example of silver standards for five total hardness values:						
38.26	TH in mg/L	50	100	200	300	400	
38.27	<hr/>						
38.28	Silver, total						
38.29	CS µg/L	0.12	0.12	0.12	0.12	0.12	

39.1	MS µg/L	1.0	2.0	6.7	13	22	
39.2	FAV µg/L	1.2	4.1	13	27	44	
39.3	<b>Substance, Characteristic, or Pollutant (Class 2A)</b>	<b>Units</b>	<b>CS</b>	<b>Basis for CS</b>	<b>MS</b>	<b>FAV</b>	<b>Basis for MS, FAV</b>
39.4							
39.5							
39.6							
39.7	<hr/>						
39.8	Temperature	°C or	No	NA	--	--	NA
39.9		°F	material				
39.10			increase				
39.11	1,1,2,2-Tetrachloroethane (c)	µg/L	1.1	HH	1,127*	2,253*	Tox
39.12	Tetrachloroethylene (c)	µg/L	3.8	HH	428*	857*	Tox
39.13	Thallium, total	µg/L	0.28	HH	64	128	Tox
39.14	Toluene	µg/L	253	Tox	1,352	2,703	Tox
39.15	Toxaphene (c)	ng/L	0.31	HH	730*	1,500*	Tox
39.16	1,1,1-Trichloroethane	µg/L	329	Tox	2,957	5,913	Tox
39.17	1,1,2-Trichloroethylene (c)	µg/L	25	HH	6,988*	13,976*	Tox
39.18	2,4,6-Trichlorophenol	µg/L	2.0	HH	102	203	Tox
39.19	Total suspended solids (TSS)	mg/L	10	NA	--	--	NA
39.20	TSS standards for Class 2A						
39.21	may be exceeded for no more						
39.22	than ten percent of the time.						
39.23	This standard applies April 1						
39.24	through September 30						
39.25	Vinyl chloride (c)	µg/L	0.17	HH	--*	--*	NA
39.26	Xylene, total m,p,o	µg/L	166	Tox	1,407	2,814	Tox
39.27	Zinc, total	µg/L	equation	Tox	equation	equation	Tox
39.28	The CS, MS, and FAV vary with total hardness and are calculated using the following						
39.29	equations:						
39.30	The CS in µg/L shall not exceed: $\exp.(0.8473[\ln(\text{total hardness mg/L})]+0.7615)$						

- 40.1 The MS in  $\mu\text{g/L}$  shall not exceed:  $\text{exp.}(0.8473[\ln(\text{total hardness mg/L})]+0.8604)$
- 40.2 The FAV in  $\mu\text{g/L}$  shall not exceed:  $\text{exp.}(0.8473[\ln(\text{total hardness mg/L})]+1.5536)$
- 40.3 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.
- 40.4 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the
- 40.5 standard.

40.6 Example of zinc standards for five total hardness values:

40.7	TH in mg/L	50	100	200	300	400
40.8	<hr/>					
40.9	Zinc, total					
40.10	CS $\mu\text{g/L}$	59	106	191	269	343
40.11	MS $\mu\text{g/L}$	65	117	211	297	379
40.12	FAV $\mu\text{g/L}$	130	234	421	594	758

40.13 [For text of subps 2a and 2b, see M.R.]

40.14 Subp. 2c. **Beneficial use definitions for lotic cold water stream and river aquatic**

40.15 **life and habitats (Class 2A).**

40.16 A. Subitems (1) to ~~(4)~~ (5) apply to the beneficial uses in items B and C:

40.17 (1) The designation and attainment of beneficial uses are based on the

40.18 biological criteria in subpart 2d.

40.19 (2) The attributes of species composition, diversity, and functional

40.20 organization are measured using:

40.21 (a) the ~~fish-based~~ fish IBI as defined in ~~Development of a Fish-based~~

40.22 ~~Index of Biological Integrity for Minnesota's Rivers and Streams, Minnesota Pollution~~

40.23 ~~Control Agency (2014)~~ Fish Data Collection Protocols for Lotic Waters in Minnesota (2017);

40.24 or



41.1 (b) the macroinvertebrate IBI as defined in ~~Development of a~~  
41.2 ~~Macroinvertebrate-based Index of Biological Integrity for Minnesota's Rivers and Streams,~~  
41.3 ~~Minnesota Pollution Control Agency (2014)~~ Macroinvertebrate Data Collection Protocols  
41.4 for Lotic Waters in Minnesota (2017).

41.5 (3) Water body types for streams and rivers are defined in the documents  
41.6 referenced in subitem (2).

41.7 (4) The following documents are incorporated by reference and are not subject  
41.8 to frequent change:

41.9 (a) Calibration of the Biological Condition Gradient for Streams of  
41.10 Minnesota, Gerritsen et al. (2012). The document is available on the agency's Web site at  
41.11 [www.pca.state.mn.us/regulations/minnesota-rulemaking](http://www.pca.state.mn.us/regulations/minnesota-rulemaking);

41.12 (b) ~~Development of a Fish-based Index of Biological Integrity for~~  
41.13 ~~Minnesota's Rivers and Streams, Minnesota Pollution Control Agency (2014)~~ Fish Data  
41.14 Collection Protocols for Lotic Waters in Minnesota, Minnesota Pollution Control Agency  
41.15 (2017). The document is available on the agency's Web site at  
41.16 [www.pca.state.mn.us/regulations/minnesota-rulemaking](http://www.pca.state.mn.us/regulations/minnesota-rulemaking);

41.17 (c) ~~Development of a Macroinvertebrate-based Index of Biological~~  
41.18 ~~Integrity for Minnesota's Rivers and Streams, Minnesota Pollution Control Agency (2014)~~  
41.19 Macroinvertebrate Data Collection Protocols for Lotic Waters in Minnesota, Minnesota  
41.20 Pollution Control Agency (2017). The document is available on the agency's Web site at  
41.21 [www.pca.state.mn.us/regulations/minnesota-rulemaking](http://www.pca.state.mn.us/regulations/minnesota-rulemaking); and

41.22 (d) Development of Biological Criteria for Tiered Aquatic Life Uses,  
41.23 Minnesota Pollution Control Agency (2016). The document is available on the agency's  
41.24 Web site at [www.pca.state.mn.us/regulations/minnesota-rulemaking](http://www.pca.state.mn.us/regulations/minnesota-rulemaking).

42.1                   (5) The beneficial use subclass designators "e" and "g" are added to the Class  
 42.2 2A designator as specific additional designators. The additional subclass designators do not  
 42.3 replace the Class 2A designator. All requirements for Class 2A cold water stream and river  
 42.4 habitats in parts 7050.0222 and 7052.0100 continue to apply in addition to requirements  
 42.5 for Class 2Ae or Class 2Ag cold water stream and river habitats in part 7050.0222. These  
 42.6 subclass designators are applied to lotic waters only.

42.7                   B. "Exceptional cold water aquatic life and habitat" or "Class 2Ae" is a beneficial  
 42.8 use that means waters capable of supporting and maintaining an exceptional and balanced,  
 42.9 integrated, adaptive community of cold water aquatic organisms having a species  
 42.10 composition, diversity, and functional organization comparable to the 75th percentile of  
 42.11 biological condition gradient level 3 as established in Calibration of the Biological Condition  
 42.12 Gradient for Streams of Minnesota, Gerritsen et al. (2012).

42.13                   C. "General cold water aquatic life and habitat" or "Class 2Ag" is a beneficial use  
 42.14 that means waters capable of supporting and maintaining a balanced, integrated, adaptive  
 42.15 community of cold water aquatic organisms having a species composition, diversity, and  
 42.16 functional organization comparable to the median of biological condition gradient level 4  
 42.17 as established in Calibration of the Biological Condition Gradient for Streams of Minnesota,  
 42.18 Gerritsen et al. (2012).

42.19                   Subp. 2d. **Biological criteria for lotic cold water stream and river aquatic life and**  
 42.20 **habitats (Class 2A).**

42.21	<b>Water Body Type</b>	<b>Tier</b>	<b>Class</b>	<b>Assemblage</b>	<b>Biocriterion</b>
42.22	<hr/>				
42.23	Southern cold water streams	Exceptional	2Ae	Fish	82
42.24		General	2Ag	Fish	50
42.25	Northern cold water streams	Exceptional	2Ae	Fish	60
42.26		General	2Ag	Fish	35

43.1	Northern cold water streams	Exceptional	2Ae	Macroinvertebrates	52
43.2		General	2Ag	Macroinvertebrates	32
43.3	Southern cold water streams	Exceptional	2Ae	Macroinvertebrates	72
43.4		General	2Ag	Macroinvertebrates	43

43.5 The biological criteria for lotic cold water aquatic life and habitats (Class 2A) are applicable  
 43.6 to perennial and intermittent waters that allow for colonization of fish or macroinvertebrates.

43.7 Subp. 3. **Class 2Bd waters.** The quality of Class 2Bd surface waters shall be such as  
 43.8 to permit the propagation and maintenance of a healthy community of cool or warm water  
 43.9 aquatic biota and their habitats according to the definitions in subpart 3c. These waters shall  
 43.10 be suitable for aquatic recreation of all kinds, including bathing, for which the waters may  
 43.11 be usable. This class of surface waters is also protected as a source of drinking water. The  
 43.12 applicable standards are given below. Abbreviations, acronyms, and symbols are explained  
 43.13 in subpart 1.

43.14	43.15	43.16	43.17	43.18	43.19	43.20	43.21	43.22	43.23	43.24
Substance,	Characteristic,		Units	CS	Basis	for	MS	FAV	Basis	for
(Class 2Bd)	or Pollutant				CS	MS	FAV	FAV	MS,	FAV
43.19	Acenaphthene		µg/L	20	HH	56	112		Tox	
43.20	Acetochlor		µg/L	3.6	Tox	86	173		Tox	
43.21	Acrylonitrile (c)		µg/L	0.38	HH	1,140*	2,281*		Tox	
43.22	Alachlor (c)		µg/L	4.2	HH	800*	1,600*		Tox	
43.23	Aluminum, total		µg/L	125	Tox	1,072	2,145		Tox	
43.24	Ammonia un-ionized as N		µg/L	40	Tox	--	--		NA	

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

44.1 
$$f = 1 / (10^{(pK_a - pH)} + 1) \times 100$$

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

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

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

44.5	<b>Substance, Characteristic, or Pollutant (Class 2Bd)</b>	<b>Units</b>	<b>CS</b>	<b>Basis</b>			<b>Basis for MS, FAV</b>
44.6				<b>CS</b>	<b>MS</b>	<b>FAV</b>	

44.7							
44.8							
44.9							
44.10	Anthracene	µg/L	0.035	Tox	0.32	0.63	Tox
44.11	Antimony, total	µg/L	5.5	HH	90	180	Tox
44.12	Arsenic, total	µg/L	2.0	HH	360	720	Tox
44.13	Atrazine (c)	µg/L	3.4	HH	323	645	Tox
44.14	Benzene (c)	µg/L	6.0	HH	4,487*	8,974*	Tox
44.15	Bromoform	µg/L	41	HH	2,900	5,800	Tox
44.16	Cadmium, total	µg/L	equation	Tox	equation	equation	Tox

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

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

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

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

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

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

44.25 Example of total cadmium standards for five hardness values:

44.26	TH in mg/L	50	100	200	300	400
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44.27

45.1	Cadmium, total						
45.2	CS µg/L	0.66	1.1	2.0	2.7	3.4	
45.3	MS µg/L	15	33	73	116	160	
45.4	FAV µg/L	31	67	146	231	319	

45.5	<b>Substance,</b>						<b>Basis</b>
45.6	<b>Characteristic,</b>			<b>Basis</b>			<b>for</b>
45.7	<b>or Pollutant</b>			<b>for</b>			<b>MS,</b>
45.8	<b>(Class 2Bd)</b>	<b>Units</b>	<b>CS</b>	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>FAV</b>
45.9							

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45.10	Carbon tetrachloride (c)	µg/L	1.9	HH	1,750*	3,500*	Tox
45.11	Chlordane (c)	ng/L	0.29	HH	1,200*	2,400*	Tox
45.12	Chloride	mg/L	230	Tox	860	1,720	Tox
45.13	Chlorine, total residual	µg/L	11	Tox	19	38	Tox

45.14 Chlorine standard applies to conditions of continuous exposure, where continuous  
 45.15 exposure refers to chlorinated effluents that are discharged for more than a total of two  
 45.16 hours in any 24-hour period.

45.17	Chlorobenzene	µg/L	20	HH	423	846	Tox
45.18	(Monochlorobenzene)						
45.19	Chloroform (c)	µg/L	53	HH	1,392	2,784	Tox
45.20	Chlorpyrifos	µg/L	0.041	Tox	0.083	0.17	Tox
45.21	Chromium +3, total	µg/L	equation	Tox	equation	equation	Tox

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

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

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

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

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

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

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

46.4	TH in mg/L	50	100	200	300	400
46.5	<hr/>					
46.6	Chromium +3, total					
46.7	CS µg/L	117	207	365	509	644
46.8	MS µg/L	984	1,737	3,064	4,270	5,405
46.9	FAV µg/L	1,966	3,469	6,120	8,530	10,797

46.10	Substance, 46.11 Characteristic, 46.12 or Pollutant 46.13 (Class 2Bd)	Units	Basis			Basis for MS, FAV	
46.14			CS	CS	MS		FAV
46.15	Chromium +6, total	µg/L	11	Tox	16	32	Tox
46.16	Cobalt, total	µg/L	2.8	HH	436	872	Tox
46.17	Copper, total	µg/L	equation	Tox	equation	equation	Tox

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

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

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

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

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

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

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

46.27	TH in mg/L	50	100	200	300	400
46.28	<hr/>					

47.1	Copper, total						
47.2	CS µg/L	6.4	9.8	15	19	23	
47.3	MS µg/L	9.2	18	34	50	65	
47.4	FAV µg/L	18	35	68	100	131	
47.5	<b>Substance,</b>						<b>Basis</b>
47.6	<b>Characteristic,</b>			<b>Basis</b>			<b>for</b>
47.7	<b>or Pollutant</b>			<b>for</b>			<b>MS,</b>
47.8	<b>(Class 2Bd)</b>	<b>Units</b>	<b>CS</b>	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>FAV</b>
47.9							
47.10	Cyanide, free	µg/L	5.2	Tox	22	45	Tox
47.11	DDT (c)	ng/L	1.7	HH	550*	1,100*	Tox
47.12	1,2-Dichloroethane (c)	µg/L	3.8	HH	45,050*	90,100*	Tox
47.13	Dieldrin (c)	ng/L	0.026	HH	1,300*	2,500*	Tox
47.14	Di-2-ethylhexyl phthalate (c)	µg/L	1.9	HH	--*	--*	NA
47.15	Di-n-octyl phthalate	µg/L	30	Tox	825	1,650	Tox
47.16	Endosulfan	µg/L	0.029	HH	0.28	0.56	Tox
47.17	Endrin	µg/L	0.016	HH	0.090	0.18	Tox
47.18	<i>Escherichia (E.) coli</i>	See	See	HH	See	See	NA
47.19		below	below		below	below	
47.20	Not to exceed 126 organisms per 100 milliliters as a geometric mean of not less than						
47.21	five samples representative of conditions within any calendar month, nor shall more						
47.22	than ten percent of all samples taken during any calendar month individually exceed						
47.23	1,260 organisms per 100 milliliters. The standard applies only between April 1 and						
47.24	October 31.						
47.25	Ethylbenzene	µg/L	68	Tox	1,859	3,717	Tox
47.26	<b>Substance,</b>						
47.27	<b>Characteristic,</b>			<b>Basis</b>			
47.28	<b>or Pollutant</b>			<b>for</b>			<b>Basis</b>
47.29	<b>(Class 2Bd)</b>	<b>Units</b>	<b>CS</b>	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>for</b>

48.1 **MS,**  
48.2 **FAV**

48.3

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48.4 Eutrophication standards for Class 2Bd lakes, shallow lakes, and reservoirs.

48.5 Lakes, Shallow Lakes, and Reservoirs in Northern Lakes and Forest Ecoregion

48.6 Phosphorus, total                    μg/L    30        NA        --        --        NA

48.7 Chlorophyll-a                        μg/L    9         NA        --        --        NA

48.8 Secchi disk transparency            meters   Not less   NA        --        --        NA  
48.9    than 2.0

48.10 Lakes and Reservoirs in North Central Hardwood Forest Ecoregion

48.11 Phosphorus, total                    μg/L    40        NA        --        --        NA

48.12 Chlorophyll-a                        μg/L    14        NA        --        --        NA

48.13 Secchi disk transparency            meters   Not less   NA        --        --        NA  
48.14    than 1.4

48.15 Lakes and Reservoirs in Western Corn Belt Plains and Northern Glaciated Plains Ecoregions

48.16 Phosphorus, total                    μg/L    65        NA        --        --        NA

48.17 Chlorophyll-a                        μg/L    22        NA        --        --        NA

48.18 Secchi disk transparency            meters   Not less   NA        --        --        NA  
48.19    than 0.9

48.20 Shallow Lakes in North Central Hardwood Forest Ecoregion

48.21 Phosphorus, total                    μg/L    60        NA        --        --        NA

48.22 Chlorophyll-a                        μg/L    20        NA        --        --        NA

48.23 Secchi disk transparency            meters   Not less   NA        --        --        NA  
48.24    than 1.0

48.25 Shallow Lakes in Western Corn Belt Plains and Northern Glaciated Plains Ecoregions



49.1	Phosphorus, total	µg/L	90	NA	--	--	NA
49.2	Chlorophyll-a	µg/L	30	NA	--	--	NA
49.3	Secchi disk transparency	meters	Not less	NA	--	--	NA
49.4			than 0.7				

49.5 Additional narrative eutrophication standards for Class 2Bd lakes, shallow lakes, and  
49.6 reservoirs are found under subpart 3a.

49.7 Eutrophication standards for Class 2Bd rivers and streams.

49.8 North River Nutrient Region

49.9	Phosphorus, total		µg/L				less than or equal to 50
49.10	Chlorophyll-a (seston)		µg/L				less than or equal to 7
49.11	Diel dissolved oxygen flux		mg/L				less than or equal to 3.0
49.12	Biochemical oxygen demand (BOD <sub>5</sub> )		mg/L				less than or equal to 1.5

49.13 Central River Nutrient Region

49.14	Phosphorus, total		µg/L				less than or equal to 100
49.15	Chlorophyll-a (seston)		µg/L				less than or equal to 18
49.16	Diel dissolved oxygen flux		mg/L				less than or equal to 3.5
49.17	Biochemical oxygen demand (BOD <sub>5</sub> )		mg/L				less than or equal to 2.0

49.18 South River Nutrient Region

49.19	Phosphorus, total		µg/L				less than or equal to 150
49.20	Chlorophyll-a (seston)		µg/L				less than or equal to 35
49.21	Diel dissolved oxygen flux		mg/L				less than or equal to 4.5
49.22	Biochemical oxygen demand (BOD <sub>5</sub> )		mg/L				less than or equal to 3.0

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

50.1	<b>Substance, Characteristic, or Pollutant (Class 2Bd)</b>	<b>Units</b>	<b>CS</b>	<b>Basis for CS</b>	<b>MS</b>	<b>FAV</b>	<b>Basis for MS, FAV</b>
50.2							

50.6	Fluoranthene	µg/L	1.9	Tox	3.5	6.9	Tox
50.7	Heptachlor (c)	ng/L	0.39	HH	260*	520*	Tox
50.8	Heptachlor epoxide (c)	ng/L	0.48	HH	270*	530*	Tox
50.9	Hexachlorobenzene (c)	ng/L	0.24	HH	--*	--*	Tox
50.10	Lead, total	µg/L	equation	Tox	equation	equation	Tox

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

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

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

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

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

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

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

50.20	TH in mg/L	50	100	200	300	400
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50.21	<hr/>					
50.22	Lead, total					
50.23	CS µg/L	1.3	3.2	7.7	13	19
50.24	MS µg/L	34	82	197	331	477
50.25	FAV µg/L	68	164	396	663	956

50.26	<b>Substance, Characteristic, or Pollutant (Class 2Bd)</b>	<b>Units</b>	<b>CS</b>	<b>Basis for CS</b>	<b>MS</b>	<b>FAV</b>	<b>Basis for</b>
50.27							

51.1 **MS,**  
51.2 **FAV**

51.3

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51.4	Lindane (c)	µg/L	0.032	HH	4.4*	8.8*	Tox
51.5	(Hexachlorocyclohexane,						
51.6	gamma-)						
51.7	Mercury, total in water	ng/L	6.9	HH	2,400*	4,900*	Tox
51.8	Mercury, total	mg/kg	0.2	HH	NA	NA	NA
51.9	in edible fish tissue	ppm					
51.10	Methylene chloride (c)	µg/L	46	HH	13,875*	27,749*	Tox
51.11	(Dichloromethane)						
51.12	Metolachlor	µg/L	23	Tox	271	543	Tox
51.13	Naphthalene	µg/L	81	Tox	409	818	Tox
51.14	Nickel, total	µg/L	equation	Tox/HH	equation	equation	Tox

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

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

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

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

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

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

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

51.26	TH in mg/L	50	100	200	300	400
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51.27

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51.28 Nickel, total

51.29	CS µg/L	88	158	283	297	297
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52.1	MS µg/L	789	1,418	2,549	3,592	4,582
52.2	FAV µg/L	1,578	2,836	5,098	7,185	9,164

52.3	Substance, Characteristic, or Pollutant (Class 2Bd)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
52.4							

52.7

52.8	Oil	µg/L	500	NA	5,000	10,000	NA
52.9	Oxygen, dissolved	mg/L	See	NA	--	--	NA
52.10			below				

52.11 5.0 mg/L as a daily minimum. This dissolved oxygen standard may be modified on a  
 52.12 site-specific basis according to part 7050.0220, subpart 7, except that no site-specific  
 52.13 standard shall be less than 5 mg/L as a daily average and 4 mg/L as a daily minimum.  
 52.14 Compliance with this standard is required 50 percent of the days at which the flow of  
 52.15 the receiving water is equal to the 7Q<sub>10</sub>.

52.16	Parathion	µg/L	0.013	Tox	0.07	0.13	Tox
52.17	Pentachlorophenol	µg/L	1.9	HH	equation	equation	Tox

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

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

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

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

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

52.24 Example of pentachlorophenol standards for five pH values:

52.25	pH su	6.5	7.0	7.5	8.0	8.5
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52.26

52.27 Pentachlorophenol

52.28	CS µg/L	1.9	1.9	1.9	1.9	1.9
-------	---------	-----	-----	-----	-----	-----

53.1	MS µg/L	5.5	9.1	15	25	41	
53.2	FAV µg/L	11	18	30	50	82	
53.3	<b>Substance, Characteristic, or Pollutant (Class 2Bd)</b>	<b>Units</b>	<b>CS</b>	<b>Basis for CS</b>	<b>MS</b>	<b>FAV</b>	<b>Basis for MS, FAV</b>
53.4							
53.5							
53.6							
53.7	<hr/>						
53.8	pH, minimum	su	6.5	NA	--	--	NA
53.9	pH, maximum	su	9.0	NA	--	--	NA
53.10	Phenanthrene	µg/L	3.6	Tox	32	64	Tox
53.11	Phenol	µg/L	123	Tox	2,214	4,428	Tox
53.12	Polychlorinated biphenyls, ng/L		0.029	HH	1,000*	2,000*	Tox
53.13	total (c)						
53.14	Radioactive materials	NA	See	NA	See	See	NA
53.15			below		below	below	
53.16	Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled						
53.17	environment as permitted by the appropriate authority having control over their use.						
53.18	Selenium, total	µg/L	5.0	Tox	20	40	Tox
53.19	Silver, total	µg/L	1.0	Tox	equation	equation	Tox
53.20	The MS and FAV vary with total hardness and are calculated using the following						
53.21	equations:						
53.22	The MS in µg/L shall not exceed: $\exp.(1.720[\ln(\text{total hardness mg/L})]-7.2156)$						
53.23	The FAV in µg/L shall not exceed: $\exp.(1.720[\ln(\text{total hardness mg/L})]-6.520)$						
53.24	Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.						
53.25	For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the						
53.26	standard.						
53.27	Example of total silver standards for five total hardness values:						

54.1	TH in mg/L	50	100	200	300	400	
54.2							
54.3	Silver, total						
54.4	CS µg/L	1.0	1.0	1.0	1.0	1.0	
54.5	MS µg/L	1.0	2.0	6.7	13	22	
54.6	FAV µg/L	1.2	4.1	13	27	44	
54.7	<b>Substance,</b>						<b>Basis</b>
54.8	<b>Characteristic,</b>						<b>for</b>
54.9	<b>or Pollutant</b>						<b>MS,</b>
54.10	<b>(Class 2Bd)</b>	<b>Units</b>	<b>CS</b>	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>FAV</b>
54.11							
54.12	Temperature	°F	See	NA	--	--	NA
54.13			below				
54.14	5°F above natural in streams and 3°F above natural in lakes, based on monthly average						
54.15	of the maximum daily temperatures, except in no case shall it exceed the daily average						
54.16	temperature of 86°F.						
54.17	1,1,2,2-Tetrachloroethane	µg/L	1.5	HH	1,127*	2,253*	Tox
54.18	(c)						
54.19	Tetrachloroethylene (c)	µg/L	3.8	HH	428*	857*	Tox
54.20	Thallium, total	µg/L	0.28	HH	64	128	Tox
54.21	Toluene	µg/L	253	Tox	1,352	2,703	Tox
54.22	Toxaphene (c)	ng/L	1.3	HH	730*	1,500*	Tox
54.23	1,1,1-Trichloroethane	µg/L	329	Tox	2,957	5,913	Tox
54.24	1,1,2-Trichloroethylene (c)	µg/L	25	HH	6,988*	13,976*	Tox
54.25	2,4,6-Trichlorophenol	µg/L	2.0	HH	102	203	Tox
54.26	Total suspended solids						
54.27	(TSS)						
54.28	North River Nutrient						
54.29	Region	mg/L	15	NA	-	-	NA

55.1	Central River Nutrient							
55.2	Region	mg/L	30	NA	-	-	-	NA
55.3	South River Nutrient							
55.4	Region	mg/L	65	NA	-	-	-	NA
55.5	Red River mainstem -							
55.6	headwaters to border	mg/L	100	NA	-	-	-	NA
55.7	TSS standards for the Class							
55.8	2Bd North, Central, and							
55.9	South River Nutrient							
55.10	Regions and the Red River							
55.11	mainstem may be exceeded							
55.12	for no more than ten							
55.13	percent of the time. This							
55.14	standard applies April 1							
55.15	through September 30							
55.16	Total suspended solids							
55.17	(TSS), summer average							
55.18	Lower Mississippi River							
55.19	mainstem - Pools 2 through							
55.20	4	mg/L	32	NA	-	-	-	NA
55.21	Lower Mississippi River							
55.22	mainstem below Lake							
55.23	Pepin	mg/L	30	NA	-	-	-	NA
55.24	TSS standards for the Class							
55.25	2Bd Lower Mississippi							
55.26	River may be exceeded for							
55.27	no more than 50 percent of							
55.28	the time. This standard							
55.29	applies June 1 through							
55.30	September 30							
55.31	<b>Substance,</b>							<b>Basis</b>
55.32	<b>Characteristic,</b>							<b>for</b>
55.33	<b>or Pollutant</b>							<b>MS,</b>
55.34	<b>(Class 2Bd)</b>	<b>Units</b>	<b>CS</b>	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>FAV</b>	<b>FAV</b>
55.35								

56.1	Vinyl chloride (c)	µg/L	0.18	HH	--*	--*	NA
56.2	Xylene, total m,p,o	µg/L	166	Tox	1,407	2,814	Tox
56.3	Zinc, total	µg/L	equation	Tox	equation	equation	Tox

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

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

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

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

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

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

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

56.13	TH in mg/L	50	100	200	300	400
56.14	<hr/>					
56.15	Zinc, total					
56.16	CS µg/L	59	106	191	269	343
56.17	MS µg/L	65	117	211	297	379
56.18	FAV µg/L	130	234	421	594	758

56.19 [For text of subps 3a and 3b, see M.R.]

56.20 Subp. 3c. **Beneficial use definitions for lotic warm or cool water ~~stream and river~~**  
 56.21 **aquatic life and habitats (Class 2Bd).**

56.22 A. Subitems (1) to ~~(4)~~ (5) apply to the beneficial uses in items B to D:

56.23 (1) The designation and attainment of beneficial uses are based on the  
 56.24 biological criteria in subpart 3d.

56.25 (2) The attributes of species composition, diversity, and functional  
 56.26 organization are measured using:



57.1 (a) the ~~fish-based~~ fish IBI as defined in ~~Development of a Fish-based~~  
57.2 ~~Index of Biological Integrity for Minnesota's Rivers and Streams, Minnesota Pollution~~  
57.3 ~~Control Agency (2014)~~ Fish Data Collection Protocols for Lotic Waters in Minnesota (2017);  
57.4 or

57.5 (b) the macroinvertebrate IBI as defined in ~~Development of a~~  
57.6 ~~Macroinvertebrate-based Index of Biological Integrity for Minnesota's Rivers and Streams,~~  
57.7 ~~Minnesota Pollution Control Agency (2014)~~ Macroinvertebrate Data Collection Protocols  
57.8 for Lotic Waters in Minnesota (2017).

57.9 (3) Water body types for streams and rivers are defined in the documents  
57.10 referenced in subitem (2).

57.11 (4) The following documents are incorporated by reference and are not subject  
57.12 to frequent change:

57.13 (a) Calibration of the Biological Condition Gradient for Streams of  
57.14 Minnesota, Gerritsen et al. (2012). The document is available on the agency's Web site at  
57.15 [www.pca.state.mn.us/regulations/minnesota-rulemaking](http://www.pca.state.mn.us/regulations/minnesota-rulemaking);

57.16 (b) ~~Development of a Fish-based Index of Biological Integrity for~~  
57.17 ~~Minnesota's Rivers and Streams, Minnesota Pollution Control Agency (2014)~~ Fish Data  
57.18 Collection Protocols for Lotic Waters in Minnesota, Minnesota Pollution Control Agency  
57.19 (2017). The document is available on the agency's Web site at  
57.20 [www.pca.state.mn.us/regulations/minnesota-rulemaking](http://www.pca.state.mn.us/regulations/minnesota-rulemaking);

57.21 (c) ~~Development of a Macroinvertebrate-based Index of Biological~~  
57.22 ~~Integrity for Minnesota's Rivers and Streams, Minnesota Pollution Control Agency (2014)~~  
57.23 Macroinvertebrate Data Collection Protocols for Lotic Waters in Minnesota, Minnesota  
57.24 Pollution Control Agency (2017). The document is available on the agency's Web site at  
57.25 [www.pca.state.mn.us/regulations/minnesota-rulemaking](http://www.pca.state.mn.us/regulations/minnesota-rulemaking); and

58.1 (d) Development of Biological Criteria for Tiered Aquatic Life Uses,  
58.2 Minnesota Pollution Control Agency (2016). The document is available on the agency's  
58.3 Web site at [www.pca.state.mn.us/regulations/minnesota-rulemaking](http://www.pca.state.mn.us/regulations/minnesota-rulemaking).

58.4 (5) The beneficial use subclass designators "e," "g," and "m" are added to  
58.5 the Class 2Bd designator as specific additional designators. The additional subclass  
58.6 designators do not replace the Class 2Bd designator. All requirements for Class 2Bd warm  
58.7 or cool water stream and river habitats in parts 7050.0222 and 7052.0100 continue to apply  
58.8 in addition to requirements for Class 2Bde, Class 2Bdg, or Class 2Bdm warm or cool water  
58.9 stream and river habitats in part 7050.0222. These subclass designators are applied to lotic  
58.10 waters only.

58.11 B. "Exceptional cool and warm water aquatic life and habitat, also protected as a  
58.12 source for drinking water" or "Class 2Bde" is a beneficial use that means waters capable of  
58.13 supporting and maintaining an exceptional and balanced, integrated, adaptive community  
58.14 of warm or cool water aquatic organisms having a species composition, diversity, and  
58.15 functional organization comparable to the 75th percentile of biological condition gradient  
58.16 level 3 as established in Calibration of the Biological Condition Gradient for Streams of  
58.17 Minnesota, Gerritsen et al. (2012).

58.18 C. "General cool and warm water aquatic life and habitat, also protected as a  
58.19 source for drinking water" or "Class 2Bdg" is a beneficial use that means waters capable  
58.20 of supporting and maintaining a balanced, integrated, adaptive community of warm or cool  
58.21 water aquatic organisms having a species composition, diversity, and functional organization  
58.22 comparable to the median of biological condition gradient level 4 as established in Calibration  
58.23 of the Biological Condition Gradient for Streams of Minnesota, Gerritsen et al. (2012).

58.24 D. "Modified cool and warm water aquatic life and habitat, also protected as a  
58.25 source for drinking water" or "Class 2Bdm" is a beneficial use that means waters capable  
58.26 of supporting and maintaining a balanced, integrated, adaptive community of warm or cool

59.1 water aquatic organisms having a species composition, diversity, and functional organization  
 59.2 comparable to the median of biological condition gradient level 5 as established in Calibration  
 59.3 of the Biological Condition Gradient for Streams of Minnesota, Gerritsen et al. (2012).

59.4 (1) To meet the definition in this item, waters must have been the subject of  
 59.5 a use attainability analysis ~~and must have been found to be incapable of supporting and~~  
 59.6 ~~maintaining~~ where it is determined that attainment of the Class 2Bdg beneficial use is not  
 59.7 feasible because of human-induced modifications of the physical habitat ~~that preclude the~~  
 59.8 ~~potential for recovery of the fauna~~. These modifications must be the result of direct alteration  
 59.9 to the channel, such as drainageway maintenance, bank stabilization, and impoundments.

59.10 (2) Examples of Class 2Bdm waters are the stream channel modification  
 59.11 activities regulated under:

59.12 (a) sections 401 and 404 of the Clean Water Act; or

59.13 (b) Minnesota Statutes, chapter 103E.

59.14 Subp. 3d. **Biological criteria for lotic warm or cool water ~~stream and river~~ aquatic**  
 59.15 **life and habitats (Class 2Bd).**

59.16	<b>Water Body Type</b>	<b>Tier</b>	<b>Class</b>	<b>Assemblage</b>	<b>Biocriterion</b>
59.17	<hr/>				
59.18	Southern rivers	Exceptional	2Bde	Fish	71
59.19		General	2Bdg	Fish	49
59.20	Southern streams	Exceptional	2Bde	Fish	66
59.21		General	2Bdg	Fish	50
59.22		Modified	2Bdm	Fish	35
59.23	Southern headwaters	Exceptional	2Bde	Fish	74
59.24		General	2Bdg	Fish	55
59.25		Modified	2Bdm	Fish	33

60.1	Northern rivers	Exceptional	2Bde	Fish	67
60.2		General	2Bdg	Fish	38
60.3	Northern streams	Exceptional	2Bde	Fish	61
60.4		General	2Bdg	Fish	47
60.5		Modified	2Bdm	Fish	35
60.6	Northern headwaters	Exceptional	2Bde	Fish	68
60.7		General	2Bdg	Fish	42
60.8		Modified	2Bdm	Fish	23
60.9	Low gradient	Exceptional	2Bde	Fish	70
60.10		General	2Bdg	Fish	42
60.11		Modified	2Bdm	Fish	15
60.12	Northern forest rivers	Exceptional	2Bde	Macroinvertebrates	77
60.13		General	2Bdg	Macroinvertebrates	49
60.14	Prairie and southern forest				
60.15	rivers	Exceptional	2Bde	Macroinvertebrates	63
60.16		General	2Bdg	Macroinvertebrates	31
60.17	High-gradient northern				
60.18	forest streams	Exceptional	2Bde	Macroinvertebrates	82
60.19		General	2Bdg	Macroinvertebrates	53
60.20	Low-gradient northern				
60.21	forest streams	Exceptional	2Bde	Macroinvertebrates	76
60.22		General	2Bdg	Macroinvertebrates	51
60.23		Modified	2Bdm	Macroinvertebrates	37
60.24	High-gradient southern				
60.25	streams	Exceptional	2Bde	Macroinvertebrates	62
60.26		General	2Bdg	Macroinvertebrates	37
60.27		Modified	2Bdm	Macroinvertebrates	24
60.28	Low-gradient southern				
60.29	forest streams	Exceptional	2Bde	Macroinvertebrates	66

61.1	General	2Bdg	Macroinvertebrates	43	
61.2	Modified	2Bdm	Macroinvertebrates	30	
61.3	Low-gradient prairie				
61.4	streams	Exceptional	2Bde	Macroinvertebrates	69
61.5	General	2Bdg	Macroinvertebrates	41	
61.6	Modified	2Bdm	Macroinvertebrates	22	

61.7 The biological criteria for lotic warm or cool water aquatic life and habitats (Class 2Bd) are  
 61.8 applicable to perennial and intermittent waters that allow for colonization of fish or  
 61.9 macroinvertebrates.

61.10 Subp. 4. **Class 2B waters.** The quality of Class 2B surface waters shall be such as to  
 61.11 permit the propagation and maintenance of a healthy community of cool or warm water  
 61.12 aquatic biota, and their habitats according to the definitions in subpart 4c. These waters  
 61.13 shall be suitable for aquatic recreation of all kinds, including bathing, for which the waters  
 61.14 may be usable. This class of surface water is not protected as a source of drinking water.  
 61.15 The applicable standards are given below. Abbreviations, acronyms, and symbols are  
 61.16 explained in subpart 1.

61.17	61.18	61.19	61.20	61.21	61.22	61.23	61.24	61.25	61.26	61.27
<b>Substance,</b>	<b>Characteristic,</b>	<b>Basis</b>	<b>Basis</b>							
<b>or Pollutant</b>	<b>(Class 2B)</b>	<b>Units</b>	<b>CS</b>	<b>for</b>	<b>MS</b>	<b>FAV</b>	<b>for MS,</b>	<b>FAV</b>		
				<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>FAV</b>			
61.22	Acenaphthene	µg/l	20	HH	56	112	Tox			
61.23	Acetochlor	µg/L	3.6	Tox	86	173	Tox			
61.24	Acrylonitrile (c)	µg/l	0.89	HH	1,140*	2,281*	Tox			
61.25	Alachlor (c)	µg/L	59	Tox	800	1,600	Tox			
61.26	Aluminum, total	µg/L	125	Tox	1,072	2,145	Tox			
61.27	Ammonia un-ionized as N	µg/L	40	Tox	--	--	NA			

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

62.5 
$$f = 1 / (10^{(pK_a - pH)} + 1) \times 100$$

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

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

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

62.9	<b>Substance, 62.10 62.11 62.12 62.13</b>	<b>Units</b>	<b>CS</b>	<b>Basis</b>			<b>Basis for MS, FAV</b>
<b>Characteristic, or Pollutant (Class 2B)</b>				<b>CS</b>	<b>MS</b>	<b>FAV</b>	
62.14	Anthracene	µg/L	0.035	Tox	0.32	0.63	Tox
62.15	Antimony, total	µg/L	31	Tox	90	180	Tox
62.16	Arsenic, total	µg/L	53	HH	360	720	Tox
62.17	Atrazine (c)	µg/L	10	Tox	323	645	Tox
62.18	Benzene (c)	µg/L	98	HH	4,487	8,974	Tox
62.19	Bromoform	µg/L	466	HH	2,900	5,800	Tox
62.20	Cadmium, total	µg/L	equation	Tox	equation	equation	Tox

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

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

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

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

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

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

62.29 Example of total cadmium standards for five hardness values:

63.1	TH in mg/L	50	100	200	300	400
63.2	<hr/>					
63.3	Cadmium, total					
63.4	CS µg/L	0.66	1.1	2.0	2.7	3.4
63.5	MS µg/L	15	33	73	116	160
63.6	FAV µg/L	31	67	146	231	319

63.7	<b>Substance,</b>						
63.8	<b>Characteristic,</b>			<b>Basis</b>			<b>Basis</b>
63.9	<b>or Pollutant</b>			<b>for</b>			<b>for MS,</b>
63.10	<b>(Class 2B)</b>	<b>Units</b>	<b>CS</b>	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>FAV</b>

63.11	<hr/>						
63.12	Carbon tetrachloride (c)	µg/L	5.9	HH	1,750*	3,500*	Tox
63.13	Chlordane (c)	ng/L	0.29	HH	1,200*	2,400*	Tox
63.14	Chloride	mg/L	230	Tox	860	1,720	Tox
63.15	Chlorine, total residual	µg/L	11	Tox	19	38	Tox
63.16	Chlorine standard applies to conditions of continuous exposure, where continuous						
63.17	exposure refers to chlorinated effluents that are discharged for more than a total of two						
63.18	hours in any 24-hour period.						
63.19	Chlorobenzene	µg/L	20	HH	423	846	Tox
63.20	(Monochlorobenzene)						
63.21	Chloroform (c)	µg/L	155	Tox	1,392	2,784	Tox
63.22	Chlorpyrifos	µg/L	0.041	Tox	0.083	0.17	Tox
63.23	Chromium +3, total	µg/L	equation	Tox	equation	equation	Tox

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

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

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

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

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

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

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

64.5	TH in mg/L	50	100	200	300	400
64.6	<hr/>					
64.7	Chromium +3, total					
64.8	CS µg/L	117	207	365	509	644
64.9	MS µg/L	984	1,737	3,064	4,270	5,405
64.10	FAV µg/L	1,966	3,469	6,120	8,530	10,797

64.11	Substance, 64.12 Characteristic, 64.13 or Pollutant 64.14 (Class 2B)	Units	CS	Basis	MS	FAV	Basis for MS, FAV
64.15				for CS			

64.16	Chromium +6, total	µg/L	11	Tox	16	32	Tox
64.17	Cobalt, total	µg/L	5.0	Tox	436	872	Tox
64.18	Copper, total	µg/L	equation	Tox	equation	equation	Tox

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

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

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

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

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

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

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



65.1	TH in mg/L	50	100	200	300	400
65.2	<hr/>					
65.3	Copper, total					
65.4	CS µg/L	6.4	9.8	15	19	23
65.5	MS µg/L	9.2	18	34	50	65
65.6	FAV µg/L	18	35	68	100	131

65.7	Substance, Characteristic, or Pollutant (Class 2B)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
65.8							
65.12	Cyanide, free	µg/L	5.2	Tox	22	45	Tox
65.13	DDT (c)	ng/L	1.7	HH	550*	1,100*	Tox
65.14	1,2-Dichloroethane (c)	µg/L	190	HH	45,050*	90,100*	Tox
65.15	Dieldrin (c)	ng/L	0.026	HH	1,300*	2,500*	Tox
65.16	Di-2-ethylhexyl phthalate	µg/L	2.1	HH	--*	--*	NA
65.17	(c)						
65.18	Di-n-octyl phthalate	µg/L	30	Tox	825	1,650	Tox
65.19	Endosulfan	µg/L	0.031	HH	0.28	0.56	Tox
65.20	Endrin	µg/L	0.016	HH	0.090	0.18	Tox
65.21	<i>Escherichia (E.) coli</i>	See	See	HH	See	See	NA
65.22		below	below		below	below	
65.23	Not to exceed 126 organisms per 100 milliliters as a geometric mean of not less than						
65.24	five samples representative of conditions within any calendar month, nor shall more						
65.25	than ten percent of all samples taken during any calendar month individually exceed						
65.26	1,260 organisms per 100 milliliters. The standard applies only between April 1 and						
65.27	October 31.						
65.28	Ethylbenzene	µg/L	68	Tox	1,859	3,717	Tox

66.1	<b>Substance,</b>						
66.2	<b>Characteristic,</b>			<b>Basis</b>			<b>Basis</b>
66.3	<b>or Pollutant</b>			<b>for</b>			<b>for MS,</b>
66.4	<b>(Class 2B)</b>	<b>Units</b>	<b>CS</b>	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>FAV</b>
66.5	<hr/>						
66.6	Eutrophication standards for Class 2B lakes, shallow lakes, and reservoirs.						
66.7	Lakes, Shallow Lakes, and Reservoirs in Northern Lakes and Forest Ecoregions						
66.8	Phosphorus, total	µg/L	30	NA	--	--	NA
66.9	Chlorophyll-a	µg/L	9	NA	--	--	NA
66.10	Secchi disk transparency	meters	Not less	NA	--	--	NA
66.11			than 2.0				
66.12	Lakes and Reservoirs in North Central Hardwood Forest Ecoregion						
66.13	Phosphorus, total	µg/L	40	NA	--	--	NA
66.14	Chlorophyll-a	µg/L	14	NA	--	--	NA
66.15	Secchi disk transparency	meters	Not less	NA	--	--	NA
66.16			than 1.4				
66.17	Lakes and Reservoirs in Western Corn Belt Plains and Northern Glaciated Plains Ecoregions						
66.18	Phosphorus, total	µg/L	65	NA	--	--	NA
66.19	Chlorophyll-a	µg/L	22	NA	--	--	NA
66.20	Secchi disk transparency	meters	Not less	NA	--	--	NA
66.21			than 0.9				
66.22	Shallow Lakes in North Central Hardwood Forest Ecoregion						
66.23	Phosphorus, total	µg/L	60	NA	--	--	NA
66.24	Chlorophyll-a	µg/L	20	NA	--	--	NA
66.25	Secchi disk transparency	meters	Not less	NA	--	--	NA
66.26			than 1.0				
66.27	Shallow Lakes in Western Corn Belt Plains and Northern Glaciated Plains Ecoregions						

67.1	Phosphorus, total	µg/L	90	NA	--	--	NA
67.2	Chlorophyll-a	µg/L	30	NA	--	--	NA
67.3	Secchi disk transparency	meters	Not less	NA	--	--	NA
67.4			than 0.7				

67.5 Additional narrative eutrophication standards for Class 2B lakes, shallow lakes, and reservoirs  
67.6 are found in subpart 4a.

67.7	<b>Substance,</b>						
67.8	<b>Characteristic,</b>			<b>Basis</b>			<b>Basis</b>
67.9	<b>or Pollutant</b>			<b>for</b>			<b>for MS,</b>
67.10	<b>(Class 2B)</b>	<b>Units</b>	<b>CS</b>	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>FAV</b>

67.11

67.12 Eutrophication standards for Class 2B rivers and streams.

67.13 North River Nutrient Region

67.14	Phosphorus, total		µg/L	less than or equal to 50
67.15	Chlorophyll-a (seston)		µg/L	less than or equal to 7
67.16	Diel dissolved oxygen flux		mg/L	less than or equal to 3.0
67.17	Biochemical oxygen demand (BOD <sub>5</sub> )		mg/L	less than or equal to 1.5

67.18 Central River Nutrient Region

67.19	Phosphorus, total		µg/L	less than or equal to 100
67.20	Chlorophyll-a (seston)		µg/L	less than or equal to 18
67.21	Diel dissolved oxygen flux		mg/L	less than or equal to 3.5
67.22	Biochemical oxygen demand (BOD <sub>5</sub> )		mg/L	less than or equal to 2.0

67.23 South River Nutrient Region

67.24	Phosphorus, total		µg/L	less than or equal to 150
67.25	Chlorophyll-a (seston)		µg/L	less than or equal to 40

68.1	Diel dissolved oxygen flux	mg/L	less than or equal to 5.0
68.2	Biochemical oxygen demand (BOD <sub>5</sub> )	mg/L	less than or equal to 3.5
68.3	Site-specific standards for specified river reaches or other waters are:		
68.4	Mississippi River Navigational Pool 1 (river miles 854.1 to 847.7 reach from Fridley to		
68.5	Ford Dam in St. Paul)		
68.6	Phosphorus, total	µg/L	less than or equal to 100
68.7	Chlorophyll-a (seston)	µg/L	less than or equal to 35
68.8	Mississippi River Navigational Pool 2 (river miles 847.7 to 815.2 reach from Ford Dam		
68.9	to Hastings Dam)		
68.10	Phosphorus, total	µg/L	less than or equal to 125
68.11	Chlorophyll-a (seston)	µg/L	less than or equal to 35
68.12	Mississippi River Navigational Pool 3 (river miles 815.2 to 796.9 reach from Hastings		
68.13	Dam to Red Wing Dam)		
68.14	Phosphorus, total	µg/L	less than or equal to 100
68.15	Chlorophyll-a (seston)	µg/L	less than or equal to 35
68.16	Mississippi River Navigational Pool 4 (river miles 796.9 to 752.8 reach from Red Wing		
68.17	Dam to Alma Dam). Lake Pepin occupies majority of Pool 4 and Lake Pepin site-specific		
68.18	standards are used for this pool.		
68.19	Mississippi River Navigational Pools 5 to 8 (river miles 752.8 to 679.1 Alma Dam to Genoa		
68.20	Dam)		
68.21	Phosphorus, total	µg/L	less than or equal to 100
68.22	Chlorophyll-a (seston)	µg/L	less than or equal to 35
68.23	Lake Pepin		
68.24	Phosphorus, total	µg/L	less than or equal to 100
68.25	Chlorophyll-a (seston)	µg/L	less than or equal to 28

69.1 Crow Wing River from confluence of Long Prairie River to the mouth of the Crow Wing  
 69.2 River at the Mississippi River

69.3	Phosphorus, total	µg/L	less than or equal to 75
69.4	Chlorophyll-a (seston)	µg/L	less than or equal to 13
69.5	Diel dissolved oxygen flux	mg/L	less than or equal to 3.5
69.6	Biochemical oxygen demand (BOD <sub>5</sub> )	mg/L	less than or equal to 1.7

69.7 Crow River from the confluence of the North Fork of the Crow River and South Fork of  
 69.8 the Crow River to the mouth of the Crow River at the Mississippi River

69.9	Phosphorus, total	µg/L	less than or equal to 125
69.10	Chlorophyll-a (seston)	µg/L	less than or equal to 27
69.11	Diel dissolved oxygen flux	mg/L	less than or equal to 4.0
69.12	Biochemical oxygen demand (BOD <sub>5</sub> )	mg/L	less than or equal to 2.5

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

69.15	<b>Substance, Characteristic, or Pollutant (Class 2B)</b>	<b>Units</b>	<b>CS</b>	<b>Basis</b>			<b>Basis for MS, FAV</b>
69.16				<b>for</b>	<b>MS</b>	<b>FAV</b>	
69.17				<b>CS</b>			
69.18				<b>MS</b>			

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69.19							
69.20	Fluoranthene	µg/L	1.9	Tox	3.5	6.9	Tox
69.21	Heptachlor (c)	ng/L	0.39	HH	260*	520*	Tox
69.22	Heptachlor epoxide (c)	ng/L	0.48	HH	270*	530*	Tox
69.23	Hexachlorobenzene (c)	ng/L	0.24	HH	--*	--*	Tox
69.24	Lead, total	µg/L	equation	Tox	equation	equation	Tox

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

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

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

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

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

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

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

70.7	TH in mg/L	50	100	200	300	400
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70.8

70.9 Lead, total

70.10	CS µg/L	1.3	3.2	7.7	13	19
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70.11	MS µg/L	34	82	197	331	477
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70.12	FAV µg/L	68	164	396	663	956
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70.13 **Substance,**  
70.14 **Characteristic,**  
70.15 **or Pollutant**  
70.16 **(Class 2B)**

**Units**

**CS**

**Basis  
for  
CS**

**MS**

**FAV**

**Basis  
for MS,  
FAV**

70.17

70.18	Lindane (c)	µg/L	0.036	HH	4.4*	8.8*	Tox
70.19	(Hexachlorocyclohexene,						
70.20	gamma-)						

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

70.22	Mercury, total	mg/kg	0.2	HH	NA	NA	NA
70.23	in edible fish tissue	ppm					

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

70.26	Metolachlor	µg/L	23	Tox	271	543	Tox
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70.27	Naphthalene	µg/L	81	Tox	409	818	Tox
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70.28	Nickel, total	µg/L	equation	Tox	equation	equation	Tox
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71.1 The CS, MS, and FAV vary with total hardness and are calculated using the following  
 71.2 equations:

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

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

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

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

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

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

71.10	TH in mg/L	50	100	200	300	400
71.11	<hr/>					
71.12	Nickel, total					
71.13	CS µg/L	88	158	283	399	509
71.14	MS µg/L	789	1,418	2,549	3,592	4,582
71.15	FAV µg/L	1,578	2,836	5,098	7,185	9,164

71.16	71.17 71.18 71.19	71.19	71.19	71.19	71.19	71.19	71.19
71.16							
71.16	<b>Substance, Characteristic, or Pollutant (Class 2B)</b>	<b>Units</b>	<b>CS</b>	<b>Basis for CS</b>	<b>MS</b>	<b>FAV</b>	<b>Basis for MS, FAV</b>
71.20	<hr/>						

71.21 Oil µg/l 500 NA 5,000 10,000 NA

71.22 Oxygen, dissolved mg/L See below NA -- -- NA  
 71.23

71.24 5.0 mg/L as a daily minimum. This dissolved oxygen standard may be modified on a  
 71.25 site-specific basis according to part 7050.0220, subpart 7, except that no site-specific  
 71.26 standard shall be less than 5 mg/L as a daily average and 4 mg/L as a daily minimum.  
 71.27 Compliance with this standard is required 50 percent of the days at which the flow of  
 71.28 the receiving water is equal to the 7Q<sub>10</sub>. This standard applies to all Class 2B waters  
 71.29 except for:

72.1 (1) those portions of the Mississippi River from the outlet of the Metro Wastewater  
 72.2 Treatment Works in Saint Paul (River Mile 835) to Lock and Dam No. 2 at Hastings  
 72.3 (River Mile 815). For this reach of the Mississippi River, the standard is not less  
 72.4 than 5 mg/L as a daily average from April 1 through November 30, and not less  
 72.5 than 4 mg/L at other times; and

72.6 (2) the portion of the Minnesota River from the outlet of the Blue Lake wastewater  
 72.7 treatment works (River Mile 21) to the mouth at Fort Snelling. For the specified  
 72.8 reach of the Minnesota River, the standard is not less than 5 mg/L as a daily average  
 72.9 year round.

72.10	Parathion	µg/L	0.013	Tox	0.07	0.13	Tox
72.11	Pentachlorophenol	µg/L	equation	Tox/HH	equation	equation	Tox

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

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

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

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

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

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

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

72.22 Example of pentachlorophenol standards for five pH values:

72.23	pH su	6.5	7.0	7.5	8.0	8.5
72.24	<hr/>					
72.25	Pentachlorophenol					
72.26	CS µg/L	3.5	5.5	5.5	5.5	5.5



73.1	MS µg/L	5.5	9.1	15	25	41	
73.2	FAV µg/L	11	18	30	50	82	
73.3	<b>Substance,</b>						
73.4	<b>Characteristic,</b>			<b>Basis</b>			<b>Basis</b>
73.5	<b>or Pollutant</b>			<b>for</b>			<b>for MS,</b>
73.6	<b>(Class 2B)</b>	<b>Units</b>	<b>CS</b>	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>FAV</b>

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73.7							
73.8	pH, minimum	su	6.5	NA	--	--	NA
73.9	pH, maximum	su	9.0	NA	--	--	NA
73.10	Phenanthrene	µg/L	3.6	Tox	32	64	Tox
73.11	Phenol	µg/L	123	Tox	2,214	4,428	Tox
73.12	Polychlorinated	ng/L	0.029	HH	1,000*	2,000*	Tox
73.13	biphenyls, total (c)						
73.14	Radioactive materials	NA	See	NA	See	See	NA
73.15			below		below	below	
73.16	Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled						
73.17	environment as permitted by the appropriate authority having control over their use.						
73.18	Selenium, total	µg/L	5.0	Tox	20	40	Tox
73.19	Silver, total	µg/L	1.0	Tox	equation	equation	Tox

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

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

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

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 the  
73.26 standard.

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

74.1	TH in mg/L	50	100	200	300	400
74.2	<hr/>					
74.3	Silver, total					
74.4	CS µg/L	1.0	1.0	1.0	1.0	1.0
74.5	MS µg/L	1.0	2.0	6.7	13	22
74.6	FAV µg/L	1.2	4.1	13	27	44

74.7	<b>Substance,</b>			<b>Basis</b>			<b>Basis</b>
74.8	<b>Characteristic,</b>			<b>for</b>			<b>for MS,</b>
74.9	<b>or Pollutant</b>			<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>FAV</b>
74.10	<b>(Class 2B)</b>	<b>Units</b>	<b>CS</b>				

74.11	<hr/>						
74.12	Temperature	°F	See	NA	--	--	NA
74.13			below				
74.14	5°F above natural in streams and 3°F above natural in lakes, based on monthly average						
74.15	of the maximum daily temperatures, except in no case shall it exceed the daily average						
74.16	temperature of 86°F.						
74.17	1,1,2,2-Tetrachloroethane (c)	µg/L	13	HH	1,127	2,253	Tox
74.18	Tetrachloroethylene (c)	µg/L	8.9	HH	428	857	Tox
74.19	Thallium, total	µg/L	0.56	HH	64	128	Tox
74.20	Toluene	µg/L	253	Tox	1,352	2,703	Tox
74.21	Toxaphene (c)	ng/L	1.3	HH	730*	1,500*	Tox
74.22	1,1,1-Trichloroethane	µg/L	329	Tox	2,957	5,913	Tox
74.23	1,1,2-Trichloroethylene (c)	µg/L	120	HH	6,988	13,976	Tox
74.24	2,4,6-Trichlorophenol	µg/L	2.0	HH	102	203	Tox
74.25	Total suspended solids (TSS)						
74.26	North River Nutrient Region	mg/L	15	NA	--	--	NA
74.27	Central River Nutrient Region	mg/L	30	NA	--	--	NA
74.28	South River Nutrient Region	mg/L	65	NA	--	--	NA

75.1	Red River mainstem -						
75.2	headwaters to border	mg/L	100	NA	--	--	NA
75.3	TSS standards for the Class						
75.4	2B North, Central, and South						
75.5	River Nutrient Regions and						
75.6	the Red River mainstem may						
75.7	be exceeded for no more than						
75.8	ten percent of the time. This						
75.9	standard applies April 1						
75.10	through September 30						
75.11	Total suspended solids (TSS),						
75.12	summer average						
75.13	Lower Mississippi River						
75.14	mainstem - Pools 2 through 4	mg/L	32	NA	--	--	NA
75.15	Lower Mississippi River						
75.16	mainstem below Lake Pepin	mg/L	30	NA	--	--	NA
75.17	TSS standards for the Class						
75.18	2B Lower Mississippi River						
75.19	may be exceeded for no more						
75.20	than 50 percent of the time.						
75.21	This standard applies June 1						
75.22	through September 30						

75.23	<b>Substance,</b>						
75.24	<b>Characteristic,</b>			<b>Basis</b>			<b>Basis</b>
75.25	<b>or Pollutant</b>			<b>for</b>			<b>for MS,</b>
75.26	<b>(Class 2B)</b>	<b>Units</b>	<b>CS</b>	<b>CS</b>	<b>MS</b>	<b>FAV</b>	<b>FAV</b>

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75.27							
75.28	Vinyl chloride (c)	µg/L	9.2	HH	--*	--*	NA
75.29	Xylene, total m,p,o	µg/L	166	Tox	1,407	2,814	Tox
75.30	Zinc, total	µg/L	equation	Tox	equation	equation	Tox

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

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

- 76.1 The MS in  $\mu\text{g/L}$  shall not exceed:  $\text{exp.}(0.8473[\ln(\text{total hardness mg/L})]+0.8604)$
- 76.2 The FAV in  $\mu\text{g/L}$  shall not exceed:  $\text{exp.}(0.8473[\ln(\text{total hardness mg/L})]+1.5536)$
- 76.3 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.
- 76.4 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the
- 76.5 standard.

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

76.7	TH in mg/L	50	100	200	300	400
76.8	<hr/>					
76.9	Zinc, total					
76.10	CS $\mu\text{g/L}$	59	106	191	269	343
76.11	MS $\mu\text{g/L}$	65	117	211	297	379
76.12	FAV $\mu\text{g/L}$	130	234	421	594	758

76.13 [For text of subps 4a and 4b, see M.R.]

76.14 Subp. 4c. **Beneficial use definitions for lotic warm or cool water ~~stream and river~~**

76.15 **aquatic life and habitats (Class 2B).**

76.16 A. Subitems (1) to ~~(4)~~ (5) apply to the beneficial uses in items B to D:

76.17 (1) The designation and attainment of beneficial uses are based on the criteria

76.18 in subpart 4d.

76.19 (2) The attributes of species composition, diversity, and functional

76.20 organization are measured using:

76.21 (a) the ~~fish-based~~ fish IBI as defined in ~~Development of a Fish-based~~

76.22 ~~Index of Biological Integrity for Minnesota's Rivers and Streams, Minnesota Pollution~~

76.23 ~~Control Agency (2014)~~ Fish Data Collection Protocols for Lotic Waters in Minnesota (2017);

76.24 or

77.1 (b) the macroinvertebrate IBI as defined in ~~Development of a~~  
77.2 ~~Macroinvertebrate-based Index of Biological Integrity for Minnesota's Rivers and Streams,~~  
77.3 ~~Minnesota Pollution Control Agency (2014)~~ Macroinvertebrate Data Collection Protocols  
77.4 for Lotic Waters in Minnesota (2017).

77.5 (3) Water body types for streams and rivers are defined in the documents  
77.6 referenced in subitem (2).

77.7 (4) The following documents are incorporated by reference and are not subject  
77.8 to frequent change:

77.9 (a) Calibration of the Biological Condition Gradient for Streams of  
77.10 Minnesota, Gerritsen et al. (2012). The document is available on the agency's Web site at  
77.11 [www.pca.state.mn.us/regulations/minnesota-rulemaking](http://www.pca.state.mn.us/regulations/minnesota-rulemaking);

77.12 (b) ~~Development of a Fish-based Index of Biological Integrity for~~  
77.13 ~~Minnesota's Rivers and Streams, Minnesota Pollution Control Agency (2014)~~ Fish Data  
77.14 Collection Protocols for Lotic Waters in Minnesota, Minnesota Pollution Control Agency  
77.15 (2017). The document is available on the agency's Web site at  
77.16 [www.pca.state.mn.us/regulations/minnesota-rulemaking](http://www.pca.state.mn.us/regulations/minnesota-rulemaking);

77.17 (c) ~~Development of a Macroinvertebrate-based Index of Biological~~  
77.18 ~~Integrity for Minnesota's Rivers and Streams, Minnesota Pollution Control Agency (2014)~~  
77.19 Macroinvertebrate Data Collection Protocols for Lotic Waters in Minnesota, Minnesota  
77.20 Pollution Control Agency (2017). The document is available on the agency's Web site at  
77.21 [www.pca.state.mn.us/regulations/minnesota-rulemaking](http://www.pca.state.mn.us/regulations/minnesota-rulemaking); and

77.22 (d) Development of Biological Criteria for Tiered Aquatic Life Uses,  
77.23 Minnesota Pollution Control Agency (2016). The document is available on the agency's  
77.24 Web site at [www.pca.state.mn.us/regulations/minnesota-rulemaking](http://www.pca.state.mn.us/regulations/minnesota-rulemaking).

78.1                   (5) The beneficial use subclass designators "e," "g," and "m" are added to  
78.2 the Class 2B designator as specific additional designators. The additional subclass designators  
78.3 do not replace the Class 2B designator. All requirements for Class 2B warm or cool water  
78.4 stream and river habitats in parts 7050.0222 and 7052.0100 continue to apply in addition  
78.5 to requirements for Class 2Be, Class 2Bg, or Class 2Bm warm or cool water stream and  
78.6 river habitats in part 7050.0222. These subclass designators are applied to lotic waters only.

78.7                   B. "Exceptional cool and warm water aquatic life and habitat" or "Class 2Be" is  
78.8 a beneficial use that means waters capable of supporting and maintaining an exceptional  
78.9 and balanced, integrated, adaptive community of warm or cool water aquatic organisms  
78.10 having a species composition, diversity, and functional organization comparable to the 75th  
78.11 percentile of biological condition gradient level 3 as established in Calibration of the  
78.12 Biological Condition Gradient for Streams of Minnesota, Gerritsen et al. (2012).

78.13                   C. "General cool and warm water aquatic life and habitat" or "Class 2Bg" is a  
78.14 beneficial use that means waters capable of supporting and maintaining a balanced, integrated,  
78.15 adaptive community of warm or cool water aquatic organisms having a species composition,  
78.16 diversity, and functional organization comparable to the median of biological condition  
78.17 gradient level 4 as established in Calibration of the Biological Condition Gradient for Streams  
78.18 of Minnesota, Gerritsen et al. (2012).

78.19                   D. "Modified cool and warm water aquatic life and habitat" or "Class 2Bm" is a  
78.20 beneficial use that means waters capable of supporting and maintaining a balanced, integrated,  
78.21 adaptive community of warm or cool water aquatic organisms having a species composition,  
78.22 diversity, and functional organization comparable to the median of biological condition  
78.23 gradient level 5 as established in Calibration of the Biological Condition Gradient for Streams  
78.24 of Minnesota, Gerritsen et al. (2012).

78.25                   (1) To meet the definition in this item, waters must have been the subject of  
78.26 a use attainability analysis ~~and must have been found to be incapable of supporting and~~

79.1 ~~maintaining~~ where it is determined that attainment of the Class 2Bg beneficial use is not  
 79.2 feasible because of human-induced modifications of the physical habitat that preclude the  
 79.3 ~~potential for recovery of the fauna~~. These modifications must be the result of direct alteration  
 79.4 to the channel, such as drainageway maintenance, bank stabilization, and impoundments.

79.5 (2) Examples of Class 2Bm waters are the stream channel modification  
 79.6 activities regulated under:

79.7 (a) sections 401 and 404 of the Clean Water Act; or

79.8 (b) Minnesota Statutes, chapter 103E.

79.9 Subp. 4d. **Biological criteria for lotic warm or cool water ~~stream and river~~ aquatic**  
 79.10 **life and habitats (Class 2B).**

79.11	<b>Water Body Type</b>	<b>Tier</b>	<b>Class</b>	<b>Assemblage</b>	<b>Biocriterion</b>
79.12	<hr/>				
79.13	Southern rivers	Exceptional	2Be	Fish	71
79.14		General	2Bg	Fish	49
79.15	Southern streams	Exceptional	2Be	Fish	66
79.16		General	2Bg	Fish	50
79.17		Modified	2Bm	Fish	35
79.18	Southern headwaters	Exceptional	2Be	Fish	74
79.19		General	2Bg	Fish	55
79.20		Modified	2Bm	Fish	33
79.21	Northern rivers	Exceptional	2Be	Fish	67
79.22		General	2Bg	Fish	38
79.23	Northern streams	Exceptional	2Be	Fish	61
79.24		General	2Bg	Fish	47
79.25		Modified	2Bm	Fish	35
79.26	Northern headwaters	Exceptional	2Be	Fish	68

80.1		General	2Bg	Fish	42
80.2		Modified	2Bm	Fish	23
80.3	Low gradient	Exceptional	2Be	Fish	70
80.4		General	2Bg	Fish	42
80.5		Modified	2Bm	Fish	15
80.6	Northern forest rivers	Exceptional	2Be	Macroinvertebrates	77
80.7		General	2Bg	Macroinvertebrates	49
80.8	Prairie and southern forest				
80.9	rivers	Exceptional	2Be	Macroinvertebrates	63
80.10		General	2Bg	Macroinvertebrates	31
80.11	High-gradient northern				
80.12	forest streams	Exceptional	2Be	Macroinvertebrates	82
80.13		General	2Bg	Macroinvertebrates	53
80.14	Low-gradient northern				
80.15	forest streams	Exceptional	2Be	Macroinvertebrates	76
80.16		General	2Bg	Macroinvertebrates	51
80.17		Modified	2Bm	Macroinvertebrates	37
80.18	High-gradient southern				
80.19	streams	Exceptional	2Be	Macroinvertebrates	62
80.20		General	2Bg	Macroinvertebrates	37
80.21		Modified	2Bm	Macroinvertebrates	24
80.22	Low-gradient southern				
80.23	forest streams	Exceptional	2Be	Macroinvertebrates	66
80.24		General	2Bg	Macroinvertebrates	43
80.25		Modified	2Bm	Macroinvertebrates	30
80.26	Low-gradient prairie				
80.27	streams	Exceptional	2Be	Macroinvertebrates	69
80.28		General	2Bg	Macroinvertebrates	41
80.29		Modified	2Bm	Macroinvertebrates	22



81.1 The biological criteria for lotic warm or cool water aquatic life and habitats (Class 2B) are  
 81.2 applicable to perennial and intermittent waters that allow for colonization of fish or  
 81.3 macroinvertebrates.

81.4 Subp. 5. [See repealer.]

81.5 [For text of subps 6 to 9, see M.R.]

81.6 **7050.0227 SPECIFIC WATER QUALITY STANDARDS FOR CLASS 7 WATERS**  
 81.7 **OF THE STATE; LIMITED RESOURCE VALUE WATERS.**

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

81.9 Subp. 2. **Class 7 waters; limited resource value waters.** The quality of Class 7 waters  
 81.10 of the state shall be such as to protect aesthetic qualities, secondary body contact use, and  
 81.11 groundwater for use as a potable water supply. Standards for substances, characteristics, or  
 81.12 pollutants given below shall not be exceeded in the waters:

81.13 Substance, Characteristic, or 81.14 Pollutant	Class 7 Standard
81.15 <i>Escherichia (E.) coli</i>	81.16 Not to exceed 630 organisms per 100 milliliters as a 81.17 geometric mean of not less than five samples 81.18 representative of conditions within any calendar month, 81.19 nor shall more than ten percent of all samples taken 81.20 during any calendar month individually exceed 1,260 81.21 organisms per 100 milliliters. The standard applies only between May 1 and October 31.
81.22 Oxygen, dissolved	81.23 The level of dissolved oxygen must be maintained at concentrations:
81.24	81.25 i. that will avoid odors or putrid conditions in the receiving water;
81.26	81.27 ii. at not less than 1 mg/L (daily average); and
81.27	81.28 iii. above 0 mg/L at all times.
81.28 pH, minimum value	6.0

82.1 pH, maximum value 9.0

82.2 Toxic pollutants Toxic pollutants shall not be allowed in such quantities  
82.3 or concentrations that will impair the specified uses.

82.4 **7050.0430 UNLISTED WATERS.**

82.5 Subpart 1. **Statewide surface waters.** Except as provided in subparts 2 and 3, all  
82.6 surface waters of the state that are not listed in part 7050.0470 and that are not wetlands as  
82.7 defined in part 7050.0186, subpart 1a, are hereby classified as Class ~~2Bg~~ 2B, 3C, 4A, 4B,  
82.8 5, and 6 waters. Unlisted lotic waters are also assigned the beneficial use subclass designator  
82.9 "g" to the Class 2B designator.

82.10 Subp. 2. **Boundary Waters Canoe Area Wilderness.**

82.11 A. All streams in the Boundary Waters Canoe Area Wilderness [11/5/84P] not  
82.12 listed in part 7050.0470 are classified as Class 1B, 2Bdg, 3B.

82.13 B. All lakes in the Boundary Waters Canoe Area Wilderness [11/5/84P] not listed  
82.14 in part 7050.0470 are classified as Class 1B, 2Bd, 3B.

82.15 C. All wetlands in the Boundary Waters Canoe Area Wilderness [11/5/84P] are  
82.16 classified as Class 2D.

82.17 Subp. 3. **Voyageurs National Park.**

82.18 A. All streams in Voyageurs National Park [11/5/84P] not listed in part 7050.0470  
82.19 are classified as Class 2Bg, 3B.

82.20 B. All lakes in Voyageurs National Park [11/5/84P] not listed in part 7050.0470  
82.21 are classified as Class 2B, 3B.

82.22 C. All wetlands in Voyageurs National Park [11/5/84P] are classified as Class  
82.23 2D.

83.1 **7050.0460 WATERS SPECIFICALLY CLASSIFIED; EXPLANATION OF**  
83.2 **LISTINGS IN PART 7050.0470.**

83.3 Subpart 1. **Explanation of listings.** The waters of the state listed in part 7050.0470  
83.4 are classified as specified. The location of lakes, wetlands, calcareous fens, and scientific  
83.5 and natural areas are described by township, range, and section. Specific stream stretches  
83.6 are described by township, range, and section; stream confluence; geographic coordinates;  
83.7 road crossing; some other recognizable landmark; or a combination of these descriptors.  
83.8 Streams and rivers are listed by the eight-digit hydrologic unit code (HUC) of the major  
83.9 watersheds in part 7050.0469 in which the streams and rivers are located. The tables that  
83.10 specify the applicable beneficial uses for the stream and river reaches are incorporated by  
83.11 reference in part 7050.0470. Any community listed in part 7050.0470 is the community  
83.12 nearest the water classified, and is included solely to assist in identifying the water. Most  
83.13 waters of the state are not specifically listed in part 7050.0470. See parts 7050.0425 and  
83.14 7050.0430 for the classifications of waters not listed.

83.15 [For text of subps 2 and 3, see M.R.]



85.1 [www.pca.state.mn.us/regulations/minnesota-rulemaking](http://www.pca.state.mn.us/regulations/minnesota-rulemaking). The tables are incorporated by  
85.2 reference and are not subject to frequent change. The date after each watershed listed in  
85.3 item A is the publication date of the applicable table. The water use classifications for the  
85.4 other listed waters in the Lake Superior Basin are as identified in items B to D. See parts  
85.5 7050.0425 and 7050.0430 for the classifications of waters not listed. Designated use  
85.6 information for water bodies can also be accessed through the agency's Environmental Data  
85.7 Access (<http://www.pca.state.mn.us/quick-links/eda-surface-water-data>).

85.8 A. Streams (by eight-digit hydrologic unit code):

85.9 (1) 04010101 Lake Superior - North (August 9, 2016);

85.10 (2) 04010102 Lake Superior - South (August 9, 2016);

85.11 (3) 04010201 St. Louis River (August 9, 2016);

85.12 (4) 04010202 Cloquet River (August 9, 2016); and

85.13 (5) 04010301 Nemadji River (August 9, 2016).

85.14 B. Lakes:

85.15 [For text of subitems (1) to (151), see M.R.]

85.16 (152) White Pine Lake, 16-0369-00, [WR] (T.61, R.3W, S.19, 20, 29, 30):

85.17 2B, 3B; and

85.18 (153) \*Winchell Lake, 16-0354-00, [11/5/84P] (T.64, R.2, 3): 1B, 2A, 3B.

85.19 [For text of items C and D, see M.R.]

85.20 Subp. 2. **Lake of the Woods Basin.** The water use classifications for the stream  
85.21 reaches within each of the major watersheds in the Lake of the Woods Basin listed in item  
85.22 A are found in tables entitled "Beneficial Use Designations for Stream Reaches" published  
85.23 on the Web site of the Minnesota Pollution Control Agency at

86.1 [www.pca.state.mn.us/regulations/minnesota-rulemaking](http://www.pca.state.mn.us/regulations/minnesota-rulemaking). The tables are incorporated by  
86.2 reference and are not subject to frequent change. The date after each watershed listed in  
86.3 item A is the publication date of the applicable table. The water use classifications for the  
86.4 other listed waters in the Lake of the Woods Basin are as identified in items B to D. See  
86.5 parts 7050.0425 and 7050.0430 for the classifications of waters not listed. Designated use  
86.6 information for water bodies can also be accessed through the agency's Environmental Data  
86.7 Access (<http://www.pca.state.mn.us/quick-links/eda-surface-water-data>).

86.8 A. Streams (by eight-digit hydrologic unit code):

86.9 (1) 09030001 Rainy River - Headwaters (August 9, 2016);

86.10 (2) 09030002 Vermilion River (August 9, 2016);

86.11 (3) 09030003 Rainy River - Rainy Lake (August 9, 2016);

86.12 (4) 09030005 Little Fork River (August 9, 2016);

86.13 (5) 09030006 Big Fork River (August 9, 2016);

86.14 (6) 09030007 Rapid River (August 9, 2016);

86.15 (7) 09030008 Rainy River - Lower (August 9, 2016); and

86.16 (8) 09030009 Lake of the Woods (August 9, 2016).

86.17 B. Lakes:

86.18 [For text of subitems (1) to (182), see M.R.]

86.19 (183) \*Wisini Lake, 38-0361-00, [11/5/84P] (T.64, R.7): 1B, 2A, 3B; and

86.20 (184) Woods, Lake of the, 39-0002-00, (see Lake of the Woods).

86.21 [For text of items C and D, see M.R.]

87.1 Subp. 3. **Red River of the North Basin.** The water use classifications for the stream  
87.2 reaches within each of the major watersheds in the Red River of the North Basin listed in  
87.3 item A are found in tables entitled "Beneficial Use Designations for Stream Reaches"  
87.4 published on the Web site of the Minnesota Pollution Control Agency at  
87.5 [www.pca.state.mn.us/regulations/minnesota-rulemaking](http://www.pca.state.mn.us/regulations/minnesota-rulemaking). The tables are incorporated by  
87.6 reference and are not subject to frequent change. The date after each watershed listed in  
87.7 item A is the publication date of the applicable table. The water use classifications for the  
87.8 other listed waters in the Red River of the North Basin are as identified in items B to D.  
87.9 See parts 7050.0425 and 7050.0430 for the classifications of waters not listed. Designated  
87.10 use information for water bodies can also be accessed through the agency's Environmental  
87.11 Data Access (<http://www.pca.state.mn.us/quick-links/eda-surface-water-data>).

87.12 A. Streams (by eight-digit hydrologic unit code):

- 87.13 (1) 09020101 Bois de Sioux River (August 9, 2016);
- 87.14 (2) 09020102 Mustinka River (August 9, 2016);
- 87.15 (3) 09020103 Otter Tail River (August 9, 2016);
- 87.16 (4) 09020104 Upper Red River of the North (August 9, 2016);
- 87.17 (5) 09020106 Buffalo River (August 9, 2016);
- 87.18 (6) 09020107 Red River of the North - Marsh River (August 9, 2016);
- 87.19 (7) 09020108 Wild Rice River (August 9, 2016);
- 87.20 (8) 09020301 Red River of the North - Sandhill River (August 9, 2016);
- 87.21 (9) 09020302 Upper/Lower Red Lake (August 9, 2016);
- 87.22 (10) 09020303 Red Lake River (August 9, 2016);
- 87.23 (11) 09020304 Thief River (August 9, 2016);

- 88.1 (12) 09020305 Clearwater River (August 9, 2016);
- 88.2 (13) 09020306 Red River of the North - Grand Marais Creek (August 9,
- 88.3 2016);
- 88.4 (14) 09020309 Snake River (August 9, 2016);
- 88.5 (15) 09020311 Red River of the North - Tamarac River (August 9, 2016);
- 88.6 (16) 09020312 Two Rivers (August 9, 2016); and
- 88.7 (17) 09020314 Roseau River (August 9, 2016).

88.8 [For text of items B to D, see M.R.]

88.9 Subp. 4. **Upper Mississippi River Basin (headwaters to the confluence with the**

88.10 **St. Croix River).** The water use classifications for the stream reaches within each of the

88.11 major watersheds in the Upper Mississippi River Basin from the headwaters to the confluence

88.12 with the St. Croix River listed in item A are found in tables entitled "Beneficial Use

88.13 Designations for Stream Reaches" published on the Web site of the Minnesota Pollution

88.14 Control Agency at [www.pca.state.mn.us/regulations/minnesota-rulemaking](http://www.pca.state.mn.us/regulations/minnesota-rulemaking). The tables are

88.15 incorporated by reference and are not subject to frequent change. The date after each

88.16 watershed listed in item A is the publication date of the applicable table. The water use

88.17 classifications for the other listed waters in the Upper Mississippi River Basin from the

88.18 headwaters to the confluence with the St. Croix River are as identified in items B to D. See

88.19 parts 7050.0425 and 7050.0430 for the classifications of waters not listed. Designated use

88.20 information for water bodies can also be accessed through the agency's Environmental Data

88.21 Access (<http://www.pca.state.mn.us/quick-links/eda-surface-water-data>).

88.22 A. Streams (by eight-digit hydrologic unit code):

- 88.23 (1) 07010101 Mississippi River - Headwaters (August 9, 2016);
- 88.24 (2) 07010102 Leech Lake River (August 9, 2016);



- 89.1 (3) 07010103 Mississippi River - Grand Rapids (August 9, 2016);
- 89.2 (4) 07010104 Mississippi River - Brainerd (August 9, 2016);
- 89.3 (5) 07010105 Pine River (August 9, 2016);
- 89.4 (6) 07010106 Crow Wing River (August 9, 2016);
- 89.5 (7) 07010107 Redeye River (August 9, 2016);
- 89.6 (8) 07010108 Long Prairie River (August 9, 2016);
- 89.7 (9) 07010201 Mississippi River - Sartell (August 9, 2016);
- 89.8 (10) 07010202 Sauk River (August 9, 2016);
- 89.9 (11) 07010203 Mississippi River - St. Cloud (August 9, 2016);
- 89.10 (12) 07010204 North Fork Crow River (August 9, 2016);
- 89.11 (13) 07010205 South Fork Crow River (August 9, 2016);
- 89.12 (14) 07010206 Mississippi River - Twin Cities (August 9, 2016); and
- 89.13 (15) 07010207 Rum River (August 9, 2016).

89.14 [For text of items B to D, see M.R.]

89.15 Subp. 5. **Minnesota River Basin.** The water use classifications for the stream reaches  
89.16 within each of the major watersheds in the Minnesota River Basin listed in item A are found  
89.17 in tables entitled "Beneficial Use Designations for Stream Reaches" published on the Web  
89.18 site of the Minnesota Pollution Control Agency at  
89.19 [www.pca.state.mn.us/regulations/minnesota-rulemaking](http://www.pca.state.mn.us/regulations/minnesota-rulemaking). The tables are incorporated by  
89.20 reference and are not subject to frequent change. The date after each watershed listed in  
89.21 item A is the publication date of the applicable table. The water use classifications for the  
89.22 other listed waters in the Minnesota River Basin are as identified in items B to D. See parts  
89.23 7050.0425 and 7050.0430 for the classifications of waters not listed. Designated use

90.1 information for water bodies can also be accessed through the agency's Environmental Data  
90.2 Access (<http://www.pca.state.mn.us/quick-links/eda-surface-water-data>).

90.3 A. Streams (by eight-digit hydrologic unit code):

90.4 (1) 07020001 Minnesota River - Headwaters (August 9, 2016);

90.5 (2) 07020002 Pomme de Terre River (August 9, 2016);

90.6 (3) 07020003 Lac qui Parle River (August 9, 2016);

90.7 (4) 07020004 Minnesota River - Yellow Medicine River (August 9, 2016);

90.8 (5) 07020005 Chippewa River (August 9, 2016);

90.9 (6) 07020006 Redwood River (August 9, 2016);

90.10 (7) 07020007 Minnesota River - Mankato (August 9, 2016);

90.11 (8) 07020008 Cottonwood River (August 9, 2016);

90.12 (9) 07020009 Blue Earth River (August 9, 2016);

90.13 (10) 07020010 Watonwan River (August 9, 2016);

90.14 (11) 07020011 Le Sueur River (August 9, 2016); and

90.15 (12) 07020012 Lower Minnesota River (August 9, 2016).

90.16 [For text of items B to D, see M.R.]

90.17 Subp. 6. **Saint Croix River Basin.** The water use classifications for the stream reaches  
90.18 within each of the major watersheds in the Saint Croix River Basin listed in item A are  
90.19 found in tables entitled "Beneficial Use Designations for Stream Reaches" published on the  
90.20 Web site of the Minnesota Pollution Control Agency at  
90.21 [www.pca.state.mn.us/regulations/minnesota-rulemaking](http://www.pca.state.mn.us/regulations/minnesota-rulemaking). The tables are incorporated by  
90.22 reference and are not subject to frequent change. The date after each watershed listed in

91.1 item A is the publication date of the applicable table. The water use classifications for the  
91.2 other listed waters in the Saint Croix River Basin are as identified in items B to D. See parts  
91.3 7050.0425 and 7050.0430 for the classifications of waters not listed. Designated use  
91.4 information for water bodies can also be accessed through the agency's Environmental Data  
91.5 Access (<http://www.pca.state.mn.us/quick-links/eda-surface-water-data>).

91.6 A. Streams (by eight-digit hydrologic unit code):

91.7 (1) 07030001 Upper St. Croix River (August 9, 2016);

91.8 (2) 07030003 Kettle River (August 9, 2016);

91.9 (3) 07030004 Snake River (August 9, 2016); and

91.10 (4) 07030005 Lower St. Croix River (August 9, 2016).

91.11 [For text of items B to D, see M.R.]

91.12 Subp. 7. **Lower Mississippi River Basin (from the confluence with the St. Croix**  
91.13 **River to the Iowa border).** The water use classifications for the stream reaches within  
91.14 each of the major watersheds in the Lower Mississippi River Basin from the confluence  
91.15 with the Saint Croix River to the Iowa border listed in item A are found in tables entitled  
91.16 "Beneficial Use Designations for Stream Reaches" published on the Web site of the  
91.17 Minnesota Pollution Control Agency at  
91.18 [www.pca.state.mn.us/regulations/minnesota-rulemaking](http://www.pca.state.mn.us/regulations/minnesota-rulemaking). The tables are incorporated by  
91.19 reference and are not subject to frequent change. The date after each watershed listed in  
91.20 item A is the publication date of the applicable table. The water use classifications for the  
91.21 other listed waters in the Lower Mississippi River Basin from the confluence with the St.  
91.22 Croix River to the Iowa border are as identified in items B to D. See parts 7050.0425 and  
91.23 7050.0430 for the classifications of waters not listed. Designated use information for water  
91.24 bodies can also be accessed through the agency's Environmental Data Access  
91.25 (<http://www.pca.state.mn.us/quick-links/eda-surface-water-data>).

- 92.1 A. Streams (by eight-digit hydrologic unit code):
- 92.2 (1) 07040001 Mississippi River - Lake Pepin (August 9, 2016);
- 92.3 (2) 07040002 Cannon River (August 9, 2016);
- 92.4 (3) 07040003 Mississippi River - Winona (August 9, 2016);
- 92.5 (4) 07040004 Zumbro River (August 9, 2016);
- 92.6 (5) 07040006 Mississippi River - La Crescent (August 9, 2016);
- 92.7 (6) 07040008 Root River (August 9, 2016);
- 92.8 (7) 07060001 Mississippi River - Reno (August 9, 2016); and
- 92.9 (8) 07060002 Upper Iowa River (August 9, 2016).

92.10 [For text of items B to D, see M.R.]

92.11 Subp. 8. **Cedar-Des Moines Rivers Basin.** The water use classifications for the stream  
92.12 reaches within each of the major watersheds in the Cedar-Des Moines Rivers Basin listed  
92.13 in item A are found in tables entitled "Beneficial Use Designations for Stream Reaches"  
92.14 published on the Web site of the Minnesota Pollution Control Agency at  
92.15 [www.pca.state.mn.us/regulations/minnesota-rulemaking](http://www.pca.state.mn.us/regulations/minnesota-rulemaking). The tables are incorporated by  
92.16 reference and are not subject to frequent change. The date after each watershed listed in  
92.17 item A is the publication date of the applicable table. The water use classifications for the  
92.18 other listed waters in the Cedar-Des Moines Rivers Basin are as identified in items B to D.  
92.19 See parts 7050.0425 and 7050.0430 for the classifications of waters not listed. Designated  
92.20 use information for water bodies can also be accessed through the agency's Environmental  
92.21 Data Access (<http://www.pca.state.mn.us/quick-links/eda-surface-water-data>).

- 92.22 A. Streams (by eight-digit hydrologic unit code):
- 92.23 (1) 07080102 Upper Wapsipinicon River (August 9, 2016);

- 93.1 (2) 07080201 Cedar River (August 9, 2016);
- 93.2 (3) 07080202 Shell Rock River (August 9, 2016);
- 93.3 (4) 07080203 Winnebago River (August 9, 2016);
- 93.4 (5) 07100001 Des Moines River - Headwaters (August 9, 2016);
- 93.5 (6) 07100002 Lower Des Moines River (August 9, 2016); and
- 93.6 (7) 07100003 East Fork Des Moines River (August 9, 2016).

93.7 [For text of items B to D, see M.R.]

93.8 Subp. 9. **Missouri River Basin.** The water use classifications for the stream reaches  
93.9 within each of the major watersheds in the Missouri River Basin listed in item A are found  
93.10 in tables entitled "Beneficial Use Designations for Stream Reaches" published on the Web  
93.11 site of the Minnesota Pollution Control Agency at  
93.12 [www.pca.state.mn.us/regulations/minnesota-rulemaking](http://www.pca.state.mn.us/regulations/minnesota-rulemaking). The tables are incorporated by  
93.13 reference and are not subject to frequent change. The date after each watershed listed in  
93.14 item A is the publication date of the applicable table. The water use classifications for the  
93.15 other listed waters in the Missouri River Basin are as identified in items B to D. See parts  
93.16 7050.0425 and 7050.0430 for the classifications of waters not listed. Designated use  
93.17 information for water bodies can also be accessed through the agency's Environmental Data  
93.18 Access (<http://www.pca.state.mn.us/quick-links/eda-surface-water-data>).

93.19 A. Streams (by eight-digit hydrologic unit code):

- 93.20 (1) 10170202 Upper Big Sioux River (August 9, 2016);
- 93.21 (2) 10170203 Lower Big Sioux River (August 9, 2016);
- 93.22 (3) 10170204 Rock River (August 9, 2016); and
- 93.23 (4) 10230003 Little Sioux River (August 9, 2016).

94.1 [For text of items B to D, see M.R.]

94.2 **7052.0100 WATER QUALITY STANDARDS.**

94.3 [For text of subps 1 to 4, see M.R.]

94.4 **Subp. 5. Water quality standards applicable to Class 2B and 2D waters.**

94.5	Substance	Units	Aquatic	Aquatic	Aquatic	Human	Wildlife	Applicable
94.6			Life	Life	Life	Health	Chronic	Chronic
94.7			Chronic	Maximum	Final	Chronic	Standard	Standard
94.8			Standard	Standard	Acute	Standard		
94.9					Value			

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94.10								
94.11	Arsenic, total	ug/l	148	340	680	53†		53
94.12	Benzene	ug/l	114†	4487†	8974†	237		114
94.13	Cadmium, total	ug/l	subp 6	subp 6	subp 6			subp 6
94.14	(TH)							
94.15	Chlordane	pg/l				225		225
94.16	Chlorobenzene	ug/l	10†	423†	846†	2916		10
94.17	Chromium III, total	ug/l	subp 6	subp 6	subp 6			subp 6
94.18	(TH)							
94.19	Chromium VI, total	ug/l	11	16	32			11
94.20	Copper, total (TH)	ug/l	subp 6	subp 6	subp 6			subp 6
94.21	Cyanide, free	ug/l	5.2	22	44	30240		5.2
94.22	DDT	pg/l				142	11	11
94.23	Dieldrin	pg/l	56000	240000	480000	6.5		6.5
94.24	2,4-Dimethylphenol	ug/l	21	137	274	7182		21

95.1	2,4-Dinitrophenol	ug/l	71	379	758	1982		71
95.2	Endrin	ug/l	0.036	0.086	0.17	0.016†		0.016
95.3	Hexachlorobenzene	pg/l				419		419
95.4	Hexachloroethane	ug/l				6.2		6.2
95.5	Lindane	ug/l		0.95	1.9	0.46		0.46
95.6	Mercury, total	ug/l	0.91	1.7	3.4	0.00153	0.0013	0.0013
95.7	Methylene Chloride	ug/l	1561†	9600†	19200†	1994		1561
95.8	Nickel, total (TH)	ug/l	subp 6	subp 6	subp 6			subp 6
95.9	Parathion	ug/l	0.013	0.065	0.13			.013
95.10	PCBs (class)	pg/l				25.2	122	25.2
95.11	Pentachlorophenol	ug/l	subp 6	subp 6	subp 6	5.5†		subp 6
95.12	(pH)							
95.13	Selenium, total	ug/l	5.0	20†	40†			5.0
95.14	2,3,7,8-TCDD	pg/l				0.0080	0.0031	0.0031
95.15	Toluene	ug/l	253†	1352†	2703†	45679		253
95.16	Toxaphene	pg/l				62		62
95.17	Trichloroethylene	ug/l				330		330
95.18	Zinc, total (TH)	ug/l	subp 6	subp 6	subp 6			subp 6

95.19 †this standard or FAV was derived under chapter 7050.

95.20 Subp. 6. **Water quality standards that vary with water quality characteristics.**

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

96.1 C. Standards that vary with pH applicable to Class 2B and 2D waters in the Lake  
 96.2 Superior Basin are listed in this subpart. Exp. is the base e exponential function.

96.3 Example standards at pH of:

96.4 Pentachlorophenol	Formula, results in ug/l	6.5	7.0	7.5	8.0	8.5
96.5						
96.6 Chronic standard	exp.(1.005[pH]-5.134) not to exceed 5.5 ug/l	4.0	5.5	5.5	5.5	5.5
96.7						
96.8 Maximum standard	exp.(1.005[pH]-4.869)	5.3	8.7	14	24	39
96.9 Final acute value	exp.(1.005[pH]-4.175)	11	17	29	48	79

96.10 **7052.0110 METHODOLOGIES FOR DEVELOPMENT OF STANDARDS AND**  
 96.11 **CRITERIA, AND BIOACCUMULATION FACTORS.**

96.12 [For text of subps 1 and 2, see M.R.]

96.13 Subp. 3. **Bioaccumulation factors.** Bioaccumulation factors (BAFs) for calculating  
 96.14 human health and wildlife standards were developed and BAFs for calculating criteria must  
 96.15 be developed using the methodology provided by Code of Federal Regulations, title 40,  
 96.16 part 132, Appendix B, entitled "Great Lakes Water Quality Methodology for Deriving  
 96.17 Bioaccumulation Factors," as amended through March 12, 1997, which is adopted and  
 96.18 incorporated by reference in part 7052.0015, item B, except that for human health standards  
 96.19 and criteria, the baseline BAF is multiplied by the following lipid fractions which apply to  
 96.20 fish in both trophic levels 3 (TL<sub>3</sub>) and 4 (TL<sub>4</sub>), except as noted in item C:

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

96.22 C. 0.015 for TL<sub>4</sub> and 0.020 for TL<sub>3</sub> for Class 2B, 2Bd, and 2D waters.

96.23 [For text of subps 4 and 5, see M.R.]

96.24 **REPEALER.** Minnesota Rules, part 7050.0222, subpart 5, is repealed.