Pollution Control Agency

Proposed Permanent Rules Relating to Human Health Methods for Water Quality

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

[For text of subps 1 to 6, see M.R.]

Subp. 7. **Impairment of waters relating to fish for human consumption.**

A. In evaluating whether the narrative standards in subpart 3, which prevent harmful pesticide or other toxic pollutant residues in aquatic flora or fauna, are being met, the commissioner ~~will~~ must use the methods in:

(1) parts 7050.0218 and 7050.0219 for site-specific fish tissue-based chronic criterion (CC_{ft}); or

(2) parts 7050.0222 and 7052.0100 for fish tissue-based chronic standard (CS_{ft}).

B. If CS_{ft} has not been established for a pollutant with chronic standards (CS) applicable in water (CS_{dfr}, CS_{dev}, or CS_{fr}), the residue levels in fish muscle tissue established by the Minnesota Department of Health must be used to identify surface waters supporting fish for which the Minnesota Department of Health recommends a reduced frequency of fish consumption for the protection of public health. A water body will be considered impaired when the recommended consumption frequency is less than one meal per week, such as one meal per month, for any member of the population. That is, a water body will not be considered impaired if the recommended consumption frequency is one meal per week, or any less restrictive recommendation such as two meals per week, for all members of the population. The impaired condition must be supported with measured data on the contaminant levels in the ~~indigenous~~ resident fish.

C. When making impairment determinations in an individual water body for a pollutant with both a fish tissue-based CC_{ft} or CS_{ft} and a CS applicable in water, comparison of fish tissue data to the CC_{ft} or CS_{ft} must be the basis for the final impairment determination.

[For text of subp 8, see M.R.]

7050.0217 OBJECTIVES FOR PROTECTION OF SURFACE WATERS FROM TOXIC POLLUTANTS.

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

Subp. 2. **Objectives.**

A. Protection of the aquatic community from the toxic effects of pollutants means the protection of no less than 95 percent of all the species in any aquatic community. Greater protection may be applied to a community if economically, recreationally, or ecologically important species are very sensitive.

B. Protection of human consumers of fish, other edible aquatic organisms, and water for drinking from surface waters means that exposure from noncarcinogenic chemicals ~~shall~~, including nonlinear carcinogens (NLC), singly or in mixtures, must be

below levels expected to produce known adverse effects; the combined risk from mixtures of noncarcinogens and NLC must not exceed the common health risk index endpoints or health endpoints described in part 7050.0222, subpart 7, item D; and the incremental cancer risk from exposure to carcinogenic chemicals, singly or in mixtures, ~~shall~~ must not exceed one in 100,000. The combined risk from mixtures of linear carcinogens (C) will be determined as described in part 7050.0222, subpart 7, item ~~D~~ E.

C. Protection of wildlife that eat aquatic organisms means the protection of the most sensitive wildlife species or populations. Greater protection may be applied if the exposed animals include endangered or threatened wildlife species listed in chapter 6134, or in Code of Federal Regulations, title 50, part 17, under the Endangered Species Act of 1973, United States Code, title 16, sections 1531 to 1543.

7050.0218 FOR TOXIC POLLUTANTS: DEFINITIONS AND METHODS FOR DETERMINATION OF ~~CRITERIA FOR TOXIC POLLUTANTS, FOR WHICH~~ HUMAN HEALTH-BASED NUMERIC STANDARDS ~~NOT PROMULGATED~~ AND SITE-SPECIFIC NUMERIC CRITERIA FOR AQUATIC LIFE, HUMAN HEALTH, AND FISH-EATING WILDLIFE.

Subpart 1. **Purpose.** ~~The Class 2 and Class 7 numeric water quality standards for toxic pollutants in parts 7050.0220, 7050.0222, and 7050.0227 do not address all pollutants which may be discharged to surface waters and cause toxic effects. Therefore, methods are established in this part to address on a site-by-site and case-by-case basis the discharge into surface waters of toxic pollutants not listed in parts 7050.0220, 7050.0222, and 7050.0227.~~ The methods in this part and part 7050.0219 meet the objectives in part 7050.0217 and provide the basis for developing human health-based numeric chronic standards and site-specific numeric criteria for aquatic toxicity, human health, and fish-eating wildlife. The agency may also adopt new standards according to Minnesota Statutes, chapter 14, to replace those listed in parts 7050.0220 to 7050.0227 and 7052.0100 that are more stringent or less stringent if new scientific evidence shows that a change in the standard is justified.

Subp. 2. **Site-specific criteria.** The Class 2 and Class 7 numeric water quality standards for toxic pollutants in parts 7050.0220, 7050.0222, 7050.0227, and 7052.0100 do not address all pollutants that may be discharged to surface waters and cause toxic effects. Therefore, methods are established in this part and part 7050.0219 to address on a site-specific basis the discharge into surface waters of toxic pollutants not listed in parts 7050.0220, 7050.0222, 7050.0227, 7052.0100. Class 2 and Class 7 site-specific numeric criteria for toxic pollutants shall be derived by the commissioner using the procedures in this part.

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

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

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

C. "Adjustment factor, lifetime" or "$AF_{lifetime}$" means the numeric multiplier used to modify the adult-based cancer slope factor for lifetime (70 years standard in risk characterization) exposure based on chemical-specific data.

D. "Adverse effect" means a biochemical change, functional impairment, or pathologic lesion that affects the performance of the whole organism or reduces an organism's ability to respond to an additional environmental challenge.

E. "Age-dependent adjustment factor" or "ADAF" means the default numeric modifiers to the cancer slope factor that account for the increased susceptibility to cancer from early-life exposures to linear carcinogens in the absence of chemical-specific data. For default use, there are three ADAF:

(1) $ADAF_{0<2} = 10$, for birth up to two years of age;

(2) $ADAF_{2 \text{ to } <16} = 3$, for two up to 16 years of age; and

(3) $ADAF_{16+} = 1$, for 16 years of age and older.

~~C.~~ F. "Available and reliable scientific data" means information derived from scientific literature including: published literature in peer reviewed scientific journals, USEPA ambient water quality criteria documents, and other reports or documents published by the USEPA or other governmental agencies.

~~D.~~ G. "Bioaccumulation factor" or "BAF" means the concentration of a pollutant in one or more tissues of an aquatic organism, exposed from any source of the pollutant but primarily from the water column, diet, and bottom sediments, divided by the average concentration in the solution in which the organism had been living, under steady state conditions.

H. "Bioaccumulative chemical of concern" or "BCC" has the meaning given in part 7052.0010, subpart 4.

~~E.~~ I. "Bioconcentration factor" or "BCF" means the concentration of a pollutant in one or more tissues of an aquatic organism, exposed only to the water as the source of the pollutant, divided by the average concentration in the solution in which the organism had been living, under steady state conditions.

J. "Biomagnification" means the increase in tissue concentration of a pollutant in aquatic organisms at successive trophic levels through a series of predator-prey associations, primarily occurring through dietary accumulation. The expression used to quantify this increase is the biomagnification factor or "BMF." For a given water body, the BMF is calculated as:

(1) the ratio of the tissue concentration of a pollutant in a predator at a particular trophic level to the tissue concentration in its prey at the next lower trophic level; or

(2) the ratio estimated from a comparable laboratory model.

K. "Biota-sediment accumulation factor" or "BSAF" means the ratio (in kilogram of organic carbon/kilogram of lipid) of a pollutant's lipid-normalized concentration in tissue of an aquatic organism to its organic carbon-normalized concentration in surface sediment, where:

(1) the ratio does not change substantially over time;

(2) both the organism and its food are exposed; and

(3) the surface sediment is representative of average surface sediment in the vicinity of the organism.

~~F.~~ L. "Cancer potency slope factor" or ~~"ql*"~~ "CSF" means a factor indicative of a chemical's human cancer causing potential~~. The ql* is the upper 95 percent confidence limit (one-sided) of the slope from a linear nonthreshold dose-response model used by the USEPA to provide an upper bound estimate of incremental cancer risk. The ql* assumes a lifetime exposure and is expressed in days times kilogram body weight per milligram toxicant (d x kg/mg).~~ and an upper-bound estimate of cancer risk per increment of dose that can be used to estimate cancer risk probabilities for different exposure levels. CSF is expressed in units of cancer incidence per milligram of pollutant per kilogram of body weight-day $(mg/kg\text{-}day)^{-1}$.

M. "Cancer risk level" or "CR" means the probability that daily exposure to a carcinogen over a lifetime may induce cancer. CR refers to an incremental or additional excess cancer risk equal to 1×10^{-5} (1 in 100,000) and is applied with the cancer potency slope factor for single chemicals and for mixtures.

N. "Carcinogen, linear" or "C" means a chemical agent for which, either by a known mode of action or a conservative assumption, the associated cancer risk varies in direct proportion to the extent of exposure and for which there is no risk-free level of exposure. The toxicological value for a C is the cancer potency slope factor. Seventy years

is the standard lifetime duration used by United States Environmental Protection Agency in the characterization of lifetime cancer risk.

O. "Carcinogen, nonlinear" or "NLC" means a chemical agent for which, particularly at low doses, the associated cancer risk does not rise in direct proportion to the extent of exposure and for which a threshold level of exposure exists below which there is no cancer risk. For NLC, the reference dose is the toxicological value used as the threshold for cancer risk.

~~G.~~ P. "Chronic toxicity" means a stimulus that lingers or continues for a long period of time, often one-tenth the life span or more. A chronic effect can be mortality, reduced growth, reproduction impairment, harmful changes in behavior, and other nonlethal effects.

~~H.~~ Q. "Chronic criterion" or "CC" ~~means~~ and "chronic standard" or "CS" mean the highest water concentration or fish tissue concentration of a toxicant or effluent to which ~~organisms, including~~ aquatic life, humans ~~or~~, wildlife, or other organisms can be exposed indefinitely without causing chronic toxicity. CC represents a site-specific chronic criterion developed under this part and part 7050.0219 or part 7052.0110. CS represents a chronic standard listed in parts 7050.0220 and 7050.0222 or in part 7052.0100. CC and CS are further distinguished by the organisms they are developed to protect and medium in which they apply:

~~"CC_{df}" means a chronic criterion~~

(1) CC_{tox} or CS_{tox} represent values applied in surface water developed to protect aquatic life from chronic toxicity;

(2) CC_{dfr} or CS_{dfr} represent values applied in surface water based on protecting humans from exposure to the pollutant from ~~both~~ drinking water ~~and~~, eating ~~sport-caught~~ fish. ~~"CC_f" means a chronic criterion~~, and aquatic recreation;

(3) CC_{fr} or CS_{fr} represent values applied in surface water based on protecting humans from exposure to the pollutant from eating ~~sport-caught~~ fish ~~only.~~ and aquatic recreation;

(4) CC_{ft} or CS_{ft} represent values applied in fish tissue based on protecting humans from exposure to the pollutant from eating fish; and

(5) ~~"~~CC_w~~" means a chronic criterion~~ represents values applied in surface water based on protecting wildlife from exposure to the pollutant from eating aquatic organisms.

~~I. "Chronic standard" or "CS" means the highest water concentration of a toxicant to which organisms can be exposed indefinitely without causing chronic toxicity. Chronic standards are listed in parts 7050.0220 and 7050.0222.~~

~~J.~~ R. "Chronic value" means the geometric mean of the highest tested concentration that did not cause an unacceptable adverse effect and the lowest tested concentration that did cause an unacceptable adverse effect, and in which all higher test values cause an effect, in an approved chronic test.

~~K.~~ S. "Cold water fisheries" means a community of fish including species of trout and salmon from the Salmonidae family that inhabit trout waters as defined in part 7050.0420.

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

U. "Developmental health endpoint" or "developmental toxicity" means an adverse effect on the developing organism that may result from parental exposure prior to conception, maternal exposure during prenatal development, or direct exposure postnatally

until the time of sexual maturation. Developmental toxicity may be detected at any point in the lifespan of the organism. The major manifestations of developmental toxicity include:

(1) death of the developing organism;

(2) structural abnormality;

(3) altered growth; or

(4) functional deficiency.

~~M.~~ V. "Duration" means the time over which the instream concentration of a pollutant is averaged for comparison with the standard or criterion.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

~~P.~~ CC. "Genus mean acute value" or "GMAV" means the geometric mean of the SMAVs available for the genus.

DD. "Health risk index" means the sum of the quotients calculated by identifying all chemicals that share a common health endpoint or are based on linear carcinogenicity

and dividing the water or fish tissue concentration for each chemical (measured or statistically derived) by its applicable chronic standard or chronic criterion. To meet the objectives in part 7050.0217, the health risk index must not exceed a value of one. The equations for the risk indices are found in part 7050.0222, subpart 7, items D and E.

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

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

~~Q.~~ GG. "Lethal concentration" or "LC50" means the toxicant concentration killing 50 percent of the exposed organisms in a specific time of observation.

~~R.~~ HH. "Lowest observable adverse effect level" or "LOAEL" means the lowest ~~tested concentration~~ exposure level that caused a statistically or biologically significant ~~occurrence of an adverse effect in comparison with a control when all higher test concentrations caused adverse effects~~ increase in the frequency or severity of adverse effects observed between the exposed population and its appropriate control group.

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

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

~~T.~~ KK. "Maximum standard" or "MS" means the highest concentration of a toxicant in water to which aquatic organisms can be exposed for a brief time with zero

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

LL. "MDH" means the Minnesota Department of Health.

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

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

~~V.~~ OO. "No observable adverse effect level" or "NOAEL" means ~~the highest tested concentration that did not cause a statistically significant occurrence of an adverse effect in comparison with a control when no lower test concentration caused an injurious or adverse effect~~ an exposure level at which there is no statistically or biologically significant increase in the frequency or severity of adverse effects between the exposed population and its appropriate control group.

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

~~X. "Parachor" means the surface tension adjusted molar volume, and specifically is the molecular weight of a liquid times the fourth root of its surface tension, divided by the~~

~~difference between the density of the liquid and the density of the vapor in equilibrium with it; essentially constant over wide ranges of temperature. Parachor relates to the physical properties of a molecule that affect its potential to bioaccumulate in aquatic organisms.~~

~~Y.~~ QQ. "Percent effluent" means the representation of acute or chronic toxicity of an effluent as a percent of whole effluent mixed in dilution water, where acute toxicity is expressed by LC50s or EC50s and chronic toxicity is expressed by ~~NOAELs~~ NOAEL.

~~Z.~~ RR. "Reference dose" or "RfD" means an estimate of a ~~daily exposure to the human population, including sensitive subpopulations, that is likely to be without appreciable risk or deleterious effects over a lifetime. The RfD is expressed in units of daily dose, mg/kg/day.~~ dose for a given duration to the human population, including susceptible subgroups such as infants, that is likely to be without an appreciable risk of adverse effects during a lifetime. It is derived from a suitable dose level at which there are few or no statistically or biologically significant increases in the frequency or severity of an adverse effect between the dosed population and its associated control group. The RfD includes one or more divisors, applied to the suitable dose level, accounting for:

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

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

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

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

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

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

~~AA.~~ SS. "Relative source contribution factor" or "RSC" means the ~~fraction of the total allowable daily dose of a toxic pollutant that is attributed to drinking water and fish consumption relative to other sources of the pollutant to humans, such as air or food, in the calculation of criteria.~~ percentage or apportioned amount (subtraction method) of the reference dose for a pollutant allocated to surface water exposures from drinking or incidental water ingestion and fish consumption. In the absence of sufficient data to establish a pollutant- or chemical-specific RSC value, the default RSC is 0.2 or 0.5 as described in part 7050.0219, subpart 5.

~~BB.~~ TT. "Species mean acute value" or "SMAV" means the geometric mean of all the available and acceptable acute values for a species.

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

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

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

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

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

~~FF.~~ ZZ. "USEPA" means the United States Environmental Protection Agency.

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

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

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

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

A. The USEPA aquatic life criteria are adopted unchanged by the agency, unless modified under item C, as the criteria applicable to designated ~~trout waters. Trout (Class 2A)~~ Class 2A waters ~~are listed~~ in parts 7050.0420 and 7050.0470.

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

C. If the commissioner finds that the information that supports a USEPA criterion is no longer current or complete for reasons including, but not limited to, changes to the relationship between a water quality characteristic and toxicity; the ACR; the weight given to toxicity data for a commercially or recreationally important species; ~~the RfD; the ql*; or the BAF~~ or the human health-based methods; then the commissioner shall evaluate all available information and modify the criterion according to the information and with the objectives in part 7050.0217 and the methods in this part and part 7050.0219. Any effluent limitation determined to be necessary based on site-specific criteria derived under this item shall only be required after the discharger has been given notice to the specific proposed effluent limitations and an opportunity to request a hearing as provided in part 7000.1800.

Subp. 5. **Toxicity-based criteria.** Toxicity-based aquatic life criteria shall be determined using the methods in this subpart when no USEPA criterion is available.

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

E. The CC_{tox} is the FAV divided by an ACR. Available chronic data are used to determine ACRs as described in item F and measured chronic values are compared to the CC_{tox}. If an approved chronic value for a commercially, recreationally, or ecologically

important freshwater species is lower than the CC_{tox}, the CC_{tox} will be set to equal that chronic value.

[For text of item F, see M.R.]

G. If the acute data available do not meet the requirements in items A and B, toxicity-based criteria can be determined by the method in this item. This method is not applicable to ionizable organic chemicals, or to bioaccumulative organic chemicals and pesticides with ~~BCFs~~ BCF greater than 5,000 or log K_{ow} values greater than 5.19.

[For text of subitems (1) to (10), see M.R.]

(11) The CC_{tox} is calculated by dividing the FAV by the appropriate ACR.

(12) If chronic data are available, they are used to determine measured ~~ACRs~~ ACR as described in item F, and chronic data are compared to the CC_{tox}.

Subp. 6. [See repealer.]

Subp. 7. [See repealer.]

[For text of subp 8, see M.R.]

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

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

B. Wildlife-based criteria are calculated using the following formula:

$$CC_w \text{ mg/L} = \frac{NOAEL \times BWt \times SSF}{DW + (F \times BAF)}$$

where: CC_w = wildlife chronic criterion in mg/L

NOAEL = no observable adverse effect level in mg of substance per kg of body weight per day (mg/kg BWt/day) as derived from mammalian or avian toxicity studies. If the NOAEL is in mg/L, the NOAEL will be multiplied by the average daily volume of water consumed by the test animals in liters per day and divided by the average weight of the test animals in kg. If the NOAEL is in mg/kg of food consumed, the NOAEL will be multiplied by the average amount of food consumed daily by the test animals and divided by the average weight of the test animals in kg

BWt = average body weight of test organisms in kg

SSF = species sensitivity factor to account for difference in the sensitivity in test species. This factor will vary between 1 and 0.1. The appropriate factor will be determined by the commissioner based on available and reliable scientific data on the relative sensitivity of the test organism compared to other wildlife species

DW = average volume of water consumed per day by the test animals in liters

F = average amount of food consumed per day by test animals in kg

BAF = BAF in liters per kg

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

Subp. 10. **Applicable criteria or human health-based standard.** ~~The criterion for a pollutant includes: the CC, the MC, and the FAV.~~ The final criteria or chronic standard for human health for toxic pollutants for surface waters are must be the lowest of the applicable criteria or standards for human health derived under this part and part 7050.0219.

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

(1) for aquatic life toxicity: a CC_{tox} and MC based on toxicity to aquatic organisms from subpart 4 or 5 or a CC_{tox} based on plant toxicity from subpart 4 or 5;

~~(2) a CC based on plant toxicity from subpart 4 or 5;~~

~~(3)~~ (2) for human health: a ~~CC_{df} or CC_f from subparts 6 and 7~~ CC or CS by medium (water or fish) as described in part 7050.0219, subpart 2, or a concentration that will prevent unacceptable taste or odor in water, fish, or other edible aquatic organisms from subpart 8; or

~~(4) a concentration that will prevent unacceptable taste or odor in water, fish, or other edible aquatic organisms from subpart 8; or~~

~~(5)~~ (3) when available, for fish-eating wildlife: a CC_w from subpart 9.

B. Applicable criteria for Class 7 waters ~~are~~ must be the lowest of the following:

[For text of subitems (1) and (2), see M.R.]

C. If the site-specific application of criteria developed in this subpart is used to establish an effluent limitation for national pollutant discharge elimination system and state disposal system permits or to establish the degree of remedial action cleanup activities, the provisions of part 7050.0222, subpart 7, items B to ~~E~~ G, apply.

D. The CS or CC and MS or MC must be averaged over the durations described in part 7050.0222, subpart 7, item C.

7050.0219 HUMAN HEALTH-BASED CRITERIA AND STANDARDS.

Subpart 1. **Objective.** Human health-based criteria and standards protect humans from potential adverse effects of eating fish and edible aquatic organisms and incidental ingestion of water while recreating in Class 2 waters and from the consumption of drinking water from Class 1 surface waters (includes Class 2A and 2Bd waters). Human health-based criteria and standards must be determined using the methods in this part.

Subp. 2. **Applicability of methods.** Human health-based chronic criteria (CC) or chronic standards (CS) must be evaluated based on the pollutant's toxicological profile: noncarcinogen or nonlinear carcinogen (NLC), developmental susceptibility, and linear carcinogen (C).

A. Algorithms for these toxicological profiles by Class 2 subclasses are described in subparts 13 to 15. Other scientifically defensible algorithms may be applied by the commissioner on a chemical-specific basis for evaluating developmental susceptibility to toxic pollutants in fish tissue based on the consideration listed in subparts 3 to 5.

B. The most stringent CC or CS by medium (water or fish tissue), Class 2 subclass, and toxicological profile, or taste and odor criteria as described in part 7050.0218, subpart 8, are the final applicable human health-based CC or CS.

Subp. 3. **Available and reliable scientific data.** The data and information used to develop a site-specific CC or CS must be approved by the commissioner. The commissioner must consider measures of availability and reliability of the data and information.

Subp. 4. **Toxicological values.** The RfD used to calculate criteria for noncarcinogenic and nonlinear carcinogenic chemicals (NLC) and the CSF and $AF_{lifetime}$ or CSF and ADAF used to calculate CC or CS for linear carcinogenic (C) chemicals are obtained from the MDH or developed according to parts 4717.7820, subparts 5 and 21, and 7050.0218, subpart 3.

Subp. 5. **Exposure values.** Drinking water intake rates are obtained from the MDH. RSC uses a default value of 0.2 for most pollutants, unless:

A. there are no significant known or potential sources other than those addressed for the designated use, then 0.5 must be used; or

B. sufficient exposure data are available to support an alternative pollutant-specific value between 0.2 and 0.8.

Subp. 6. **Bioaccumulation factors.** This subpart describes the process and data for deriving bioaccumulation factors (BAF) used in the calculation of the human health-based chronic criteria (CC) or chronic standards (CS).

A. Information used for defining BAF must be consistent with the pollutant form used to derive the RfD or CSF. BAF development must also consider other forms that bioaccumulate in fish tissue. The preferred bioaccumulation data are available and reliable field and laboratory studies.

B. A general description of the steps and data used to determine final state or site BAF are listed in subitems (1) to (6) and described in detail in subparts 7 to 12.

(1) Categorize the pollutant based on certain properties into one of three broadly defined chemical categories: nonionic organic, ionic organic, or inorganic and organometallic chemicals as described in subpart 7.

(2) Define the methods for developing baseline BAF as described in subpart 8. A baseline BAF is the expression of the BAF based on the bioavailable or freely dissolved fraction of a pollutant in the ambient water and normalized concentration of the pollutant within the organism.

(3) Determine the relevant procedure (1 to 6) for identifying the acceptable baseline BAF methods (maximum of four) and their hierarchy for developing individual or aquatic species-specific baseline BAF as described in subpart 9.

(4) Calculate species mean baseline BAF from acceptable individual baseline BAF as described in subpart 10.

(5) Determine final baseline BAF for TL_3 and TL_4 as described in subpart 11.

(6) Develop final state or site BAF for TL_3 and TL_4 based on default parameters by Class 2 subclass or site-specific data as described in subpart 12.

Subp. 7. **Chemical categorization.** For BAF purposes, organic chemicals that have no or negligible ionization at the pH range of ambient surface waters are categorized as nonionic organic chemicals; organic chemicals that undergo ionization at the pH range of ambient surface waters are categorized as ionic organic chemicals and further delineated

for BAF development based on subpart 9, item C; organometallic chemicals and other chemicals or elements are categorized as organometallic and inorganic chemicals.

Subp. 8. **Methods for baseline BAF.** The four methods for developing baseline BAF in items A to D are listed in a hierarchy from most preferred to least preferred, except as noted in subpart 9: use of field-measured BAF studies (field BAF); use of field-measured BSAF studies (field BSAF); use of laboratory-measured BCF studies with food chain multipliers (lab BCF*FCM); and use of octanol-water partition coefficients with food chain multipliers (K_{ow}*FCM). Where relevant, differences in the baseline BAF methods are described by chemical categorization.

A. Method 1: Field BAF. The field-measured BAF for a nonionic organic chemical is calculated based on the total concentration of the chemical in the appropriate tissue of the aquatic organism (on a wet tissue basis) and the total concentration of chemical in ambient surface water at the site of sampling (BAF^{t}_{T}).

measured $BAF^{t}_{T} = C_t/C_w$

where: BAF^{t}_{T} = field-measured BAF based on total concentration in tissue and water (L/kg)

C_t = total concentration of the chemical in the specified wet tissue (µg/kg)

C_w = total concentration of the chemical in water (µg/L)

The measured BAF^{t}_{T} is converted to a baseline BAF or BAF_{l}^{fd} by the following equation:

$$\text{baseline } BAF_l^{fd} = \left[\frac{\text{measured } BAF_T^t}{f_{fd}}\right]\left(\frac{1}{f_l}\right)$$

where: baseline BAF_{l}^{fd} = BAF expressed on a freely dissolved and lipid-normalized basis (L/kg)

f_l = fraction of the tissue that is lipid

f_{fd} = fraction of the total chemical that is freely dissolved in ambient surface water

The freely dissolved fraction or f_{fd} is the portion of the nonionic organic chemical that is not bound to particulate organic carbon or dissolved organic carbon and is calculated:

$$f_{fd} = \frac{1}{[1 + (POC \times K_{OW}) + (DOC \times 0.08 \times K_{OW})]}$$

where: POC = concentration of particulate organic carbon (kg/L)

DOC = concentration of dissolved organic carbon (kg/L)

K_{OW} = n-octanol water partition coefficient for the chemical

POC and DOC concentrations are obtained from the original study from which the field-measured BAF is determined. If POC and DOC concentrations are not reported in the BAF study, reliable estimates of POC and DOC are obtained from other studies at closely related sites within the same water body. If no study data are available, the USEPA national default DOC and POC values are used, as they are representative of average ambient surface water conditions. The USEPA national default values are DOC of 2.9 mg/L and POC of 0.5 mg/L, converted to kg/L by dividing by 1,000,000.

For the field-measured BAF for a chemical classified as inorganic and organometallic, the field BAF is equal to the baseline BAF and is not expressed on a lipid or freely dissolved fraction basis. Normalization on other characteristics must be supported by chemical-specific data.

B. Method 2: Field BSAF. For nonionic organic chemicals, the field-measured BSAF is determined by relating lipid-normalized concentration of the chemical in the appropriate tissue of the aquatic organism to organic carbon-normalized concentrations of the chemical in the surface sediment.

$$BSAF = \frac{C_l}{C_{soc}}$$

where: BSAF = biota-sediment accumulation factor for the chemical (kg of sediment organic carbon/kg of lipid)

C_l = lipid-normalized concentration of the chemical in the specified wet tissue (µg/g lipid), calculated as:

$$C_l = \frac{C_t}{f_l}$$

where: f_l = fraction lipid content in the tissue

Other variables as defined under item A

C_{soc} = organic-carbon normalized concentration of a chemical in surface sediment samples (µg/g sediment organic carbon), calculated as:

$$C_{soc} = \frac{C_s}{f_{oc}}$$

where: C_s = concentration of chemical in dry sediment (µg/g sediment)

f_{oc} = fraction organic carbon in dry sediment

The measured BSAF is converted to a baseline BAF or BAF_l^{fd} by the following equation:

$$(\text{baseline } BAF_l^{fd})_i = (BSAF)_i \frac{(\Pi_{socw})_r (D_{i/r}) (K_{OW})_i}{(K_{ow})_r}$$

where: $(\text{baseline } BAF_l^{fd})_i$ = BAF expressed on a freely dissolved and lipid-normalized basis for chemical of interest "i" or the chemical that is the basis of the criteria (L/kg)

$BSAF_i$ = measured BSAF for the chemical "i" (kg organic carbon/kg of lipid)

$(\Pi_{socw})_r$ = sediment to water partition coefficient or sediment organic carbon to freely dissolved concentration ratio of the reference chemical "r." Reference chemicals with $(\Pi_{socw})_r/(K_{ow})$ similar to that of the chemical of interest are preferred for this method (L/kg sediment organic carbon)

$$\left(\prod_{socw}\right)_r = \frac{\left(C_{soc}\right)_r}{\left(C_w^{fd}\right)_r}$$

where: $(C_{soc})_r$ = concentration of the reference chemical "r" in dry sediment normalized to sediment organic carbon (µg/kg sediment organic carbon)

$(C_w^{fd})_r$ = concentration of the reference chemical "r" freely dissolved in water (µg/L)

$(D_{i/r})$ = ratio between Π_{socw}/K_{ow} for chemicals "i" and reference chemical "r"; a ratio equal to or close to one is preferred

$(K_{ow})_i$ = octanol-water partition coefficient for the chemical "i"

$(K_{ow})_r$ = octanol-water partition coefficient for the reference chemical "r"

Other variables as defined under item A

C. Method 3: Lab BCF*FCM. The laboratory-measured BCF for nonionic organic chemicals is calculated based on the total concentration of the chemical in the appropriate tissue of the aquatic organism (on a wet tissue basis) and the total concentration of chemical in the study water (BCF_T^t).

$$\text{measured } BCF_T^t = \frac{C_t}{C_w}$$

where: C_w = total concentration of chemical in the laboratory test water (µg/L)

Other variables as defined under item A

Baseline BAF_l^{fd} equation:

$$\text{baseline } BAF_l^{fd} = (FCM)\left[\frac{\text{measured } BCF_T^t}{f_{fd}} - 1\right] x \left(\frac{1}{f_l}\right)$$

where: f_{fd} = fraction of the total chemical in the test water that is freely dissolved, where POC and DOC or reasonable estimates based on total organic carbon (TOC) values measured in the test water are used, unless not available, then the following defaults are used based on typical lab water characteristics: DOC of 2.5 mg/L and POC at 0 mg/L, converted to kg/L by dividing by 1,000,000

FCM = food chain multiplier

Other variables as defined under item A

For ionic organic, inorganic, and organometallic chemicals, based on available data, the laboratory BCF is equal to the baseline BAF and is not expressed on a lipid or freely dissolved fraction basis. Normalization on other characteristics must be supported by chemical-specific data. FCM must come from field BAF studies.

D. Method 4: K_{ow}*FCM. In this method, K_{ow} is assumed to be equal to the baseline BAF_1^{fd} for certain nonionic organic chemicals described in the procedures.

$$\text{baseline } BAF_1^{fd} = (FCM) \times (K_{ow})$$

where: Variables as defined under items A and C

Subp. 9. **Hierarchy of acceptable baseline BAF methods.** Determine the hierarchy of acceptable baseline BAF methods available under subpart 8 for appropriate use based on the chemical categorization of the pollutant and other relevant properties as described under Procedures 1 to 6.

A. Procedures 1 to 6 are used for defining the hierarchy and use of the four baseline BAF methods based on chemical categorization and a chemical's ionization state in ambient surface waters, hydrophobicity, biomagnification, and metabolism in aquatic organisms, primarily freshwater fish species. Table 1 provides the basic information for identifying the acceptable procedures and hierarchy for baseline BAF methods as described under items B to D:

Table 1.
Chemical Categorization

Nonionic Organic and Ionic (negligible ionization) Organic Chemicals				Inorganic, Organometallic, and Ionic Chemicals	
Hydrophobicity				Biomagnification Factor (BMF)	
log K_{ow} ≥ 4		log K_{ow} < 4		BMF ≤ 1,000	BMF > 1,000
Metabolism in Aquatic Organisms (Fish)					
Low or Unknown	High	Low or Unknown	High		
Procedures:					
Procedure 1	Procedure 2	Procedure 3	Procedure 4	Procedure 5	Procedure 6
1) Field BAF 2) Field BSAF 3) Lab BCF*FCM 4) K_{ow}*FCM	1) Field BAF 2) Field BSAF 3) Lab BCF	1) Field BAF or Lab BCF 2) K_{ow}	Field BAF or Lab BCF	Field BAF or Lab BCF	1) Field BAF 2) Lab BCF*FCM

B. For nonionic (neutral) organic chemicals, defined as chemicals that have no or negligible ionization in ambient surface water, Procedures 1 to 4 describe the hierarchy of acceptable baseline BAF methods to use.

(1) Procedure 1 applies to nonionic organic chemicals with moderate to high hydrophobicity defined as log K_{ow} greater than or equal to (≥) 4 and either a low level of documented metabolism in aquatic organisms or lack of sufficient data to characterize metabolism. All four baseline BAF methods are available for use based on the stated hierarchy in Table 1 and availability of acceptable data.

(2) Procedure 2 applies to nonionic organic chemicals with moderate to high hydrophobicity defined as log K_{ow} ≥ 4 and a high level of documented metabolism in aquatic organisms. The acceptable methods are field BAF, BSAF, and lab BCF*FCM, where FCM is equal to one.

(3) Procedure 3 applies to nonionic organic chemicals with low hydrophobicity defined as log K_{ow} less than (<) 4 and either a low level of documented metabolism in aquatic organisms or lack of sufficient data to characterize metabolism. The acceptable methods are field BAF or lab BCF*FCM, with equal preference given, and K_{ow}*FCM, where FCM is equal to one in both methods.

(4) Procedure 4 applies to nonionic organic chemicals with low hydrophobicity defined as log K_{ow} < 4 and high levels of documented metabolism in aquatic organisms. Equal preference is given to both acceptable methods: field BAF or lab BCF*FCM, where FCM is equal to one.

C. For ionic organic chemicals (defined as chemicals that can readily accept or donate protons) the procedures that define the available hierarchy and appropriate baseline BAF methods depend on further characteristics of the chemical. The main characteristics relate to exhibiting primarily nonionic (neutral) characteristics (ionization is negligible) or ionic characteristic in average surface water pH ranges based on its acid dissociation constant (K_a) expressed as the negative base 10 log (pK_a) and functional group or groups:

(1) When ionization is negligible, the chemical is categorized as a nonionic organic chemical and baseline BAF procedures are applied based on hydrophobicity and metabolism characteristics described for Procedures 1 to 4 under item B, subitems (1) to (4).

(2) In all other cases, the chemical is categorized with inorganic and organometallic chemicals and addressed with Procedure 5 or 6 under item D, subitem (1) or (2).

Available chemical-specific data that supports more defensible baseline BAF methods must be used in place of these default assignments.

D. Inorganic and organometallic chemicals are defined as inorganic minerals, other inorganic chemicals, and elements: metals and metalloids and organometallic chemicals, and Procedures 5 and 6 define the use of acceptable baseline BAF methods. Procedures 5 and 6 are distinguished by the determination of whether the chemical demonstrates biomagnifications through field BAF or laboratory BCF studies, with BAF or BMF greater than 1,000 being the cut-off for this purpose. BMF is calculated using chemical concentrations in the tissue of aquatic organisms at two successive trophic levels as:

$$BMF_{(TL,\ n)} = C_{t\ (TL,\ n)} / C_{t\ (TL,\ n-1)}$$

where: $C_{t\ (TL,\ n)}$ = total concentration of relevant chemical form or forms in appropriate tissue of predator organism at trophic level "n" (may be either wet weight or dry weight concentration so long as both the predator and prey concentrations are expressed in the same manner) (µg/kg)

$C_{t\ (TL,\ n-1)}$ = total concentration of relevant chemical form or forms in appropriate tissue of prey organism at the next lower trophic level from the predator (may be either wet weight or dry weight concentration so long as both the predator and prey concentrations are expressed in the same manner) (µg/kg)

(1) Procedure 5 applies when geometric mean BAF or BMF is less than or equal to 1,000 when comparing successive trophic level ratios up through trophic level 4. Equal preference is given to field BAF or lab BCF*FCM, where FCM is equal to one. For this procedure, field BAF or lab BCF is applied as the baseline BAF.

measured $BAF^{t}_{T} = C_t/C_w$ or $BCF^{t}_{T} = C_t/C_w$ are applied as the baseline BAF.

where: Variables as defined under subpart 8

(2) Procedure 6 applies when geometric mean BAF or BMF is greater than 1,000 when comparing successive trophic level ratios up through trophic level 4. The acceptable methods are field BAF or lab BCF*FCM, with preference for field BAF. For this procedure, field BAF or lab BCF is applied as the baseline BAF.

measured $BAF^{t}_{T} = C_t/C_w$ or $BCF^{t}_{T} = C_t/C_w$ are applied as the baseline BAF.

where: Variables as defined under subpart 8

Subp. 10. **Species mean baseline BAF.** Calculate species and mean baseline BAF from acceptable individual baseline BAF.

A. For each appropriate baseline BAF method, calculate species-mean baseline BAF using the geometric mean.

B. Any baseline BAF with large differences between species (greater than ten percent) needs additional justification for use in a species-mean baseline BAF.

C. Evaluate data uncertainties for consideration in method hierarchy application for calculating trophic level baseline BAF.

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

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

B. Combine species-means for methods that have equal preference in procedural hierarchies and have similarly reliable baseline BAF based on evaluation of data uncertainties for a final baseline BAF for TL_3 where applicable, and final baseline BAF for TL_4.

C. For some pollutants, TL_3 and TL_4 baseline BAF may be identical when not dependent on trophic level factors, such as lipid partitioning.

Subp. 12. **Final state or site BAF by trophic level.** Calculate final state or site BAF for TL_3 where applicable and TL_4 for use in developing human health-based chronic criteria or standards.

A. For nonionic organic chemicals and ionic organic chemicals with no or negligible ionization as defined under subpart 7, for each TL_3 and TL_4, calculate a state or site BAF using the following equation:

$$\text{state or site BAF}_{(TL\ n)} = \left[\left(\text{final baseline BAF}_l^{fd}\right)_{TL\ n} \times (f_l)_{TL\ n} + 1\right] \times (f_{fd})$$

where: $(\text{final baseline BAF}_{l}^{fd})_{TL\ n}$ = final trophic-level-mean baseline BAF expressed on a freely dissolved and lipid-normalized basis for trophic level "n" (L/kg)

$(f_l)_{TL\ n}$ = lipid fraction of aquatic species consumed at trophic level "n" by Class 2 subclass: Class 2A = 0.06; Class 2Bd/2B/2C/2D = 0.02 for TL_3 and 0.015 for TL_4

f_{fd} = fraction of the total chemical in water that is freely dissolved in ambient waters

The default DOC and POC values for the state ambient Class 2 surface waters are 7.5×10^{-6} kg/L (7.5 mg/L) and 5×10^{-7} kg/L (0.5 mg/L), respectively. For a site BAF for use in site-specific criteria development, the DOC and POC values are from the site monitoring data, if available; in all other cases, the state defaults are used.

B. For inorganic and organometallic chemicals and ionic organic chemicals with ionization in natural waters, the baseline BAF^{t}_{T} using total chemical concentrations or bioavailable forms are directly applied as the state or site BAF:

$$\text{state BAF}_{(TL\ n)} \text{ or site BAF} = \text{final baseline BAF}_{(TL\ n)}$$

Subp. 13. **Algorithms for Class 2A or 2Bd surface waters.** This subpart describes human health-based criteria or standards for classes of surface waters designated for drinking water, fish consumption, and recreational use. To develop a final chronic criteria (CC_{dfr}) or standard (CS_{dfr}) applicable to surface waters designated Class 2A or 2Bd, items A to D must be evaluated for use based on the pollutant's toxicological profile: noncarcinogen or nonlinear carcinogen (NLC); developmental susceptibility; or linear carcinogen (C).

A. Algorithm for noncarcinogenic or NLC chemicals applicable to surface waters designated Class 2A or 2Bd to calculate: CC_{dfr} or CS_{dfr} =

$$\frac{RfD_{chronic}\ (\text{mg/kg-d}) \times RSC\ (\text{no units}) \times 1{,}000\ \mu\text{g/mg}}{\{DWIR_{chronic}\ (\text{L/kg-d}) + FCR_{adult}\ (\text{kg/kg-d})[(0.24 \times BAF_{TL3}\ (\text{L/kg})) + (0.76 \times BAF_{TL4}\ (\text{L/kg})]\}}$$

where: CC_{dfr} or CS_{dfr} = drinking water plus fish consumption and recreation chronic criterion or standard in µg/L

$RfD_{chronic}$ = reference dose for chronic duration in mg/kg-day

RSC = relative source contribution factor

1,000 µg/mg = a factor used to convert milligram (mg) to microgram (µg); there are 1,000 micrograms per milligram

$DWIR_{chronic}$ = drinking water intake rate for the chronic duration based on a 95th percentile time-weighted average from MDH; rate may be chemical-specific with sufficient data or use the default rate of 0.043 L/kg-d

FCR_{adult} = fish consumption intake rate of 0.00043 kg/kg-d based on 0.030 kg/day of amount of fish assumed to be consumed per day and 70 kg adult body weight or rate may be chemical-specific with sufficient data

BAF_{TL3} = final BAF for TL_3 fish in L/kg; accounts for 24 percent of fish consumed

BAF_{TL4} = final BAF for TL_4 fish in L/kg; accounts for 76 percent of fish consumed; for Class 2A, the BAF_{TL4} is applied to 100 percent of the FCR

B. Supplemental algorithm for developmental susceptibility for noncarcinogenic or NLC chemicals applicable to surface waters designated Class 2A or 2Bd to calculate:

CC_{dev} or CS_{dev} =

$$\frac{RfD_{duration\_(acute,\ short\text{-}term,\ or\ subchronic)}\ (mg/kg\text{-}d) \times RSC\ (no\ units)}{DWIR_{duration\_(acute,\ short\text{-}term,\ or\ subchronic)}\ (L/kg\text{-}d)}$$

where: CC_{dev} or CS_{dev} = developmental-based drinking water chronic criterion or standard in µg/L applied when shorter duration adverse effects and exposure parameters result in a more stringent chronic criterion or standard than calculated from item A

$RfD_{duration}$ = reference dose for acute, short-term, or subchronic duration in mg/kg-day

$DWIR_{duration}$ = drinking water intake rate for acute, short-term, or subchronic duration in L/kg-d; drinking water intake rate for the acute, short-term, and subchronic durations based on a 95th percentile time-weighted average from MDH; rate may be chemical-specific with sufficient data or use default rates of 0.289, 0.289, and 0.077 L/kg-d, respectively

Other variables as defined under item A

C. Algorithm for linear carcinogenic chemicals with lifetime adjustment factors ($AF_{lifetime}$) applicable to surface waters designated Class 2A or 2Bd to calculate: CC_{dfr} or CS_{dfr} =

$$\frac{CR\ (1 \times 10^{-5})}{CSF(mg/kg\text{-}d)^{-1} \times AF_{Lifetime}} \times \frac{1000\ \mu g/mg}{\{DWIR_{Lifetime}(L/kg\text{-}d) + FCR_{Adult}(kg/kg\text{-}d)[(0.24 \times BAF_{TL3}(L/kg)) + (0.76 \times BAF_{TL4}(L/kg))]\}}$$

where: CC_{dfr} or CS_{dfr} = drinking water plus fish consumption and recreation chronic criterion or standard in µg/L

CR = cancer risk level or an additional excess cancer risk equal to 1 x 10^{-5} (1 in 100,000)

CSF = cancer potency slope factor in $(mg/kg\text{-}d)^{-1}$

$AF_{lifetime}$ = adjustment factor, lifetime (no units)

$DWIR_{lifetime}$ = drinking water intake rate for lifetime duration; drinking water intake rate for the lifetime duration based on a 95th percentile time-weighted average from MDH; rate may be chemical-specific with sufficient data or use default rate of 0.043 L/kg-d

Other variables as defined under item A

D. Algorithm for linear carcinogenic chemicals with age-dependent adjustment factors (ADAF) applicable to surface waters designated Class 2A or 2Bd to calculate: CC_{dfr} or CS_{dfr} =

$$\frac{CR\ (1 \times 10^{-5}) \times 1000}{\left(\begin{array}{l}\left\{CSF \times ADAF_{<2} \times D_{<2} \times [DWIR_{<2} + FCR_{<2} \times (0.24BAF_{TL3} + 0.76BAF_{TL4})]\right\} + \\ \left\{CSF \times ADAF_{2\ to\ <16} \times D_{2to<16} \times [DWIR_{2to<16} + FCR_{2\ to<16} \times (0.24BAF_{TL3} + 0.76BAF_{TL4})]\right\} + \\ \left\{CSF \times ADAF_{16to70} \times D_{16to70} \times [DWIR_{16to70} + FCR_{Adult} \times (0.24BAF_{TL3} + 0.76BAF_{TL4})]\right\}\end{array}\right) /70yrs}$$

where: CC_{dfr} or CS_{dfr} = drinking water plus fish consumption and recreation chronic criterion or standard in µg/L

ADAF = age-dependent adjustment factor by age groups

D = duration corresponding to the three age groups: birth up to two years of age (two-year duration), two years of age up to 16 years of age (14-year duration), and 16 years of age up to 70 years of age (54-year duration)

DWIR = drinking water intake rate for age groups; drinking water intake rate for the lifetime duration based on a 95th percentile time-weighted average from MDH; rate may be chemical-specific with sufficient data or use default rates for:

$DWIR_{0<2}$ = 0.137 L/kg-d, birth up to two years of age

$DWIR_{2 \text{ to } < 16}$ = 0.047 L/kg-d, two up to 16 years of age

$DWIR_{16 \text{ to } 70}$ = 0.039 L/kg-d, 16 up to 70 years of age

FCR = fish consumption intake rate by age groups:

$FCR_{0<2}$ = 0.00086 kg/kg-d

$FCR_{2 \text{ to } < 16}$ = 0.00055 kg/kg-d

$FCR_{16 \text{ to } 70}$ = 0.00043 kg/kg-d

Subp. 14. **Algorithm for Class 2B, 2C, or 2D surface waters.** This subpart describes human health-based criteria or standards for classes of surface waters designated for fish consumption and recreational use (nondrinking water use). To develop a final chronic criteria (CC_{fr}) or standard (CS_{fr}) applicable to surface waters designated Class 2B, 2C, or 2D, items A to C must be evaluated for use based on the pollutant's toxicological profile: noncarcinogen or nonlinear carcinogen (NLC) or linear carcinogen (C).

A. Algorithm for noncarcinogenic or NLC chemicals applicable to Class 2B, 2C, or 2D surface waters to calculate: CC_{fr} or CS_{fr} =

$$\frac{RfD_{chronic} \text{ (mg/kg-d) x RSC (no units) x 1,000 µg/mg}}{\{IWR_{chronic} \text{ (L/kg-d)} + FCR_{adult} \text{ (kg/kg-d)}[(0.24 \text{ x } BAF_{TL3} \text{ (L/kg)}) + (0.76 \text{ x } BAF_{TL4} \text{ (L/kg)}]\}}$$

where: CC_{fr} or CS_{fr} = fish consumption and recreation chronic criterion or standard in µg/L

$IWR_{chronic}$ = 0.0013 L/kg-d; assumed incidental water intake rate based on minimum chronic duration

Other variables as defined under subpart 13

B. Algorithm for linear carcinogenic chemicals with lifetime adjustment factors ($AF_{lifetime}$) applicable to surface waters designated Class 2B, 2C, or 2D to calculate: CC_{fr} or CS_{fr} =

$$\frac{CR\ (1 \times 10^{-5})}{CSF(\text{mg/kg-d})^{-1} \times AF_{Lifetime}} \times \frac{1000\ \mu g/mg}{\{IWR_{chronic}\ (L/kg\text{-d}) + FCR_{Adult}\ (kg/kg\text{-d})\left[(0.24 \times BAF_{TL3}\ (L/kg)) + (0.76 \times BAF_{TL4}(L/kg))\right]\}}$$

where: CC_{fr} or CS_{fr} = fish consumption and recreation chronic criterion or standard in µg/L

Other variables as defined under item A and subpart 13

C. Algorithm for linear carcinogenic chemicals with age-dependent adjustment factors (ADAF) applicable to surface waters designated Class 2B, 2C, or 2D to calculate: CC_{fr} or CS_{fr} =

$$\frac{CR\ (1 \times 10^{-5}) \times 1000}{\left(\begin{array}{l}\left\{CSF \times ADAF_{<2} \times D_{<2} \times [IWR + FCR_{<2} \times (0.24BAF_{TL3} + 0.76BAF_{TL4})]\right\} + \\ \left\{CSF \times ADAF_{2\ to\ <16} \times D_{2\ to\ <16} \times [IWR + FCR_{2\ to\ <16} \times (0.24BAF_{TL3} + 0.76BAF_{TL4})]\right\} + \\ \left\{CSF \times ADAF_{16\ to\ 70} \times D_{16\ to\ 70} \times [IWR + FCR_{Adult} \times (0.24BAF_{TL3} + 0.76BAF_{TL4})]\right\}\end{array}\right) / 70yrs}$$

where: CC_{fr} or CS_{fr} = fish consumption and recreation chronic criterion or standard in µg/L

Other variables as defined under item A and subpart 13

Subp. 15. **Algorithms for Class 2 fish tissue.** This subpart describes algorithms and fish tissue criteria (CC_{ft}) and standards (CS_{ft}) for chemical with BAF greater than 1,000 (BCC threshold) applicable to Class 2 surface waters. Items A to C must be evaluated for

use based on the pollutant's toxicological profile: noncarcinogen or nonlinear carcinogen (NLC) or linear carcinogen (C).

A. Algorithm for noncarcinogenic or NLC chemicals applicable to Class 2 surface waters to calculate: CC_{ft} or CS_{ft} =

$$\frac{RfD_{chronic}\text{ (mg/kg-d) x RSC (no units) or - RSC (mg/kg-d)}}{FCR_{adult}\text{ (kg/kg-d)}}$$

where: CC_{ft} or CS_{ft} = fish tissue-based chronic criterion or standard in mg/kg
Other variables as defined under subpart 13

B. Algorithm for linear carcinogenic chemicals with lifetime adjustment factors ($AF_{lifetime}$) applicable to Class 2 surface waters to calculate: CC_{ft} or CS_{ft} =

$$\frac{CR\ (1 \times 10^{-5})}{CSF\text{ (mg/kg-d)}^{-1} \times AF_{lifetime}\text{ (no units)}} \times \frac{1}{FCR_{Adult}\text{ (kg/kg-d)}}$$

where: CC_{ft} or CS_{ft} = fish tissue-based chronic criterion or standard in mg/kg
Other variables as defined under subpart 13

C. Algorithm for linear carcinogenic chemicals with age-dependent adjustment factors (ADAFs) applicable to Class 2 surface waters to calculate: CC_{ft} or CS_{ft} =

$$\frac{CR\ (1 \times 10^{-5})}{\left[\frac{(CSF \times ADAF_{<2} \times D_{0\text{-}2} \times FCR_{<2}) + (CSF \times ADAF_{2\text{-}16} \times D_{2\text{-}16} \times FCR_{2\text{-}16}) + (CSF \times ADAF_{16\text{-}70} \times D_{16\text{-}70} \times FCR_{16\text{-}70})}{70\text{ years}}\right]}$$

where: CC_{ft} or CS_{ft} = fish tissue-based chronic criterion or standard in mg/kg
Other variables as defined under subpart 13

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

[For text of subps 1 to 6, see M.R.]

Subp. 7. **Additional standards; Class 2 waters.** The following additional standards and requirements apply to all Class 2 waters.

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

C. To prevent chronically toxic conditions, concentrations of toxic pollutants must not exceed the applicable CS or CC and MS or MC in surface waters outside allowable mixing zones as described in part 7050.0210, subpart 5. The CS or CC and MS or MC will be averaged over the following durations: the MS or MC will be a one-day average; the CS or CC, based on toxicity to aquatic life, will be a four-day average; and the CS or CC, based on human health and applied in water or wildlife toxicity, will be a 30-day average.

D. Concentrations of noncarcinogenic or nonlinear carcinogenic (NLC) chemicals in water or fish tissue from point or nonpoint sources, singly or in mixtures, must be below levels expected to produce known adverse effects. This is accomplished through the application of an additive noncancer health risk index using common health risk index endpoints or health endpoints. Mixtures of chemicals with listed CS or site-specific CC are evaluated using the following approach:

Chemicals must be grouped according to medium (water or fish) and each health endpoint. Chemicals for which no health endpoint is specified are not grouped. Chemicals that are also linear carcinogens must be grouped as described under item E. Using the following equation, a noncancer health risk index must be determined for each group of two or more chemicals that have a common health endpoint listed in this part. To meet the protection objectives in part 7050.0217, the noncancer health risk index must not exceed a value of one.

$$\text{Noncancer health risk index by common health endpoint} = \frac{C_1}{CS_1} + \frac{C_2}{CS_2} + \ldots + \frac{C_n}{CS_n} \leq 1$$

where: C_n is the concentration of the first to the n^{th} chemical by common health endpoint and medium

$CS_1 \ldots CS_n$ is the drinking water plus fish consumption and recreation chronic standard (CS_{dfr} or CS_{dev}), fish consumption and recreation chronic standard (CS_{fr}), or fish tissue chronic standard (CS_{ft}) for the first to n^{th} chemical by common health endpoint

$CC_1 \ldots CC_n$ is the drinking water plus fish consumption and recreation criterion (CC_{dfr} or CC_{dev}), fish consumption and recreation criterion (CC_{fr}), or fish tissue criterion (CC_{ft}) for the first to n^{th} chemical by common health endpoint

~~D.~~ E. Concentrations of carcinogenic chemicals from point or nonpoint sources, singly or in mixtures, ~~should~~ must not exceed ~~a~~ an incremental or additional excess risk level of one ~~chance~~ in 100,000 (10^{-5}) in surface waters or fish tissue. Carcinogenic chemicals will be considered additive in their effect according to the following equation unless an alternative model is supported by available scientific evidence. The additive equation applies to chemicals that have a human health-based standard calculated with a cancer potency slope factor. To meet the protection objectives in part 7050.0217, the cancer health risk index must not exceed a value of one.

~~$\frac{C_1}{CC_1} + \frac{C_2}{CC_2} + \ldots + \frac{C_n}{CC_n}$ equals a value of one or more, a risk level greater than 10^{-5} is indicated~~

$$\text{Cancer health risk index} = \frac{C_1}{CS_1} + \frac{C_2}{CS_2} + \ldots + \frac{C_n}{CS_n} \leq 1$$

where: C_1 .... C_n is the concentration of the first to the n^{th} carcinogen~~.~~ in water or fish tissue

CS_1 ... CS_n is the drinking water plus fish consumption and recreation chronic standard (CS_{dfr}), fish consumption and recreation chronic standard (CS_{fr}), or fish tissue chronic standard (CS_{ft}) for the first to n^{th} carcinogenic chemical

CC_1 .... CC_n is the drinking water plus fish consumption criterion ~~(CC_{df}) or~~ (CC_{dfr}) fish consumption and recreation criterion (~~CC_f~~ CC_{fr}), or fish tissue criterion (CC_{ft}) for the first to n^{th} carcinogenic chemical~~.~~

F. When monitoring indicates that chemical breakdown products or environmental degradates are present in surface water or fish tissue, those products must be considered when meeting the objectives for toxic pollutants in part 7050.0217. When no human health-based CS or other MDH health-based guidance is available for the chemical breakdown product, the CS or CC for the parent chemical must be applied for that product. The parent CS or CC must also be applied to evaluate mixtures of chemicals.

~~E.~~ G. ~~The provisions of~~ This item ~~apply~~ applies to maximum standards (MS), final acute values (FAV), and double dashes (–) in this part and part 7050.0220 marked with an asterisk (*). For carcinogenic or highly bioaccumulative chemicals with BCFs greater than 5,000 or log K_{ow} values greater than 5.19, the human health-based chronic standard (CS) may be two or more orders of magnitude smaller than the acute toxicity-based MS. ~~If the commissioner finds that a very large MS and FAV, relative to the CS for such pollutants is not protective of the public health, the MS and FAV shall be reduced according to the following guidelines:~~

If the ratio of the MS to the CS is greater than 100, the CS times 100 ~~should~~ must be substituted for the applicable MS, and the CS times 200 ~~should~~ must be substituted for the applicable FAV. Any effluent limit derived using the procedures of this item ~~shall~~ must only be required after the discharger has been given notice of the specific proposed effluent limits and an opportunity to request a hearing as provided in part 7000.1800.

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

7052.0005 SCOPE.

A. This chapter establishes aquatic life, human health, and wildlife water quality standards and criteria for Great Lakes Initiative (GLI) pollutants; nondegradation standards for surface waters of the state in the Lake Superior Basin including, on a limited basis as described in item B, Class 7 waters; and implementation procedures for deriving effluent limitations from these standards and criteria. Other water quality standards, nondegradation standards, and implementation procedures applicable to the surface waters of the state in the Lake Superior Basin can be found in ~~chapters~~ chapter 7050 and ~~7065~~ in parts 7052.0100, subpart 1, items A to G, and 7053.0255.

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

7052.0010 DEFINITIONS.

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

Subp. 11. **Criterion.** "Criterion" means a number or numbers established for a pollutant derived under parts 7050.0218, 7050.0219, 7052.0110, or issued by the EPA, to protect aquatic life, humans, or wildlife.

[For text of subps 12 to 20, see M.R.]

Subp. 21. **GLI pollutant.** "GLI pollutant" means a toxic pollutant or chemical listed as a pollutant of initial focus in the GLI Guidance, Code of Federal Regulations, title 40, part 132, Table 6, as amended ~~through March 12, 1997~~.

[For text of subps 22 to 39, see M.R.]

Subp. 40. **Tier I.** "Tier I" means the methods referenced in part 7052.0110 for developing aquatic life~~, human health,~~ and wildlife standards or criteria.

Subp. 41. **Tier II.** "Tier II" means the methods referenced in part 7052.0110 for developing aquatic life ~~and human health~~ standards or criteria when there is not a set of data available that meets Tier I data requirements.

[For text of subps 42 to 45, see M.R.]

7052.0100 WATER QUALITY STANDARDS.

Subpart 1. **Applicability.**

A. The ambient water quality standards in subparts 2 to 6 are Class 2 standards for the protection of aquatic life, human health, and wildlife from the GLI pollutants. The numeric standard for a GLI pollutant includes the CS, MS, and FAV. Some pollutants do not have an MS or an FAV because of insufficient data. For these pollutants, the CS is the numeric standard. Additional standards applicable to the surface waters of the state in the Lake Superior Basin are found in ~~chapters~~ chapter 7050 ~~and 7065~~, including standards applicable to drinking water sources, which are listed in parts 7050.0220 and 7050.0221.

B. Some of the GLI pollutants listed in subparts 2 to 6 have both aquatic life and human health standards and four of the GLI pollutants have wildlife standards, as provided in tables 1 to 4 of the GLI Guidance. These standards are listed in subparts 2 to 6 to facilitate implementation of the standards under parts 7052.0200, subpart 3, and 7052.0210, subpart 1. The most stringent chronic aquatic life, human health, or wildlife standard listed is the applicable standard except when a less stringent chronic or maximum standard applies when setting an effluent limitation under part 7052.0200, subpart 3. For any aquatic life, human health, or wildlife chronic standard, a blank space in subparts 2 to 5 means no GLI standard is available and the most stringent listed chronic standard is applicable. For the aquatic life MS and FAV, blank spaces mean the GLI guidance lists no MS or FAV, and part 7050.0222 may contain an applicable MS or FAV.

C. The definitions and methods for human health-based chronic standards and site-specific chronic criteria in parts 7050.0217 to 7050.0219 are incorporated by reference and are further described in part 7052.0110, subpart 4.

D. The Class 2A human health-based chronic standards listed in chapter 7050 are incorporated by reference as modified by the procedures in part 7052.0110, subpart 3.

E. The *Escherichia (E.) coli* water quality standards in Code of Federal Regulations, title 40, section 131.41, Table (c)(1), that apply to coastal recreation waters are incorporated by reference as:

(1) *E. coli* bacteria must not exceed 126 organisms per 100 milliliters, as a geometric mean of not less than five samples representative of conditions during any calendar month; or

(2) *E. coli* bacteria must not exceed 235 organisms per 100 milliliters in more than ten percent of all the individual samples taken during any calendar month. The *E. coli* standard under this item applies only between April 1 and October 31.

F. Standards for metals are expressed as total metal but must be implemented as dissolved metal standards. Conversion factors for converting total to dissolved metal standards are listed in part 7052.0360, and applied under part 7052.0200, subpart 4. The conversion factor for metals not listed in part 7052.0360 is one. Standards for GLI pollutants followed by (TH) or (pH) vary with total hardness or pH. The formulas for these standards are found in subpart 6.

G. The CS and MS are averaged over the following durations:

(1) the MS is a one-day average;

(2) the CS, based on toxicity to aquatic life, is a four-day average; and

(3) the CS applied in water, based on human health or wildlife toxicity, is a 30-day average.

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

7052.0110 METHODOLOGIES FOR DEVELOPMENT OF ~~TIER I AND TIER II~~ STANDARDS AND CRITERIA, AND BIOACCUMULATION FACTORS.

Subpart 1. **Applicability.** This part identifies the methods that must be used to develop aquatic life and wildlife-based Tier I and Tier II standards and criteria and human

health-based chronic standards and criteria. Subparts 3 and 4 also list exceptions to some of the assumptions used in the GLI Guidance methods. These exceptions are based on Minnesota-specific data.

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

Subp. 3. **Bioaccumulation factors.** Bioaccumulation factors (BAFs) for calculating human health and wildlife standards were developed and BAFs for calculating criteria must be developed using the methodology provided by Code of Federal Regulations, title 40, part 132, Appendix B, entitled "Great Lakes Water Quality Methodology for Deriving Bioaccumulation Factors," as amended through March 12, 1997, which is adopted and incorporated by reference in part 7052.0015, item B, except that for human health standards and criteria, the baseline BAF is multiplied by the following lipid fractions which apply to fish in both trophic levels 3 (TL_3) and 4 (TL_4), except as noted in item C:

A. 0.085 for Lake Superior;

B. 0.06 for Class 2A waters other than Lake Superior; and

C. 0.015 for TL_4 and 0.020 for TL_3 for Class 2B, 2Bd, 2C, and 2D waters.

Subp. 4. **Human health.**

A. ~~All Tier I and Tier II~~ Human health standards listed in part 7052.0100 for benzene, chlordane, chlorobenzene, cyanide (free), DDT, dieldrin, 2,4-dimethylphenol, 2,4-dinitrophenol, hexachlorobenzene, hexachloroethane, lindane, mercury (total), methylene chloride, PCBs, 2,3,7,8-TCDD, toluene, and trichloroethylene were developed ~~and all criteria must be developed~~ using the Tier I methodology provided by Code of Federal Regulations, title 40, part 132, Appendix C, entitled "Great Lakes Water Quality Initiative Methodology for Development of Human Health Criteria and Values," as amended through March 12, 1997, which is adopted and incorporated by reference in part 7052.0015, item C, except that the daily human consumption of fish caught in the Lake

Superior Basin is assumed to be 0.030 kg/day (0.0072 kg/day for ~~trophic level 3~~ TL_3 fish plus 0.0228 kg/day for ~~trophic level 4~~ TL_4 fish).

B. Changes to the standards established for the pollutants in item A or additional human health-based chronic standards or site-specific chronic criteria must be based on the algorithms and methods in parts 7050.0217 to 7050.0219, with site-specific consideration as provided in part 7052.0270, except the bioaccumulation factor methods in part 7052.0110, subpart 3, must be used in place of those listed in part 7050.0219, subpart 6.

C. Concentrations of noncarcinogenic or nonlinear carcinogenic (NLC) chemicals in water or fish tissue from point or nonpoint sources, singly or in mixtures, must be below levels expected to produce known adverse effects. This is accomplished through the application of an additive noncancer health risk index using common health risk index endpoints or health endpoints as described in part 7050.0222, subpart 7, item D. Concentrations of carcinogenic chemicals from point or nonpoint sources, singly or in mixtures, must not exceed an incremental or additional excess risk level of one in 100,000 (10^{-5}) in surface waters. The combined risk from mixtures of linear carcinogens (C) is determined as described in part 7050.0222, subpart 7, item E.

[For text of subp 5, see M.R.]

7052.0220 REASONABLE POTENTIAL FOR CHEMICAL-SPECIFIC WQBELS.

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

Subp. 2. **Developing preliminary effluent limitations.** The first step in a reasonable potential determination is to calculate a PEL. The procedures in parts 7052.0200 and 7052.0210 must be used to determine a PEL from a ~~Tier I or Tier II~~ standard or criterion. If the agency determines that there are insufficient data to calculate a standard or criterion, the procedure in subpart 4 must be followed to determine if data must be generated to calculate a ~~Tier II~~ standard or site-specific criterion.

[For text of subp 3, see M.R.]

Subp. 4. **Developing data for calculating Tier II ~~noncancer human health and~~ aquatic life standards and criteria or noncancer human health-based standards or site-specific criteria.** This subpart applies when the agency determines that insufficient data currently exist to calculate aquatic life toxicity-based Tier II or human health-based standards or criteria for GLI pollutants known to be in the discharge, or suspected to be in the discharge based on knowledge of the raw materials used or internal process or waste streams.

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

B. Using the provisions in parts 7052.0200 and 7052.0210, the agency must develop PELs based on the estimated ambient screening criteria and compare the PELs with each PEQ developed under subpart 3. If the PEQ exceeds the PEL for any GLI pollutant, the agency must generate or require the permittee to generate the data necessary to derive ~~Tier H~~ standards or site-specific criteria to protect human health from noncancer effects and aquatic life from acute and chronic effects using the methods in part 7052.0110 with site-specific consideration as provided in part 7052.0270.

C. The agency must use the data generated according to item B to calculate ~~Tier H~~ standards and site-specific criteria according to the methods in part 7052.0110. The derived ~~Tier H~~ standards and criteria must be used to calculate PELs to determine if an effluent limitation must be established in the permit. If the PEQ exceeds the PEL for any GLI pollutant, an effluent limitation must be established in the permit.

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

[For text of subps 5 to 7, see M.R.]

7052.0230 ADDITIVITY.

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

Subp. 2. **Carcinogenic human health GLI pollutant additivity.** The agency must calculate the additive effects of carcinogenic human health pollutants in effluents according to part 7050.0222, subpart 7, item ~~D~~ E, for which individual WQBELs have been established under part 7052.0200, subpart 5. Cumulative incremental risk for carcinogens in the effluent must be maintained at 1×10^{-5} or less.

Subp. 3. **Noncarcinogenic human health GLI pollutant additivity.** The agency must determine the additive effects of noncarcinogenic human health pollutants where individual WQBELs have been established under part 7052.0200, subpart 5, and where the pollutants exhibit the same adverse effects through the same mechanisms of action as established through the use of health risk index endpoints or health endpoints according to part 7050.0222, subpart 7, item D.

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

REPEALER. Minnesota Rules, part 7050.0218, subparts 6 and 7, are repealed.