

CR 88-1

State of Wisconsin

DEPARTMENT OF NATURAL RESOURCES

Carroll D. Besadny  
Secretary

BOX 7921  
MADISON, WISCONSIN 53707

STATE OF WISCONSIN )  
 )  
DEPARTMENT OF NATURAL RESOURCES )

TO ALL TO WHOM THESE PRESENTS SHALL COME, GREETINGS;

I, Bruce B. Braun, Deputy Secretary of the Department of Natural Resources and custodian of the official records of said Department, do hereby certify that the annexed copy of Natural Resources Board Order No. WR-47-87 was duly approved and adopted by this Department on July 28, 1988 and November 17, 1988. I further certify that said copy has been compared by me with the original on file in this Department and that the same is a true copy thereof, and of the whole of such original.

IN TESTIMONY WHEREOF, I have here-  
unto set my hand and affixed the  
official seal of the Department at  
the Natural Resources Building in  
the City of Madison, this 22nd  
day of December, 1988.

*Bruce B. Braun*  
Bruce B. Braun, Deputy Secretary

(SEAL)

RECEIVED

DEC 23 1988

*10:00 am*  
Revisor of Statutes  
Bureau

ORDER OF THE STATE OF WISCONSIN NATURAL RESOURCES BOARD  
REPEALING, RENUMBERING, RENUMBERING AND AMENDING,  
AND CREATING RULES

.....  
IN THE MATTER of amending ss. NR 102.04(5),  
102.05(2) and (3)(intro.) and creating . WR-47-87  
ch. NR 106 of the Wisconsin Administrative  
Code pertaining to surface water quality  
based effluent limitations for toxic  
and organoleptic substances  
.....

Analysis Prepared by  
Department of Natural Resources

Statutory authority: 144.025(1) and (2), 147.01, 147.04, and 227.11(2)(a),  
Stats.

Statutes interpreted: 144.025(1) and (2) and (2)(b) and 147.01, 147.02, and  
147.04, Stats.

Chapter NR 106 specifies the method used to calculate water quality based  
effluent limitations and the basis for establishing those limitations in  
Wisconsin pollutant discharge elimination system (WPDES) permits. Water  
quality based effluent limitations include limitations for toxic and  
organoleptic substances and whole effluent toxicity. In order to implement  
ch. NR 106, modifications to ch. NR 102 are necessary. One modification to  
ch. NR 102 is necessary to ensure consistency with ch. NR 210.

General information on how water quality based effluent limits are calculated  
is currently contained in chs. NR 102 to 104. Chapters NR 102 to 104 also  
contain surface water quality standards. Water quality based effluent  
limitations are imposed in permits where necessary to maintain surface water  
quality standards. As compared to current rules, chapter NR 106 provides more  
specific procedures on how water quality based effluent limits are calculated  
and established. Water quality based effluent limitations have, to date,  
primarily been based on protection of fish and aquatic life. Water quality  
based effluent limitations have not, to date, been extensively established in  
permits based on protection of human health and animal health. Whole effluent  
toxicity limitations and testing have not, to date, been extensively imposed  
in permits.

DRAFTER'S NOTE: Other modifications to ch. NR 102 are being proposed under orders WR-10-87 and WR-45-87.

SECTION 1. NR 102.04(5) as renumbered by order WR-10-87 is amended to read:

NR 102.04(5) STANDARDS FOR RECREATIONAL USE. A sanitary survey and/or evaluation to assure protection from fecal contamination is the chief criterion in determining the suitability of a surface water for recreational use. ~~In addition, the following bacteriological guidelines are set forth:~~

(a) Bacteriological guidelines. The membrane filter fecal coliform count ~~shall~~ may not exceed 200 per 100 ml as a geometric mean based on not less than 5 samples per month, nor exceed 400 per 100 ml in more than 10% of all samples during any month.

(b) Exceptions. Whenever the department determines, in accordance with the procedures specified in s. NR 210.06, that wastewater disinfection is not required to protect recreational uses, the recreational use criteria and classifications as established in this subsection and in chs. NR 103 and 104 do not apply.

SECTION 2. As renumbered by order WR-10-87, NR 102.05(2) and (3)(intro.) are amended to read:

NR 102.05(2) STREAMFLOW. Water quality standards will not be maintained under all natural occurrences of flow, temperature, or other water quality characteristics. The ~~design~~ determination of water ~~related~~ quality based effluent limitations or other management practices shall be based upon the following conditions except as provided in ch. NR 106 for toxic and

organoleptic substances and whole effluent toxicity:

(3) MIXING ZONES. Water quality standards ~~must~~ shall be met at every point outside of a mixing zone. The size of the mixing zone cannot be uniformly prescribed, but shall be based on such factors as effluent quality and quantity, available dilution, temperature, current, type of outfall, channel configuration and restrictions to fish movement. For toxic and organoleptic substances with water quality criteria specified in or developed pursuant to chs. NR 102 and 105, allowable dilution shall be determined as specified in ch. NR 106 in addition to the requirements specified in this subsection. As a guide to the delineation of a mixing zone, the following shall be taken into consideration:

SECTION 3. Chapter NR 106 is created to read:

CHAPTER NR 106

PROCEDURES FOR CALCULATING  
WATER QUALITY BASED  
EFFLUENT LIMITATIONS FOR TOXIC  
AND ORGANOLEPTIC SUBSTANCES  
DISCHARGED TO SURFACE WATERS

- 106.01 Purpose
- 106.02 Applicability
- 106.03 Definitions

- 106.04 General
- 106.05 Determination of the necessity for water quality based effluent limitations for toxic and organoleptic substances
- 106.06 Calculation of water quality based effluent limitations for toxic and organoleptic substances
- 106.07 Application of water quality based effluent limitations in permits
- 106.08 Determination of the necessity for whole effluent toxicity testing requirements and limitations
- 106.09 Calculation of whole effluent toxicity limitations
- 106.10 Exclusions
- 106.11 Multiple Discharges
- 106.12 Limitations for ammonia nitrogen
- 106.13 Leachate in publically owned treatment works
- 106.14 Analytical methods and laboratory requirements
- 106.15 Limitations for Mercury

NR 106.01 PURPOSE. One purpose of this chapter is to specify how the department will calculate water quality based effluent limitations under s. 147.04(5), Stats., for toxic and organoleptic substances and whole effluent toxicity. The other purpose of this chapter is to specify how the department will decide if and how these limitations will be included in Wisconsin pollution discharge elimination system (WPDES) permits. Water quality based effluent limitations for toxic and organoleptic substances are needed to assure attainment and maintenance of surface water quality standards as established in accordance with s. 144.025(2)(b), Stats., and as set forth in chs. NR 102 to NR 105.

NR 106.02 APPLICABILITY. The provisions of this chapter are applicable to point sources which discharge wastewater containing toxic or organoleptic substances to surface waters of the state.

NR 106.03 DEFINITIONS. The following definitions are applicable to terms used in this chapter.

(1) "Biologically based design flow" means a receiving water design flow to protect fish and aquatic life for which both the duration of exposure is expressed in days and the allowable frequency of excursion is expressed in years. An example of a biologically based design flow is a 4-day 3-year design flow which corresponds to the lowest 4-day average flow that will limit excursions from any water quality criteria to no more than once in 3 years.

(2) "Dynamic models" means computer simulation models which use real or derived time series data to predict a time series of, observed or derived receiving water concentrations. Methods include continuous simulation, Monte Carlo simulations, or other similar statistical or deterministic techniques.

(3) "EC<sub>50</sub>" means the concentration of a toxic substance which causes an adverse effect including mortality to 50% of the exposed organisms in a given time of observation.

(4) "LC<sub>50</sub>" means the concentration of a toxic substance which is lethal to 50% of the exposed organisms in a given time period.

(5) "Limit of detection" or "LOD" means the lowest concentration level that can be determined to be significantly different from a blank for that analytical test method and sample matrix.

(6) "Limit of quantitation" or "LOQ" means the concentration of an analyte at which one can state with a degree of confidence for that analytical

test method and sample matrix that an analyte is present at a specific concentration on the sample tested.

(7) "Total maximum load" or "TML" means the maximum quantity of a pollutant or pollutants that can be discharged into a water quality limited segment over a specified period of time to maintain the applicable water quality standards.

(8) "Toxicity test" means a test which determines the toxicity of a chemical or an effluent or other waters using living organisms. A toxicity test measures the degree of response of an exposed test organism to a specific chemical or effluent or other waters.

(9) "Whole effluent toxicity" means the aggregate toxic effect of an effluent as measured directly by a toxicity test.

NR 106.04 GENERAL. (1) Water quality based effluent limitations shall be established whenever categorical effluent limits required under s. 147.04, Stats., are less stringent than necessary to achieve applicable water quality standards specified in chs. NR 102 to 105. Water quality based effluent limitations for a point source shall be specified in the WPDES permit for that point source.

(2) In no case may the water quality based effluent limitations be less stringent than applicable categorical effluent limitations.

(3) The department shall establish limitations for toxic and organoleptic substances if any of the conditions specified in s. NR 106.05 are met. Limitations shall be established according to the methods provided in s. NR 106.06 and included in WPDES permits according to the conditions provided in s. NR 106.07. The department shall establish limitations for whole effluent toxicity if any of the conditions specified in s. NR 106.08 are

met. Whole effluent limitations shall be established and included in WPDES permits according to the methods provided in s. NR 106.09.

(4) Water quality based effluent limitations or monitoring requirements for toxic or organoleptic substances or whole effluent toxicity may be removed from a permit, subject to public notice and opportunity for hearing under ch. NR 203, if the limitation is determined to be unnecessary based on the procedures presented in this chapter or based on other information available to the department.

NR 106.05 DETERMINATION OF THE NECESSITY FOR WATER QUALITY BASED EFFLUENT LIMITATIONS FOR TOXIC AND ORGANOLEPTIC SUBSTANCES. (1) The department shall establish water quality based effluent limitations for point source dischargers whenever the discharges from those point sources contain(s) toxic or organoleptic substances at concentrations or loadings which do not, as determined by any method in this section, meet applicable water quality standards specified in chs. NR 102 to 105.

(2) When considering the necessity for water quality based effluent limitations, the department shall consider in-stream biosurvey data and data from ambient toxicity analyses whenever such data are available.

(3) If representative discharge data are available for a toxic or organoleptic substance being discharged from a point source, limitations shall be established in accordance with any one of the following conditions:

(a) The discharge concentration of the substance for any day exceeds the limit of detection and exceeds the limitations based on acute toxicity for the substance as determined in s. NR 106.06(2) where appropriate.

(b) The arithmetic average discharge concentration of the substance for any 4 consecutive days calculated as described in sub. (7) exceeds the limit

of detection and exceeds the limitations based on either the chronic toxicity criterion or final chronic value for the substance as determined in s.

NR 106.06(3).

(c) The arithmetic average discharge concentration of the substance for any 30 consecutive days calculated as described in sub. (7) exceeds the limit of detection and exceeds any limitation based on the wild and domestic animal, human threshold, human cancer, or taste and odor criteria for the substance as determined in s. NR 106.06(3).

(4) If at least 11 daily discharge concentrations of the substance are greater than the limit of detection and the requirements of sub. (3) do not result in the need for an effluent limitation, water quality based effluent limitations are necessary for a substance in a point source discharge if the upper 99th percentile of available discharge concentrations as calculated in sub. (5) meets any of the conditions specified in pars. (a) to (c).

(a) The upper 99th percentile of daily discharge concentrations of the substance exceeds the limitation based on acute toxicity for the substance as determined in s. NR 106.06(2),

(b) The upper 99th percentile of 4-day average discharge concentration of the substance exceeds the limitation based on either the chronic toxicity criterion for the substance as determined in s. NR 106.06(3), or

(c) The upper 99th percentile of 30-day average discharge concentration of the substance exceeds any limitation based on the wild and domestic animal, human threshold, human cancer, or taste and odor criteria for the substance as determined in s. NR 106.06(3).

(5) This subsection shall be used to calculate upper 99th percentile values unless a probability distribution other than log normal is determined

to be more appropriate and alternate methods to calculate the upper 99th percentile are available.

(a) When available daily discharge concentrations of the substance are not serially correlated and at least 11 concentrations are greater than the limit of detection, the upper 99th percentile of the daily average, the 4-day average and the 30-day average discharge concentrations may be calculated as follows:

$$P_{99} = \exp (\mu_{dn} + Z_p \sigma_{dn})$$

Where:

- $P_{99}$  - Upper 99th percentile of n-day average discharge concentrations.
- $d$  - Ratio of the number of daily discharge concentrations less than the limit of detection to the total number of discharge concentrations.
- $n$  - Number of discharge concentrations used to calculate an average over a specified monitoring period ( $n=1$  for daily concentrations, 4 for 4-day averages and 30 for 30-day averages).
- $\exp$  - Base e (or approximately 2.718) raised to the power shown between the parentheses in the original equation.
- $Z_p$  - Z value corresponding to the upper  $p^{\text{th}}$  percentile of the standard normal distribution.
- $p$  -  $(0.99-d^n)/(1-d^n)$ .
- $\mu_{dn}$  -  $\mu_d + [(\sigma_d)^2 - (\sigma_{dn})^2] / 2 + \ln[(1-d)/(1-d^n)]$  - estimated log mean of n-day average discharge concentrations greater than the limit of detection. (Note:  $\mu_{dn} = \mu_d$  if  $n = 1$ .)
- $(\sigma_{dn})^2$  -  $\ln [(1-d^n)([1+(s/m)^2]/[n(1-d)] + (n-1)/n)]$  - estimated log variance of n-day average discharge concentrations greater than the limit of detection. (Note:  $(\sigma_{dn})^2 = (\sigma_d)^2$  if  $n = 1$ .)
- $\mu_d$  -  $\ln m - 0.5 (\sigma_d)^2$  - estimated log mean of discharge concentrations greater than the limit of detection.

- $(\sigma_d)^2$  =  $\ln [1 + (s/m)^2]$  = estimated log from variance of discharge concentrations greater than the limit of detection.
- $\ln$  = Natural logarithm.
- $m$  = Mean of discharge concentrations greater than the limit of detection.
- $s$  = Standard deviation of discharge concentrations greater than the limit of detection.

(b) When the daily discharge concentrations of any substance are serially correlated, the serially correlated data may be adjusted using appropriate methods such as that presented in Appendix E of "Technical Support Document for Water Quality-based Toxics Control", U.S. environmental protection agency, Sept. 1985. The equation presented in par. (a) may be used after adjustment of the serially correlated data.

(6) If less than 11 daily discharge concentrations of the substance are greater than the limit of detection, and the requirements in sub. (3) do not result in an effluent limitation, water quality based effluent limitations are necessary for a substance in a point source discharge if the arithmetic average of available discharge concentrations as calculated in sub. (7) exceeds any value determined in par. (a) or (b):

(a) One fifth of the limitation based on the acute toxicity for the substance, as determined in s. NR 106.06(2) where appropriate, or

(b) One fifth of any limitation based on chronic toxicity or long-term impacts as determined in s. NR 106.06(3).

(7) The arithmetic average discharge concentration as used in subs. (3) and (6) shall be calculated using all available discharge data treated according to this subsection.

(a) If, in the judgment of the department, the analytical methods used to test for the substance represent acceptable methods, all values reported as less than the limit of detection shall be set equal to zero for calculation of the average concentration.

(b) If, in the judgment of the department, the analytical methods used to test for the substance do not represent the best acceptable methods, all values reported as less than the limit of detection shall be discarded from the data.

(8) If representative discharge data are not available for a substance, water quality based effluent limitations may be established if, in the judgment of the department, water quality standards will be exceeded if the discharge from the point source is not limited.

(9) Regardless of the results of the analysis conducted under this section, the department may, whenever determined necessary, require monitoring for any toxic or organoleptic substance.

NR 106.06 CALCULATION OF WATER QUALITY BASED EFFLUENT LIMITATIONS FOR TOXIC AND ORGANOLEPTIC SUBSTANCES. (1) BASIS FOR LIMITATIONS. (a) The department shall establish water quality based effluent limitations for point source dischargers whenever such limitations are necessary, as determined by any method in this section, to meet the applicable water quality standards and criteria in chs. NR 102 to 105.

(b) Water quality based effluent limitations for toxic and organoleptic substances shall be determined to attain and maintain water quality standards and criteria for all locations in a receiving water that may be influenced by a discharge.

(2) LIMITATIONS BASED ON ACUTE TOXICITY. (a) The department shall establish water quality based effluent limitations to ensure that substances are not present in amounts which are acutely harmful to animals, plants or aquatic life in all surface waters including those portions of the mixing zone normally habitable by aquatic life and effluent channel as required by s. NR 102.04(1).

(b) To assure compliance with par. (a) and except as provided in par. (c), water quality based effluent limitations shall equal the final acute value as determined in s. NR 105.05 for the respective fish and aquatic life subcategory for which the receiving water is classified.

(c) Water quality based effluent limitations may exceed the final acute value as determined in s. NR 105.05 within a zone of initial dilution provided that the acute toxicity criteria as determined in s. NR 105.05 are met within a short distance from the point of discharge. A zone of initial dilution shall only be provided if the discharger demonstrates to the department that mixing of the effluent with the receiving water in the zone of initial dilution is rapid and all the following conditions are met:

1. The discharge is not at the water surface or at the shoreline.
2. The discharge does not constitute a significant portion of the streamflow or otherwise dominate the receiving water.
3. The discharge velocity is not less than 3 meters per second (10 feet per second) unless an alternative discharge velocity, which similarly minimizes organism exposure time, is determined appropriate for the specific site.

4. The acute toxicity criteria must be met within ten percent of the distance from the edge of the outfall structure to the edge of a mixing zone which may be determined in accordance with s. NR 102.05(3).

5. The acute toxicity criteria shall be met within a distance of 50 times the discharge length scale in any direction. The discharge length scale is defined as the square root of the cross-sectional area of any discharge outlet. If a multiport diffuser is used, this requirement must be met for each port using the appropriate discharge length scale for that port.

6. The acute toxicity criteria shall be met within a distance of 5 times the local water depth in any horizontal direction from any discharge outlet. The local water depth is defined as the natural water depth(existing prior to the installation of the discharge outlet) prevailing under the mixing zone design conditions for the site.

(d) Whenever the representative background concentrations for a toxic or organoleptic substance in the receiving water, as determined by s. NR 106.06(3)(e), are greater than the limitation based on acute toxicity as determined in this subsection, the effluent limitation for that wastewater shall equal the representative background concentration of that substance. In the event the dischargers relative contribution to the mass of the toxic or organoleptic substance in the receiving water is negligible in the best professional judgment of the department, the department shall establish an alternate effluent limitation for the discharger. In making this judgment, consideration shall be given to the type of substance being limited, the uses potentially affected and other relevant factors. The alternate effluent limitation shall represent, in the judgment of the department, application of

the best demonstrated treatment technology reasonably achievable for that substance.

(3) LIMITATIONS BASED ON CHRONIC TOXICITY OR LONG-TERM IMPACTS. (a) Water quality criteria. The department shall calculate water quality based effluent limitations to ensure that the chronic toxicity criteria (CTC), the wild and domestic animal criteria (WDAC), the taste and odor criteria (TOC), the human threshold criteria (HTC), and human cancer criteria (HCC) appropriate for the receiving water as specified in chs. NR 102 to 105 will be met after dilution with an appropriate allowable quantity of receiving water flow as specified in this subsection, subs. (4) to (8) and s. NR 106.11. The available dilution shall be determined according to par. (c) unless the conditions specified in s. NR 102.05(3) require less dilution be allowed.

(b) Calculation of limits. Water quality based effluent limitations to meet the requirements of this subsection shall be calculated using the procedure specified in subd. 1. or 2 except as provided in par. (e)(3) to (6). Chemical specific water quality based effluent limitations may be expressed as a maximum concentration limitation (in units of mg/L or equivalent units), as a maximum load limitation (in units of kg/day or equivalent units), or both.

1. For discharges of toxic or organoleptic substances to flowing receiving waters, the water quality based effluent limitation for a substance shall be calculated using the following conservation of mass equation whenever the background concentration is less than the water quality criterion:

$$\text{Limitation} = \frac{(\text{WQC})(Q_s + (1-f)Q_e) - (Q_s C_s)}{Q_e}$$

Where:

Limitation = Water quality based effluent limitation (in units of mass per unit of volume),

- WQC - The water quality criterion concentration (in units of mass per unit volume) as specified in sub. (1) and par. (a),
- $Q_s$  - Receiving water design flow (in units of volume per unit time) as specified in par. (c),
- $Q_e$  - Effluent flow (in units of volume per unit time) as specified in par. (d),
- f - Fraction of the effluent flow that is withdrawn from the receiving water, and
- $C_s$  - Background concentration of the substance (in units of mass per unit volume) as specified in par. (e).

Note: In applying this equation, all units for the flow and concentration parameters respectively, shall be consistent.

2. For discharges of toxic or organoleptic substances to receiving waters which do not exhibit a unidirectional flow at the point of discharge, such as lakes or impoundments, the department may calculate, in the absence of specific data, water quality based effluent limitations using the following equation whenever the background concentration is less than the water quality criterion:

$$\text{Limitation} = 11(WQC) - 10C_s$$

Where:

Limitation - Water quality based effluent limitation (in units of mass per unit of volume)

- WQC - The water quality criterion concentration (in units of mass per unit volume) as specified in sub. (1) and par. (a),
- $C_s$  - Background concentration of the substance (in units of mass per unit volume) as specified in par. (e).

On a case-by-case basis other dilutional factors may be used, but in no case may the dilution allowed exceed an area greater than the area where discharge induced mixing occurs. The discharge is also subject to the conditions specified in s. NR 102.05(3). The discharger may be required to determine the size of the mixing zone using acceptable models or dye studies.

3. The limitation calculated in subs. 1. or 2. may be converted to a maximum load limitation by multiplying the calculated concentration limitation by the rate of effluent flow as determined in par. (d) and appropriate conversion factors.

(c) Receiving water design flow ( $Q_s$ ). The value of  $Q_s$  to be used in calculating the effluent limitation for discharges to flowing waters shall be determined as follows:

1. The department shall make reasonable efforts to determine the area of the zone of passage and the dilution characteristics of discharges.

2. The department may require that the discharger provide information on the discharge mixing and dilution characteristics of discharges.

3. The discharger shall be allowed to demonstrate, through appropriate and reasonable methods that an adequate zone of free passage exists in the cross-section of the receiving water or that dilution is accomplished rapidly such that the extent of the mixing zone is minimized. In complex situations, the department may require that the demonstration under this subdivision include water quality modeling or field dispersion studies.

4. Following the determinations under subs. 1. to 3., the value of  $Q_s$  of the receiving water for calculating effluent limitations based upon the chronic toxicity criteria specified in s. NR 105.06 shall be determined on a case-by-case basis. In no case may  $Q_s$  exceed the larger of the average

minimum 7-day flow which occurs once in 10 years (7-day  $Q_{10}$ ) or, if sufficient information is available to calculate a biologically based receiving water design flow, the flow which prevents an excursion from the criterion using a duration of 4 days and a frequency of less than once every 3 years (4-day, 3-year biological flow).

5. If the requirements of subds. 2. and 3. are not satisfied, the department shall notify the permittee and identify the deficiencies and allow additional time, if necessary, to complete the demonstration. If the demonstration cannot be completed satisfactorily, the value of  $Q_s$  of the receiving water for calculating effluent limitations based upon the chronic toxicity criteria specified in s. NR 105.06 shall equal  $\frac{1}{4}$  of the 7-day  $Q_{10}$  or  $\frac{1}{4}$  of the 4-day, 3 year biological flow.

6.  $Q_s$  may be reduced from those values calculated in subds. 3. to 5. where natural receiving water flow is significantly altered by flow regulation.

7.  $Q_s$  shall equal 85% of the average minimum 7-day flow which occurs once in 2 years (7-day  $Q_2$ ) of the receiving water for calculating effluent limitations based upon the wild and domestic animal criteria specified in ch. NR 105. Whenever a discharger determines, through techniques acceptable to the department, the average minimum 30-day flow which occurs once in 5 years (30-day  $Q_5$ ), this value shall be used as  $Q_s$ .

8. Except as provided in subd. 9., the value of  $Q_s$  shall equal the mean annual flow of the receiving water for calculating effluent limitations based upon the human cancer criteria or the human threshold criteria specified in ch. NR 105 or the taste and odor criteria as specified in ch. NR 102.

9.  $Q_s$  may be reduced from those values calculated in subd. 8. whenever the department determines such discharges may directly affect public drinking water supplies.

(d) Effluent flows ( $Q_e$ ). 1. For dischargers subject to ch. NR 210 and which discharge for 24 hours per day on a year-round basis,  $Q_e$  shall equal the average day design flow rate unless it is demonstrated to the department that such a design flow rate is not representative of projected flows at the facility.

2. For all other dischargers not subject to ch. NR 210,  $Q_e$  shall equal the average annual flow rate.

3. For seasonal discharges, discharges proportional to stream flow, or other unusual discharge situations,  $Q_e$  shall be determined on a case by case basis.

(e) Background concentrations of toxicant or organoleptic substances ( $C_s$ ). The representative background concentration of a toxic or organoleptic substance shall be used in deriving chemical specific water quality based effluent limitations. Except as provided elsewhere in this paragraph, the representative background concentration shall equal the geometric mean of the acceptable available data for a substance. Background concentrations may not be measured at a location within the direct influence of a point source discharge.

1. The department shall determine representative background concentrations of toxic substances on a case-by-case basis using available data on the receiving water or similar waterbodies in the state and best professional judgment.

2. The department may utilize representative seasonal concentrations and may consider other information on background concentrations submitted to the department.

3. Whenever the representative background concentration for a toxic or organoleptic substance in the receiving water is determined to be greater than any applicable water quality standard or criterion for that substance and the source of at least 90 percent of the wastewater is from groundwater or a public drinking water supply, the effluent limitation for that substance without dilution shall be equal to the lowest applicable water quality standard or criterion except as provided by subd. 4. Facilities subject to NR 210 and which discharge to the same surface water from which the water supply is withdrawn shall be subject to subd. 5.

4. The department may establish limitations greater than the applicable water quality standard or criterion for the substance as required by subd. 3. in a range up to, but not greater than, the representative background concentration of the substance in the receiving water. The limitation shall only be increased above the standard or criterion if it is demonstrated to the department that the concentration of the substance in the groundwater or public drinking water supply at the point of intake exceeds the applicable standard or criterion for that substance and that reasonable, practical or otherwise required methods are implemented to minimize the addition of the toxic or organoleptic substance to the wastewater. This subdivision shall not apply where groundwater is withdrawn from a location because of noncompliance with the standards contained in ch. NR 140.

5. Whenever the representative background concentration for a toxic or organoleptic substance in the receiving water is determined to be greater than

any applicable water quality standard or criteria for that substance and the source of more than 10 percent of the wastewater for any discharger is from the same receiving water, the effluent limitation for that substance shall equal the representative background toxicant concentration of that substance in the receiving water as determined by the department. In the event the dischargers relative contribution to the mass of the toxic or organoleptic substance in the receiving water is negligible in the best professional judgment of the department, the department shall establish an alternate effluent limitation for the discharger. In making this judgment, consideration shall be given to the type of substance being limited, the uses potentially affected and other relevant factors. The alternate effluent limitation shall represent in the judgment of the department, application of the best demonstrated treatment technology reasonably achievable and shall not exceed the effluent limitation which would otherwise be calculated assuming zero background concentration for that substance. The department may require a discharger to monitor background concentrations of substances limited in accordance with this subdivision.

6. The determination of representative background concentrations for toxic or organoleptic substances in subds. 4. and 5. shall be statistically ( $P \leq 0.01$ ) or otherwise appropriately determined as the reasonably expected maximum background concentration for that substance.

7. Whenever there is sufficient representative background concentration data for a toxic or organoleptic substance in the receiving water and some concentration measurements are less than an acceptable level of detection, those concentrations which are below the acceptable level of detection shall be assumed equal to zero and the arithmetic mean shall be calculated.

(4) VALUES FOR PARAMETERS WHICH AFFECT THE LIMIT. For toxic substances with water quality criteria related to one or more other water quality parameters, the department may calculate effluent limitations in consideration of those other water quality parameters. Water quality parameters include but are not limited to pH, temperature and hardness. The department shall determine the value of the water quality parameters on a case-by-case basis as follows:

(a) Receiving water. 1. The geometric mean of available data for the receiving water shall be used, except the arithmetic mean for pH shall be used.

2. Representative seasonal values may be used.

3. If information on the water quality parameters is not available, then information on the quality of similar water bodies in the area and best professional judgment may be used.

(b) Effluent. 1. The geometric mean of available data for the effluent shall be used, except the arithmetic mean for pH shall be used.

2. If information on the water quality parameters is not available, then values representative of similar effluents may be used.

(5) CUMULATIVE RISK FOR HUMAN CARCINOGENS. (a) If an effluent for a particular discharger contains more than one substance for which a human cancer criterion (HCC) exists at levels which warrant water quality based effluent limits, the incremental risk of each carcinogen should be assumed to be additive. Except as provided in par. (b), the water quality based limitation for each carcinogen shall be established in a permit to protect against additive or synergistic effects possibly associated with simultaneous multiple chemical human exposure such that the following condition is met:

$$\frac{C_1}{\text{Limit}_1} + \frac{C_2}{\text{Limit}_2} + \dots + \frac{C_n}{\text{Limit}_n} \leq 1$$

Where:

$C_{1\dots n}$  - the monthly average concentration of each separate carcinogen in the effluent (assumed equal to zero if effluent concentration is not detected).

$\text{Limit}_{1\dots n}$  - the effluent limitation concentration based on the human cancer criterion for each respective carcinogen.

Note: This additional condition is equivalent to a total incremental risk of cancer due to multiple chemicals not exceeding  $10^{-5}$ .

(b) If information is provided to the department that the carcinogenic risk is not additive, the limitations for each carcinogen will be determined based on that information.

(6) SEDIMENT DEPOSITION. The limitations calculated according to the procedures in this section may be reduced to prevent contamination of sediment with toxic substances or to prevent accumulation of the substance in sediments if determined necessary to protect water quality.

(7) ENVIRONMENTAL FATE. The limitations calculated pursuant to this section may be modified to account for degradation of the substance based on information available to the department provided that:

(a) The rate of degradation is documented by field studies supplied by the discharger, and

(b) The field studies demonstrate rapid and significant loss of the substance inside the mixing zone under the full range of critical conditions expected to be encountered; and

(c) The field studies are reviewed and approved by the department.

(8) OTHER METHODS OF CALCULATION. In lieu of sub. (3), scientifically defensible technical approaches such as calibrated and verified mathematical water quality models developed or adapted for a particular stream, simplified modeling approaches as outlined in "WATER QUALITY ASSESSMENT" (EPA-600/6-82-004), or dynamic methods may be utilized in developing water quality based effluent limitations such that applicable water quality standards specified in chs. NR 102 to 105 are maintained.

NR 106.07 APPLICATION OF WATER QUALITY BASED EFFLUENT LIMITATIONS IN PERMITS. (1) The department shall determine on a case-by-case basis the monitoring frequency to be required for each water quality based effluent limitation in a permit.

(2) Except as provided in sub. (3), effluent limitations based on acute toxicity shall be expressed in permits as daily maximum limitations; effluent limitations based on chronic toxicity criteria and final chronic values shall be expressed in permits as weekly average limitations; and effluent limitations based on all other criteria shall be expressed in permits as monthly average limitations.

(3) If, for a substance, the monitoring frequency determined according to sub. (1) is insufficient to allow calculation of a weekly average, then the water quality based effluent limitation for that substance based on aquatic life chronic toxicity criteria or final chronic values shall be established in a permit as a daily maximum limitation. If, for a substance, the monitoring frequency determined according to sub. (1) is insufficient to allow calculation of a monthly average, then the water quality based effluent limitation for that substance shall be established in a permit as a daily maximum limitation.

(4) If application of sub. (3) results in multiple daily maximum limitations for a substance, the most stringent of the daily maximum limitations for that substance shall be established in the permit as the limitation.

(5) When the water quality based effluent limitation for any substance is less than the limit of detection or the limit of quantitation normally achievable and determined to be appropriate for that substance in the effluent, an acceptable analytical methodology for that substance in the effluent shall be used to produce the lowest limit of detection and limit of quantitation.

(a) When the water quality based effluent limitation is less than the limit of detection, the permit may include conditions which provide that effluent concentrations less than the limit of detection or reported as "not detected" are in compliance with the effluent limitation.

(b) When the water quality based effluent limitation is less than the limit of detection, the permit may include conditions which provide that effluent concentrations greater than the limit of detection, but less than the limit of quantitation determined to be appropriate for that substance in the effluent, are in compliance with the effluent limitation except when confirmed by a sufficient number of analyses of multiple samples and use of appropriate statistical techniques.

(c) When the water quality based effluent limitation is greater than the limit of detection, but less than the limit of quantitation determined to be appropriate for that substance in the effluent, the permit may include conditions which provide that effluent concentrations reported as "not detected" or "not quantified" are in compliance with the effluent limitation.

NR 106.08 DETERMINATION OF THE NECESSITY OF WHOLE EFFLUENT TOXICITY

TESTING REQUIREMENTS AND LIMITATIONS. (1) The department shall establish whole effluent toxicity testing requirements and limitations whenever necessary to meet applicable water quality standards as specified in chs. NR 102 to 105 as measured by exposure of aquatic organisms to an effluent or specified effluent dilutions. When considering the necessity of whole effluent toxicity testing requirements and limitations, the department shall consider in-stream biosurvey data and data from ambient toxicity analyses, whenever such data are available.

(2) If representative discharge data are available for an effluent being discharged from a point source, whole effluent toxicity testing requirements are necessary when:

(a) Existing aquatic life toxicity test data generated according to standard test protocols indicate a potential for an effluent from a point source discharge to adversely impact the receiving water aquatic life community.

(b) A water quality based effluent limitation for a toxic substance is determined necessary in s. NR 106.05.

(3) If no representative discharge data are available for an effluent being discharged from a point source, whole effluent toxicity testing requirements are necessary if, in the judgment of the department, water quality standards may be exceeded. In such cases, the following factors shall be considered:

(a) Any relevant information which is available that indicates a potential for an effluent to impact the receiving water aquatic life community.

- (b) Available dilution in the receiving water.
- (c) Discharge category and predicted effluent quality.
- (d) Proximity to other point source dischargers.

(4) Regardless of the results of the analysis conducted under this section, the department may, whenever determined necessary, require whole effluent toxicity testing for a point source discharge. The department may use information submitted under s. 166.20(5)(a)3. and 4., Stats., together with other information, in determining when whole effluent toxicity testing is necessary.

(5) Whole effluent toxicity limitations are necessary when representative whole effluent toxicity data indicate toxicity to aquatic life as determined in s. NR 106.09.

NR 106.09 CALCULATION OF WHOLE EFFLUENT TOXICITY LIMITATIONS. (1)

LIMITATIONS BASED ON ACUTE WHOLE EFFLUENT TOXICITY. (a) Except as provided in par. (c), the department shall establish acute whole effluent toxicity limitations to ensure that substances shall not be present in amounts which are acutely harmful to aquatic life in all surface waters including the mixing zone and effluent channel as required by s. NR 102.04(1).

(b) To assure compliance with par. (a), an effluent, as discharged and without dilution, shall not be lethal or cause immobilization to more than 50% of the test organism population with the following taxa-specific exposure periods:

1. 48 hours for aquatic invertebrate organisms;
2. 96 hours for aquatic vertebrate organisms;
3. Any other exposure period deemed appropriate by the department for the specific test organism.

(c) If a zone of initial dilution is determined appropriate in accordance with the provisions of s. NR 106.02(2)(c), whole effluent acute toxicity

limitations determined by this subsection shall be adjusted such that the effluent meets either of the following conditions:

1. After dilution with the receiving water at a concentration equal to the dilution calculated after application of the zone of initial dilution, the test solution of effluent and receiving water shall not exhibit lethality which is statistically different from a valid control, or

2. After dilution of the effluent with the receiving water at a concentration equal to 3.3 times the percent dilution value calculated through application of the zone of initial dilution, the test solution of effluent and receiving water shall not be lethal to more than 50 percent of the test organism population with the exposure periods as provided in par. (b).

(2) LIMITATIONS BASED ON CHRONIC WHOLE EFFLUENT TOXICITY. (a) The department shall establish chronic whole effluent toxicity limitations to ensure that unauthorized concentrations of substances are not discharged from a point source that alone or in combination with other materials present are toxic to fish or other aquatic life as required by s. NR 102.04(4)(d).

(b) To assure compliance with par. (a), an effluent, after dilution with an appropriate allowable quantity of receiving water flow equivalent to that provided by receiving water flows specified in s. NR 106.06(3)(c) or implied in s. NR 106.06(3)(b)2., shall not cause a significant adverse effect, as determined by subd. 1. and 2., to a test organism population when compared to an appropriate control.

1. Using statistical interpretation methods appropriate to the toxicity test protocol, an adverse effect will be determined to be significant if  $P \leq 0.05$ .

2. If, in the judgment of the department, the statistical interpretation methods used to test for significance are not appropriate for a specific data set, empirical interpretation methods may be used to determine the significance of an effect.

NR 106.10 EXCLUSIONS. (1) NONCONTACT COOLING WATER. Except as provided in sub. (2), the department may not impose water quality based effluent limitations for toxic and organoleptic substances for discharges of uncontaminated stormwater runoff not defined as point sources by s. 147.015(12), Stats., noncontact cooling waters which do not contain additives or combined discharges consisting solely of uncontaminated stormwater runoff and noncontact cooling water without additives. Only the additives to noncontact cooling waters shall be examined under this chapter for the establishment of water quality based effluent limitations. For purposes of this exclusion, the term "additives" are those compounds intentionally introduced by the discharger, but do not include the addition of compounds at a rate and quantity necessary to provide a safe drinking water supply, or the addition of substances in similar type and amount to those substances typically added to a public drinking water supply. The following may be used to establish water quality based effluent limitations for noncontact cooling waters:

(a) If at least one 48-hour  $LC_{50}$  or  $EC_{50}$  value is available for daphnia magna and at least one 96-hour  $LC_{50}$  or  $EC_{50}$  value is available for either fathead minnow, rainbow trout or bluegill, the geometric mean  $LC_{50}$  or  $EC_{50}$  for each of these species shall be divided by 5 if rainbow trout are represented in the data base or divided by 10 if rainbow trout are not represented in the data base. The limitation for purposes of this section shall be equal to the

lowest resultant value. A limitation can be calculated for an additive only if both LC50 and EC50 data for daphnia magna and at least one of the fish species listed above are available.

(b) Effluent limitations based on chronic toxicity to aquatic life shall be established using the procedures described in this paragraph for additives whenever chronic toxicity criteria are not available from s. NR 105.06. The calculation of limitations shall be in accordance with the requirements of s. NR 106.06(3)(b). In this calculation, the water quality criterion concentration shall be equal to the final acute value for that additive as provided in s. NR 105.05, or the effluent limitation as determined in par. (a), divided by the geometric mean of all the vertebrate and invertebrate species mean acute-chronic ratios determined in accordance with s. NR 105.06(5) for that additive. A water quality criterion concentration may be calculated for an additive only if a final acute value, as provided in s. NR 105.05 or an effluent limitation as determined in par. (a), and an acute-chronic ratio for a vertebrate species and an acute-chronic ratio for an invertebrate species are available.

(c) Groundwater which is withdrawn from a location because of noncompliance with the standards contained in ch. NR 140 and which is used as noncontact cooling water shall not be subject to this exclusion.

(2) INTERMITTENT DISCHARGES. Effluent limitations derived as specified in ss. 106.06(2) and (3) for substances which rapidly degrade and which are discharged for less than 24 hours per day shall be calculated as specified in those sections, unless the discharger demonstrates to the department that, as a result of the duration and frequency of the discharge, adverse effects will not occur when limitations are increased.

NR 106.11 MULTIPLE DISCHARGES. Whenever the department determines that more than one discharge may be affecting the water quality of the same receiving water for one or more substances, a total maximum load may be calculated and the resultant load shall be divided among the various discharges using an allocation method based on site-specific considerations. Whenever the department makes a determination under this section, the department shall notify all permittees who may be affecting the water quality of the same receiving water of the determination and any limitations developed under this section. Permittees shall be given the opportunity to comment to the department on any determination made under this section.

NR 106.12 LIMITATIONS FOR AMMONIA NITROGEN. Regardless of any other requirement of this chapter, the department shall establish, on a case-by-case basis, water quality based effluent limitations for discharges of ammonia nitrogen. The criteria and limitations established in s. NR 104.02(3)(a)2.b. and NR 104.02(3)(a)3.a. for discharges to surface waters not supporting a balanced aquatic community shall apply.

NR 106.13 LEACHATE IN PUBLICLY OWNED TREATMENT WORKS. Publicly owned treatment works subject to ch. NR 210 may demonstrate to the department that leachate from a licensed solid waste facility materially affects the quality of effluent from that treatment works and affects the capability of the treatment works to meet the effluent limitations established under this chapter. If the department determines that a proper demonstration has been made, the department shall, within its capabilities, provide reasonable assistance to the owner of the treatment works and establish an appropriate schedule of compliance.

NR 106.14 ANALYTICAL METHODS AND LABORATORY REQUIREMENTS. Methods used for analysis of samples shall be those specified in ch. NR 219 unless alternative methods are specified in the WPDES discharge permits.

NR 106.15 LIMITATIONS FOR MERCURY. Regardless of the effluent limitations determined under this chapter, the discharge of organic mercury compounds, inorganic mercury compounds, and metallic mercury shall not exceed the requirements in s. 144.15, Stats., and ch. NR 100, Wis. Adm. Code.

The foregoing rules were approved and adopted by State of Wisconsin Natural Resources Board on November 17, 1988.

The rules shall take effect on the first day of the month following publication in the Wisconsin Administrative Register as provided in s. 227.22(2)(intro.), Stats.

Dated at Madison, Wisconsin December 22, 1988.

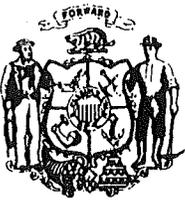
STATE OF WISCONSIN

DEPARTMENT OF NATURAL RESOURCES

By Carroll D. Besadny  
Carroll D. Besadny, Secretary

(SEAL)

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State of Wisconsin

DEPARTMENT OF NATURAL RESOURCES

Carroll D. Besadny  
Secretary

BOX 7921  
MADISON, WISCONSIN 53707

December 22, 1988.

File Ref: 8250

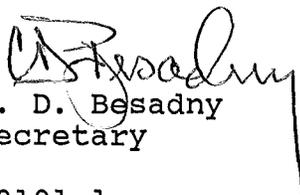
Mr. Orlan L. Prestegard  
Revisor of Statutes  
Suite 702  
30 W. Mifflin Street  
Madison, WI

Dear Mr. Prestegard:

Enclosed are two copies, including one certified copy, of State of Wisconsin Natural Resources Board order No. WR-47-87. These rules were reviewed by the Assembly Committee on Natural Resources, the Senate Committee on Urban Affairs, Energy, Environmental Resources and Elections, and the Joint Committee for Review of Administrative Rules pursuant to s. 227.19, Stats. A summary of the final regulatory flexibility analysis and comments of the legislative review committees is also enclosed.

You will note that this order takes effect following publication. Kindly publish it in the Administrative Code accordingly.

Sincerely,

  
C. D. Besadny  
Secretary

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Encs.