ARTICLE 2. WATER QUALITY STANDARDS

Rule 1. Water Quality Standards Applicable to All State Waters Except Waters of the State Within the Great Lakes System

327 IAC 2-1-1 Applicability of rule

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4

Sec. 1. The water quality standards established by this rule shall apply to all waters of the state except waters of the state within the Great Lakes system regulated under 327 IAC 2-1.5. *(Water Pollution Control Board; 327 IAC 2-1-1; filed Sep 24, 1987, 3:00 p.m.: 11 IR 579; filed Feb 1, 1990, 4:30 p.m.: 13 IR 1018; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1347)*

327 IAC 2-1-1.5 Water quality goals

Authority: IC 13-1-3-7; IC 13-7-1-1; IC 13-7-7-5
Affected: IC 13-7-4-1

Sec. 1.5. The goal of the state is to restore and maintain the chemical, physical, and biological integrity of the waters of the state. In furtherance of this primary goal:

(1) it is the public policy of the state that the discharge of toxic substances in toxic amounts be prohibited; and

(2) it is the public policy of the state that the discharge of persistent and bioconcentrating toxic substances be reduced or eliminated.

(Water Pollution Control Board; 327 IAC 2-1-1.5; filed Feb 1, 1990, 4:30 p.m.: 13 IR 1018)

327 IAC 2-1-2 Maintenance of surface water quality standards

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-1; IC 13-18-4; IC 13-30-2-1

Sec. 2. The following policies of nondegradation are applicable to all surface waters of the state:

(1) For all waters of the state, existing beneficial uses shall be maintained and protected. No degradation of water quality shall be permitted which would interfere with or become injurious to existing and potential uses.

(2) All waters whose existing quality exceeds the standards established herein as of February 17, 1977, shall be maintained in their present high quality unless and until it is affirmatively demonstrated to the commissioner that limited degradation of such waters is justifiable on the basis of necessary economic or social factors and will not interfere with or become injurious to any beneficial uses made of, or presently possible, in such waters. In making a final determination under this subdivision, the commissioner shall give appropriate consideration to public participation and intergovernmental coordination.

(3) The following waters of high quality, as defined in subdivision (2), are designated by the board to be an outstanding state resource and shall be maintained in their present high quality without degradation:

(A) The Blue River in Washington, Crawford, and Harrison Counties, from river mile 57.0 to river mile 11.5.

(B) The North Fork of Wildcat Creek in Carroll and Tippecanoe Counties, from river mile 43.11 to river mile 4.82.

(C) The South Fork of Wildcat Creek in Tippecanoe County, from river mile 10.21 to river mile 0.00.

(4) Any determination made by the commissioner in accordance with Section 316 of the Clean Water Act concerning alternative thermal effluent limitations will be considered to be consistent with the policies enunciated in this section.

(Water Pollution Control Board; 327 IAC 2-1-2; filed Sep 24, 1987, 3:00 p.m.: 11 IR 579; filed Feb 1, 1990, 4:30 p.m.: 13 IR 1018; errata filed Jul 6, 1990, 5:00 p.m.: 13 IR 2003; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1346)

327 IAC 2-1-3 Surface water use designations; multiple uses

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4

Sec. 3. (a) The following water uses are designated by the water pollution control board:

(1) Except as provided in subsection (c), surface waters of the state are designated for full body contact recreation as provided in section 6(d) of this rule.

(2) All waters, except as described in subdivision (5), will be capable of supporting:

(A) a well-balanced, warm water aquatic community; and

(B) where natural temperatures will permit, put-and-take trout fishing.

All waters capable of supporting the natural reproduction of trout as of February 17, 1977, shall be so maintained.

(3) All waters that are used for public or industrial water supply must meet the standards for those uses at the points where the water is withdrawn. This use designation and its corresponding water quality standards are not to be construed as imposing a user restriction on those exercising or desiring to exercise the use.

(4) All waters that are used for agricultural purposes must, as a minimum, meet the standards established in section 6(a) of this rule.

(5) All waters in which naturally poor physical characteristics (including lack of sufficient flow), naturally poor chemical quality, or irreversible man-induced conditions, which came into existence before January 1, 1983, and having been established by use attainability analysis, public comment period, and hearing:

(A) may qualify to be classified for limited use; and

(B) must be evaluated for restoration and upgrading at each triennial review of this rule.

Specific waters of the state designated for limited use are listed in section 11(a) of this rule.

(6) All waters that:

(A) provide unusual aquatic habitat;

(B) are an integral feature of an area of exceptional natural beauty or character; or

(C) support unique assemblages of aquatic organisms:

may be classified for exceptional use. Specific waters of the state designated for exceptional use are listed in section 11(b) of this rule.

(b) Where multiple uses have been designated for a body of water, the most protective of all simultaneously applicable standards will apply.

(c) A CSO wet weather limited use designation is established as a subcategory of the recreational use designation established under subsection (a). This subcategory shall be applied in accordance with section 3.1 of this rule. *(Water Pollution Control Board; 327 IAC 2-1-3; filed Sep 24, 1987, 3:00 p.m.: 11 IR 580; filed Feb 1, 1990, 4:30 p.m.: 13 IR 1019; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1348; filed Sep 6, 2007, 12:25 p.m.: 20071003-IR-327050218FRA)*

327 IAC 2-1-3.1 CSO wet weather limited use designation

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3-2.5
Affected: IC 13-14-2-6; IC 13-14-9-14; IC 13-18-4

Sec. 3.1. (a) The CSO wet weather limited use subcategory established under section 3 of this rule shall be applied only to waters receiving wet weather discharges from combined sewer overflows.

(b) To receive consideration for the CSO wet weather limited use subcategory designation, a CSO community must do the following:

(1) Perform a use attainability analysis (UAA) to change the recreational designated use of the waterbody or waterbodies receiving the wet weather discharges from combined sewer overflows.

(2) Submit the UAA to the department for approval.

(3) Submit a long term control plan (LTCP) consistent with the application of the CSO wet weather limited use subcategory to the department for approval.

(c) The LTCP submitted to the department must:

(1) specify the water quality-based requirements that will apply to combined sewer overflows under subsection (h) if the waterbody or waterbodies receiving the wet weather overflows are redesignated to the CSO wet weather limited use subcategory; and

(2) meet the requirements of Section 402(q) of the Clean Water Act.

(d) The department shall review the UAA concurrently with the LTCP if they are submitted concurrently. The department shall use the LTCP to satisfy the requirements of the UAA, to the extent possible.

(e) Upon approval of a UAA, the department shall begin a rulemaking under IC 13-14-9-14 to amend the designated use to a CSO wet weather limited use designation. The rulemaking may commence before full implementation of the approved LTCP.

(f) Upon completion of the rulemaking required under subsection (e), the department shall submit the amended recreational

use designation and the supporting UAA to the U.S. EPA for approval.

(g) Upon U.S. EPA's approval of the use designation change for the waterbody or waterbodies receiving wet weather overflows from a CSO community, the department shall modify the NPDES permit holder's permit to incorporate the CSO wet weather limited use designation and the approved LTCP into the permit.

(h) The water quality-based requirements for the CSO wet weather limited use designation shall:

(1) be determined by the approved LTCP for the combined sewer system;

(2) be consistent with the Clean Water Act; and

(3) remain in effect during the time and to the physical extent that the recreational use designation that applied to the waters immediately before the application to the waters of the CSO wet weather limited use subcategory is not attained but for not more than four (4) days after the date the overflow discharge ends.

(Water Pollution Control Board; 327 IAC 2-1-3.1; filed Sep 6, 2007, 12:25 p.m.: 20071003-IR-327050218FRA)

327 IAC 2-1-4 Mixing zone guidelines

Authority: IC 13-1-3-7; IC 13-7-7-5
Affected: IC 13-1-3-7; IC 13-7-7-5

Sec. 4. (a) All surface water quality standards in this rule, except those provided in section 6(a)(1) of this rule, are to be applied at a point outside of the mixing zone to allow for a reasonable admixture of waste effluents with the receiving waters.

(b) Due to varying physical, chemical, and biological conditions, no universal mixing zone may be prescribed. The commissioner shall determine the mixing zone upon application by the discharger. The applicability of the guideline set forth in subsection (c) will be on a case-by-case basis and any application to the commissioner shall contain the following information:

(1) The dilution ratio.

(2) The physical, chemical, and biological characteristics of the receiving body of water.

(3) The physical, chemical, and biological characteristics of the waste effluent.

(4) The present and anticipated uses of the receiving body of water.

(5) The measured or anticipated effect of the discharge on the quality of the receiving body of water.

(6) The existence of and impact upon any spawning or nursery areas of any indigenous aquatic species.

(7) Any obstruction of migratory routes of any indigenous aquatic species.

(8) The synergistic effects of overlapping mixing zones or the aggregate effects of adjacent mixing zones.

(c) The mixing zone should be limited to no more than one-fourth (1/4) (twenty-five percent (25%)) of the cross-sectional area and/or volume of flow of the stream, leaving at least three-fourths (3/4) (seventy-five percent (75%)) free as a zone of passage for aquatic biota nor should it extend over one-half (1/2) (fifty percent (50%)) of the width of the stream.

(d) Based on consideration of aquatic life or human health effects, the commissioner may deny a mixing zone for a discharge or certain substances in a discharge.

(e) Notwithstanding other subsections of this section, no mixing zone shall be allowed for discharges to lakes except for those consisting entirely of noncontact cooling water which meet the requirements set forth in Section 316(a) of the Federal Water Pollution Control Act of 1972. *(Water Pollution Control Board; 327 IAC 2-1-4; filed Sep 24, 1987, 3:00 p.m.: 11 IR 580; filed Feb 1, 1990, 4:30 p.m.: 13 IR 1020)*

327 IAC 2-1-5 Exception to quality standards applicability

Authority: IC 13-14-9; IC 13-18-3-2
Affected: IC 13-14-8

Sec. 5. All surface water quality standards in section 6 of this rule, except those provided in section 6(a)(1) of this rule, will cease to be applicable when the stream flows are less than the average minimum seven (7) consecutive day low flow that occurs once in ten (10) years. This determination will be made using Low-Flow Characteristics of Indiana Streams, 1996, United States Department of the Interior, Geological Survey, or any additional information compiled on a comparable basis. *(Water Pollution Control Board; 327 IAC 2-1-5; filed Sep 24, 1987, 3:00 p.m.: 11 IR 581; filed Feb 1, 1990, 4:30 p.m.: 13 IR 1020; filed Feb 14, 2005, 10:05 a.m.: 28 IR 2047)*

327 IAC 2-1-6 Minimum surface water quality standards

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-11-2-258; IC 13-18-4; IC 13-30-2-1; IC 14-22-9

Sec. 6. (a) The following are minimum surface water quality conditions:

(1) All surface waters at all times and at all places, including waters within the mixing zone, shall meet the minimum conditions of being free from substances, materials, floating debris, oil, or scum attributable to municipal, industrial, agricultural, and other land use practices, or other discharges that do any of the following:

(A) Will settle to form putrescent or otherwise objectionable deposits.

(B) Are in amounts sufficient to be unsightly or deleterious.

(C) Produce:

(i) color;

(ii) visible oil sheen;

(iii) odor; or

(iv) other conditions;

in such degree as to create a nuisance.

(D) Are in concentrations or combinations that will cause or contribute to the growth of aquatic plants or algae to such degree as to:

(i) create a nuisance;

(ii) be unsightly; or

(iii) otherwise impair the designated uses.

(E) Are in amounts sufficient to be acutely toxic to, or to otherwise severely injure or kill, aquatic life, other animals, plants, or humans. To assure protection of aquatic life, concentrations of toxic substances shall not exceed the final acute value (FAV = 2 (AAC)) in the undiluted discharge or the acute aquatic criterion (AAC) outside the zone of initial dilution or, if applicable, the zone of discharge-induced mixing:

(i) for certain substances, an AAC is established and set forth in subdivision (3), Table 6-1 and subdivision (3), Table 6-2 (which table incorporates subdivision (4), Table 6-3);

(ii) for substances for which an AAC is not specified in subdivision (3), Table 6-1 or subdivision (3), Table 6-2, an AAC can be calculated by the commissioner using the procedures in section 8.2 of this rule; and

(iii) the AAC determined under item (i) or (ii) may be modified on a site-specific basis to reflect local conditions in accordance with section 8.9 of this rule.

This clause shall not apply to the chemical control of plants and animals when that control is performed in compliance with approval conditions specified by the Indiana department of natural resources as provided by IC 14-22-9.

(2) At all times, all surface waters outside of mixing zones shall be free of substances in concentrations that on the basis of available scientific data are believed to be sufficient to injure, be chronically toxic to, or be carcinogenic, mutagenic, or teratogenic to humans, animals, aquatic life, or plants. To assure protection against the adverse effects identified in this subdivision, the following requirements are established:

(A) A toxic substance or pollutant shall not be present in such waters in concentrations that exceed the most stringent of the following continuous criterion concentrations (CCCs):

(i) A chronic aquatic criterion (CAC) to protect aquatic life from chronic toxic effects.

(ii) A terrestrial life cycle safe concentration (TLSC) to protect terrestrial organisms from toxic effects that may result from the consumption of aquatic organisms or water from the waterbody.

(iii) A human life cycle safe concentration (HLSC) to protect human health from toxic effects that may result from the consumption of aquatic organisms or drinking water from the waterbody.

(iv) For carcinogenic substances, a criterion to protect human health from unacceptable cancer risk of greater than one (1) additional occurrence of cancer per one hundred thousand (100,000) population.

(B) For certain substances, one (1) or more of the CCCs identified in clause (A) are established and set forth in subdivision (3), Table 6-1 and subdivision (3), Table 6-2 (which table incorporates subdivision (4), Table 6-3).

(C) For substances for which one (1) or more of the CCCs identified in clause (A) are not specified in subdivision (3), Table 6-1 or subdivision (3), Table 6-2, such criterion or criteria may be calculated by the commissioner using the corresponding procedures prescribed by sections 8.3 through 8.6 of this rule.

(D) A CCC determined under clause (B) or (C) may be modified on a site-specific basis to reflect local conditions in accordance with section 8.9 of this rule.

(E) The CAC and TLSC for a substance apply in all surface waters outside a mixing zone for a discharge of that substance. Similarly, in waters where a public water system intake is not present or is unaffected by the discharge of a substance, the HLSC and the carcinogenic criterion for that substance based on consumption of organisms from the waterbody and only incidental ingestion of water shall apply to all surface waters outside the mixing zone for a discharge of that substance. In surface waters where a public water system intake is present, the HLSC and the carcinogenic criterion for a substance based on consumption of organisms and potable water from the waterbody shall apply at the point of the public water system intake.

(3) The following establishes surface water quality criteria for specific substances:

Table 6-1

Surface Water Quality Criteria for Specific Substances

AAC (Maximum)	CCC		
	Outside of Mixing Zone		Point of Water Intake
Substances	Aquatic Life (CAC) (4-Day Average)	Human Health (30-Day Average)	Human Health (30-Day Average)
Metals (µg/l)			
(Total recoverable)			
Antimony		45,000 (T)	146 (T)
Arsenic (III)	#	#	0.175 (C)	0.022 (C)
Barium			1,000 (D)
Beryllium		1.17 (C)	0.068 (C)
Cadmium	#	#	10 (D)
Chromium (III)	#	#	3,433,000 (T)	170,000 (T)
Chromium (VI)	#	#	50 (D)
Copper	#	#	
Lead	#	#	50 (D)
Mercury$	2.4	0.012	0.15 (T)	0.14 (T)
Nickel	#	#	100 (T)	13.4 (T)
Selenium	130*	35	10 (D)
Silver	#		50 (D)
Thallium		48 (T)	13 (T)
Zinc	#	#	
Organics (µg/l)			
Acrolein		780 (T)	320 (T)
Acrylonitrile		6.5 (C)	0.58 (C)
Aldrin$	1.5*	0.00079 (C)	0.00074 (C)
Benzene		400 (C)	6.6 (C)
Benzidine		0.0053 (C)	0.0012 (C)
Carbon Tetrachloride		69.4 (C)	4.0 (C)
Chlordane$	1.2*	0.0043	0.0048 (C)	0.0046 (C)
Chlorinated Benzenes			
Monochlorobenzene			488 (T)
1,2,4,5-Tetrachlorobenzene $		48 (T)	38 (T)
Pentachlorobenzene $		85 (T)	74 (T)
Hexachlorbenzene$		0.0074 (C)	0.0072 (C)
Chlorinated Ethanes			
1,2-dichloroethane		2,430 (C)	9.4 (C)
1,1,1-trichloroethane		1,030,000 (T)	18,400 (T)

1,1,2-trichloroethane			418 (C)	6.0 (C)
1,1,2,2-tetrachloroethane			107 (C)	1.7 (C)
Hexachloroethane			87.4 (C)	19 (C)
Chlorinated Phenols				
2,4,5-trichlorophenol				2,600 (T)
2,4,6-trichlorophenol			36 (C)	12 (C)
Chloroalkyl Ethers				
bis(2-chloroisopropyl) ether			4,360 (T)	34.7 (T)
bis(chloromethyl) ether			0.018 (C)	0.000038 (C)
bis(2-chloroethyl) ether			13.6 (C)	0.3 (C)
Chloroform			157 (C)	1.9 (C)
Chlorpyrifos	0.083	0.041		
DDT$	0.55*	0.0010	0.00024 (C)	0.00024 (C)
Dichlorobenzenes			2,600 (T)	400 (T)
Dichlorobenzidine			0.2 (C)	0.1 (C)
1,1-dichloroethylene			18.5 (C)	0.33 (C)
2,4-dichlorophenol				3,090 (T)
Dichloropropenes			14,100 (T)	87 (T)
Dieldrin$	1.3*	0.0019	0.00076 (C)	0.00071 (C)
2,4-dinitrotoluene			91 (C)	1.1 (C)
Dioxin (2,3,7,8-TCDD)$			0.0000001 (C)	0.0000001 (C)
1,2-diphenylhydrazine			5.6 (C)	0.422 (C)
Endosulfan	0.11*	0.056	159 (T)	74 (T)
Endrin$	0.09*	0.0023		1.0 (D)
Ethylbenzene			3,280 (T)	1,400 (T)
Fluoranthene			54 (T)	42 (T)
Halomethanes			157 (C)	1.9 (C)
Heptachlor$	0.26*	0.0038	0.0028 (C)	0.0028 (C)
Hexachlorobutadiene$			500 (C)	4.47 (C)
Hexachlorocyclohexane (HCH)				
alpha HCH$			0.31 (C)	0.09 (C)
beta HCH$			0.55 (C)	0.16 (C)
gamma HCH (Lindane)$	1.0*	0.080	0.63 (C)	0.19 (C)
Technical HCH$			0.41 (C)	0.12 (C)
Hexachlorocyclopentadiene				206 (T)
Isophorone			520,000 (T)	5,200 (T)
Nitrobenzene				19,800 (T)
Nitrophenols				
4,6-dinitro-o-cresol			765 (T)	13.4 (T)
Dinitrophenol			14,300 (T)	70 (T)
Nitrosamines				
N-nitrosodiethylamine			12.4 (C)	0.008 (C)
N-nitrosodimethylamine			160 (C)	0.014 (C)
N-nitrosodibutylamine			5.9 (C)	0.064 (C)
N-nitrosodiphenylamine			161 (C)	49 (C)
N-nitrosopyrrolidine			919 (C)	0.16 (C)
Parathion	0.065	0.013		
Pentachlorophenol	$e^{(1.005\ [pH]-4.830)}$	$e^{(1.005\ [pH]-5.290)}$		1,000 (T)
Phenol				3,500 (T)

Phthalate Esters				
Dimethyl phthalate			2,900,000 (T)	313,000 (T)
Diethyl phthalate			1,800,000 (T)	350,000 (T)
Dibutyl phthalate			154,000 (T)	34,000 (T)
Di-2-ethylhexyl phthalate			50,000 (T)	15,000 (T)
Polychlorinated Biphenyls (PCBs)$		0.014	0.00079 (C)	0.00079 (C)
Carcinogenic Polynuclear Aromatic Hydrocarbons (PAHs)			0.31 (C)	0.028 (C)
Tetrachloroethylene			88.5 (C)	8 (C)
Toluene			424,000 (T)	14,300 (T)
Toxaphene$	0.73	0.0002	0.0073 (C)	0.0071 (C)
Trichloroethylene			807 (C)	27 (C)
Vinyl Chloride			5,246 (C)	20 (C)
Other Substances				
Asbestos (fibers/liter)				300,000 (C)
Chloride (mg/l)	860	230		
Chlorine (Total Residual) (µg/l)	19	11		
Chlorine[a] (mg/l) (intermittent, total residual)		0.2		
Cyanide (Free) (µg/l)	22	5.2		
Cyanide (Total) (µg/l)				200 (D)
Nitrate-N + Nitrite-N (mg/l)				10 (D)
Nitrite-N (mg/l)				1.0 (D)

Fluoride shall not exceed two (2.0) mg/l in all surface waters outside of the mixing zone except the Ohio River and Interstate Wabash River where it shall not exceed one (1.0) mg/l outside of the mixing zone.

Sulfate shall not exceed the criteria established in subdivision (5) in all surface waters outside of the mixing zone.

#The AAC and CAC for this substance are established in Table 6-2.

*One-half (½) of the final acute value (FAV) as calculated by procedures developed by U.S. EPA in 1980. This value would correspond to acute aquatic values calculated using IDEM procedures or U.S. EPA procedures developed in 1985 in which the calculated FAV is divided by two (2) to reduce acute toxicity.

T derived from threshold toxicity.

C derived from nonthreshold cancer risk.

D derived from drinking water standards, equal to or less than threshold toxicity.

$This substance is a bioaccumulative chemical of concern.

[a]To be considered an intermittent discharge, total residual chlorine shall not be detected in the discharge for a period of more than forty (40) minutes in duration, and such periods shall be separated by at least five (5) hours.

Table 6-2

Surface Water Quality Criteria for Specific Substances

Substances	AAC (Maximum) (µg/l)	AAC Conversion Factors	CAC (4-Day Average) (µg/l)	CAC Conversion Factors
Metals (dissolved)[1]				
Arsenic (III)	WER[2](360)	1.000	WER[2](190)	1.000
Cadmium	WER[2]($e^{(1.128\ [\ln(\text{hardness})]-3.828)}$)	1.136672-[(ln hardness)(0.041838)]	WER[2]($e^{(0.7852\ [\ln(\text{hardness})]-3.490)}$)	1.101672-[(ln hardness)(0.041838)]
Chromium (III)	WER[2]($e^{(0.819\ [\ln(\text{hardness})]+3.688)}$)	0.316	WER[2]($e^{(0.8190\ [\ln(\text{hardness})]+1.561)}$)	0.860
Chromium (VI)	WER[2](16)	0.982	WER[2](11)	0.962

Copper	WER[2]($e^{(0.9422\ [\ln(\text{hardness})]-1.464)}$)	0.960	WER[2]($e^{(0.8545\ [\ln(\text{hardness})]-1.465)}$)	0.960
Lead	WER[2]($e^{(1.273\ [\ln(\text{hardness})]-1.460)}$)	1.46203-[(ln hardness)(0.145712)]	WER[2]($e^{(1.273\ [\ln(\text{hardness})]-4.705)}$)	1.46203-[(ln hardness)(0.145712)]
Nickel	WER[2]($e^{(0.8460\ [\ln(\text{hardness})]+3.3612)}$)	0.998	WER[2]($e^{(0.8460\ [\ln(\text{hardness})]+1.1645)}$)	0.997
Silver	WER[2]($e^{(1.72\ [\ln(\text{hardness})]-6.52)}/2$[3])	0.85		
Zinc	WER[2]($e^{(0.8473\ [\ln(\text{hardness})]+0.8604)}$)	0.978	WER[2]($e^{(0.8473\ [\ln(\text{hardness})]+0.7614)}$)	0.986

[1] The AAC and CAC columns of this table contain total recoverable metals criteria (numeric and hardness-based). The criterion for the dissolved metal is calculated by multiplying the appropriate conversion factor by the AAC or CAC. This dissolved AAC or CAC shall be rounded to two (2) significant digits, except when the criteria are used as intermediate values in a calculation, such as in the calculation of water quality-based effluent limitations (WQBELs).

[2] A value of one (1) shall be used for the water-effect ratio (WER) unless an alternate value is established under section 8.9 of this rule.

[3] One-half (½) of the FAV as calculated by procedures developed by U.S. EPA in 1980. This value would correspond to acute aquatic values calculated using IDEM procedures or U.S. EPA procedures developed in 1985 in which the calculated FAV is divided by two (2) to reduce acute toxicity.

(4) The following establishes dissolved AAC and CAC for certain metals at selected hardness values calculated from the equations and conversion factors in subdivision (3), Table 6-2 and using a value of one (1) for the WER:

Table 6-3

Metals Concentrations in Micrograms Per Liter; Hardness in Milligrams Per Liter $CaCO_3$[1]

	Arsenic (III)		Cadmium		Chromium (III)		Chromium (VI)		Copper		Lead		Nickel		Silver		Zinc	
Hardness	AAC	CAC	AAC	CAC	AAC	CAC	AAC	CAC	AAC	CAC	AAC	CAC	AAC	CAC	AAC	CAC	AAC	CAC
50	360	190	1.7	0.62	310	100	16	11	8.9	6.3	30	1.2	790	87	0.52	–	64	58
100	360	190	3.7	1.0	550	180	16	11	17	11	65	2.5	1400	160	1.7	–	110	100
150	360	190	5.7	1.4	760	250	16	11	25	16	100	3.9	2000	220	3.5	–	160	150
200	360	190	7.8	1.7	970	310	16	11	33	21	140	5.3	2500	280	5.7	–	210	190
250	360	190	10	2.0	1200	380	16	11	40	25	170	6.7	3100	340	8.3	–	250	230
300	360	190	12	2.3	1300	440	16	11	48	29	210	8.1	3600	400	11	–	290	270
350	360	190	14	2.6	1500	500	16	11	55	33	240	9.5	4100	450	15	–	330	300
400	360	190	17	2.9	1700	550	16	11	63	37	280	11	4600	510	19	–	370	340
450	360	190	19	3.1	1900	610	16	11	70	41	320	12	5100	560	23	–	410	370
500	360	190	21	3.4	2100	670	16	11	78	45	350	14	5500	610	27	–	450	410

[1] The dissolved metals criteria in this table have been rounded to two (2) significant digits in accordance with subdivision (3), Table 6-2. The equations and conversion factors in subdivision (3), Table 6-2 shall be used instead of the criteria in this table when dissolved metals criteria are used as intermediate values in a calculation, such as in the calculation of WQBELs.

(5) The following establishes surface water quality criteria for sulfate that shall not be exceeded in all surface waters outside of the mixing zone:

(A) The following provides surface water quality criteria for sulfate in mg/l for the specified ranges of hardness (in mg/l as $CaCO_3$) or chloride (in mg/l), or both:

(i) If the hardness concentration of surface waters is greater than or equal to one hundred (100) mg/l but less than or equal to five hundred (500) mg/l, and if the chloride concentration of surface waters is greater than or equal to five (5) mg/l but less than twenty-five (25) mg/l, then:

$$C = [-57.478 + 5.79\ (\text{hardness}) + 54.163\ (\text{chloride})] \times 0.65$$

Where: C = sulfate criterion in mg/l.

(ii) If the hardness concentration of surface waters is greater than or equal to one hundred (100) mg/l but less than or equal to five hundred (500) mg/l, and if the chloride concentration of surface waters is greater than or equal to twenty-five (25) mg/l but less than or equal to five hundred (500) mg/l, then:

$$C = [1276.7 + 5.508\ (\text{hardness}) - 1.457\ (\text{chloride})] \times 0.65$$

Where: C = sulfate criterion in mg/l.

(iii) If the hardness concentration of surface waters is less than one hundred (100) mg/l and the chloride concentration of surface waters is less than or equal to five hundred (500) mg/l, the sulfate criterion is five hundred (500) mg/l.

(iv) If the hardness concentration of surface waters is greater than five hundred (500) mg/l and the chloride concentration of surface waters is greater than or equal to five (5) mg/l, but less than or equal to five hundred (500) mg/l, the sulfate criterion shall be calculated using a hardness concentration of five hundred (500) mg/l and the equation in item (i) or (ii) that applies to the chloride concentration.

(v) If the chloride concentration of surface waters is less than five (5) mg/l, the sulfate criterion is five hundred (500) mg/l.

(B) The following applies to the surface water quality criteria for sulfate provided in clause (A):

(i) Sulfate criteria may only be established based on a chloride concentration greater than the CAC of two hundred thirty (230) mg/l for chloride, as established under Table 6-1, where the CAC for chloride has been modified on a site-specific basis in accordance with either the variance provisions under section 8.8 of this rule or the site-specific criteria provisions under section 8.9 of this rule.

(ii) The surface water quality criteria for sulfate calculated from equations in clause (A) shall be rounded to the nearest whole numbers, except when the criteria are used as intermediate values in a calculation, such as in the calculation of WQBELs.

(C) The following establishes surface water quality criteria for sulfate in mg/l at selected concentrations of hardness and chloride, with the understanding that the equations in clause (A) shall be used instead of the criteria in this clause when sulfate criteria are used as intermediate values in a calculation, such as in the calculation of WQBELs:

	Hardness (mg/l)										
Chloride (mg/l)	<100	100	150	200	250	300	350	400	450	500	>500
<5	500	500	500	500	500	500	500	500	500	500	500
5	500	515	703	891	1,080	1,268	1,456	1,644	1,832	2,020	2,020
10	500	691	879	1,067	1,256	1,444	1,632	1,820	2,008	2,196	2,196
15	500	867	1,055	1,243	1,432	1,620	1,808	1,996	2,184	2,372	2,372
20	500	1,043	1,231	1,419	1,608	1,796	1,984	2,172	2,360	2,549	2,549
25	500	1,164	1,343	1,522	1,701	1,880	2,059	2,238	2,417	2,596	2,596
50	500	1,141	1,320	1,499	1,678	1,857	2,036	2,215	2,394	2,573	2,573
100	500	1,093	1,272	1,451	1,630	1,809	1,988	2,167	2,346	2,525	2,525
150	500	1,046	1,225	1,404	1,583	1,762	1,941	2,120	2,299	2,478	2,478
200	500	998	1,177	1,356	1,535	1,715	1,894	2,073	2,252	2,431	2,431
230	500	970	1,149	1,328	1,507	1,686	1,865	2,044	2,223	2,402	2,402

(b) This subsection establishes minimum surface water quality for aquatic life. In addition to subsection (a), subdivisions (1) through (5) are established to ensure conditions necessary for the maintenance of a well-balanced aquatic community. The following are applicable at any point in the waters outside of the mixing zone:

(1) There shall be no substances that:

(A) impart unpalatable flavor to food fish; or

(B) result in offensive odors in the vicinity of the water.

(2) No pH values below six (6.0) or above nine (9.0), except daily fluctuations that:

(A) exceed pH nine (9.0); and

(B) are correlated with photosynthetic activity;

shall be permitted.

(3) Concentrations of dissolved oxygen shall:

(A) average at least five (5.0) milligrams per liter per calendar day; and

(B) not be less than four (4.0) milligrams per liter at any time.

(4) The following are conditions for temperature:

(A) There shall be no abnormal temperature changes that may adversely affect aquatic life unless caused by natural conditions.

(B) The normal daily and seasonal temperature fluctuations that existed before the addition of heat due to other than natural causes shall be maintained.

(C) The maximum temperature rise at any time or place above natural temperatures shall not exceed:

(i) five (5) degrees Fahrenheit (two and eight-tenths (2.8) degrees Celsius) in streams; and

(ii) three (3) degrees Fahrenheit (one and seven-tenths (1.7) degrees Celsius) in lakes and reservoirs.

(D) Water temperatures shall not exceed the maximum limits in the following table during more than one percent (1%) of the hours in the twelve (12) month period ending with any month. At no time shall the water temperature at such locations exceed the maximum limits in the following table by more than three (3) degrees Fahrenheit (one and seven-tenths (1.7) degrees Celsius):

Table 6-4

	Ohio River Main Stem °F(°C)	Other Indiana Streams °F(°C)
January	50 (10.0)	50 (10.0)
February	50 (10.0)	50 (10.0)
March	60 (15.6)	60 (15.6)
April	70 (21.1)	70 (21.1)
May	80 (26.7)	80 (26.7)
June	87 (30.6)	90 (32.2)
July	89 (31.7)	90 (32.2)
August	89 (31.7)	90 (32.2)
September	87 (30.7)	90 (32.2)
October	78 (25.6)	78 (25.5)
November	70 (21.1)	70 (21.1)
December	57 (14.0)	57 (14.0)

(5) The following criteria will be used to regulate ammonia:

(A) Except for waters covered in clause (B), at all times, all surface waters outside of mixing zones shall be free of substances in concentrations that, on the basis of available scientific data, are believed to be sufficient to:

(i) injure;

(ii) be chronically toxic to; or

(iii) be carcinogenic, mutagenic, or teratogenic to;

humans, animals, aquatic life, or plants.

(B) For those waters listed in subsection (c), the following ammonia criteria will apply outside the mixing zone:

Maximum Ammonia Concentrations
(Unionized Ammonia as N)[***]
(mg/l)

	Temperature (°C)						
pH	0	5	10	15	20	25	30
6.5	0.0075	0.0106	0.0150	0.0211	0.0299	0.0299	0.0299
6.6	0.0092	0.0130	0.0183	0.0259	0.0365	0.0365	0.0365
6.7	0.0112	0.0158	0.0223	0.0315	0.0444	0.0444	0.0444
6.8	0.0135	0.0190	0.0269	0.0380	0.0536	0.0536	0.0536
6.9	0.0161	0.0228	0.0322	0.0454	0.0642	0.0642	0.0642
7.0	0.0191	0.0270	0.0381	0.0539	0.0761	0.0761	0.0761
7.1	0.0244	0.0316	0.0447	0.0631	0.0892	0.0892	0.0892
7.2	0.0260	0.0367	0.0518	0.0732	0.1034	0.1034	0.1034
7.3	0.0297	0.0420	0.0593	0.0837	0.1183	0.1183	0.1183
7.4	0.0336	0.0474	0.0669	0.0946	0.1336	0.1336	0.1336
7.5	0.0374	0.0528	0.0746	0.1054	0.1489	0.1489	0.1489
7.6	0.0411	0.0581	0.0821	0.1160	0.1638	0.1638	0.1638
7.7	0.0447	0.0631	0.0892	0.1260	0.1780	0.1780	0.1780
7.8	0.0480	0.0678	0.0958	0.1353	0.1911	0.1911	0.1911

7.9	0.0510	0.0720	0.1017	0.1437	0.2030	0.2030	0.2030
8.0	0.0536	0.0758	0.1070	0.1512	0.2135	0.2135	0.2135
8.1	0.0537	0.0758	0.1071	0.1513	0.2137	0.2137	0.2137
8.2	0.0537	0.0758	0.1071	0.1513	0.2137	0.2137	0.2137
8.3	0.0537	0.0758	0.1071	0.1513	0.2137	0.2137	0.2137
8.4	0.0537	0.0758	0.1071	0.1513	0.2137	0.2137	0.2137
8.5	0.0537	0.0758	0.1071	0.1513	0.2137	0.2137	0.2137
8.6	0.0537	0.0758	0.1071	0.1513	0.2137	0.2137	0.2137
8.7	0.0537	0.0758	0.1071	0.1513	0.2137	0.2137	0.2137
8.8	0.0537	0.0758	0.1071	0.1513	0.2137	0.2137	0.2137
8.9	0.0537	0.0758	0.1071	0.1513	0.2137	0.2137	0.2137
9.0	0.0537	0.0758	0.1071	0.1513	0.2137	0.2137	0.2137

[***]To calculate total ammonia, divide the number in the table by the value determined by: $1/(10^{pK_a - pH} + 1)$.

Where: pK_a = $0.09018 + (2729.92/(T + 273.2))$

pH = pH of water

T = °C

24-Hour Average Ammonia Concentrations
(Unionized Ammonia as N)[***]
(mg/l)
Temperature (°C)

pH	0	5	10	15	20	25	30
6.5	0.0005	0.0008	0.0011	0.0015	0.0015	0.0015	0.0015
6.6	0.0007	0.0010	0.0014	0.0019	0.0019	0.0019	0.0019
6.7	0.0009	0.0012	0.0017	0.0024	0.0024	0.0024	0.0024
6.8	0.0011	0.0015	0.0022	0.0031	0.0031	0.0031	0.0031
6.9	0.0014	0.0019	0.0027	0.0038	0.0038	0.0038	0.0038
7.0	0.0017	0.0024	0.0034	0.0048	0.0048	0.0048	0.0048
7.1	0.0022	0.0031	0.0043	0.0061	0.0061	0.0061	0.0061
7.2	0.0027	0.0038	0.0054	0.0077	0.0077	0.0077	0.0077
7.3	0.0034	0.0048	0.0068	0.0097	0.0097	0.0097	0.0097
7.4	0.0043	0.0061	0.0086	0.0122	0.0122	0.0122	0.0122
7.5	0.0054	0.0077	0.0108	0.0153	0.0153	0.0153	0.0153
7.6	0.0068	0.0097	0.0136	0.0193	0.0193	0.0193	0.0193
7.7	0.0086	0.0122	0.0172	0.0242	0.0242	0.0242	0.0242
7.8	0.0092	0.0130	0.0184	0.0260	0.0260	0.0260	0.0260
7.9	0.0098	0.0138	0.0196	0.0276	0.0276	0.0276	0.0276
8.0	0.0103	0.0146	0.0206	0.0294	0.0294	0.0294	0.0294
8.1	0.0103	0.0146	0.0206	0.0294	0.0294	0.0294	0.0294
8.2	0.0103	0.0146	0.0206	0.0294	0.0294	0.0294	0.0294
8.3	0.0103	0.0146	0.0206	0.0294	0.0294	0.0294	0.0294
8.4	0.0103	0.0146	0.0206	0.0294	0.0294	0.0294	0.0294
8.5	0.0103	0.0146	0.0206	0.0294	0.0294	0.0294	0.0294
8.6	0.0103	0.0146	0.0206	0.0294	0.0294	0.0294	0.0294
8.7	0.0103	0.0146	0.0206	0.0294	0.0294	0.0294	0.0294
8.8	0.0103	0.0146	0.0206	0.0294	0.0294	0.0294	0.0294
8.9	0.0103	0.0146	0.0206	0.0294	0.0294	0.0294	0.0294
9.0	0.0103	0.0146	0.0206	0.0294	0.0294	0.0294	0.0294

[***]To calculate total ammonia, divide the number in the table by the value determined by: $1/(10^{pK_a - pH} + 1)$.

Where: pK_a = $0.09018 + (2729.92/(T + 273.2))$

pH = pH of water

T = °C

(c) This subsection establishes surface water quality for cold-water fish. In addition to subsections (a) and (b), the following criteria are established to ensure conditions necessary for the maintenance of a well-balanced, cold-water fish community and are applicable at any point in the waters outside of the mixing zone:

(1) Waters:

(A) designated as salmonid waters; and

(B) that shall be protected for cold-water fish;

are those waters designated by the Indiana department of natural resources for put-and-take trout fishing.

(2) In the waters listed in subdivision (1), dissolved oxygen concentrations shall not be less than:

(A) six (6.0) milligrams per liter at any time; and

(B) seven (7.0) milligrams per liter in areas where spawning occurs during the spawning season and in areas used for imprinting during the time salmonids are being imprinted.

(3) In those waters listed in subdivision (1), the maximum temperature rise above natural shall not exceed two (2) degrees Fahrenheit (one and one-tenth (1.1) degrees Celsius) at any time or place and, unless due to natural causes, the temperature shall not exceed the following:

(A) Seventy (70) degrees Fahrenheit (twenty-one and one-tenth (21.1) degrees Celsius) at any time.

(B) Sixty-five (65) degrees Fahrenheit (eighteen and three-tenths (18.3) degrees Celsius) during spawning and imprinting periods.

(d) This subsection establishes bacteriological quality for recreational uses during the recreational season as follows:

(1) The recreational season is defined as the months of April through October, inclusive.

(2) In addition to subsection (a), the criteria in this subsection are to be used to do the following:

(A) Evaluate waters for full body contact recreational uses.

(B) Establish wastewater treatment requirements.

(C) Establish effluent limits during the recreational season.

(3) For full body contact recreational uses, E. coli bacteria shall not exceed the following:

(A) One hundred twenty-five (125) per one hundred (100) milliliters as a geometric mean based on not less than five (5) samples equally spaced over a thirty (30) day period.

(B) Two hundred thirty-five (235) per one hundred (100) milliliters in any one (1) sample in a thirty (30) day period, except that in cases where there are at least ten (10) samples at a given site, up to ten percent (10%) of the samples may exceed two hundred thirty-five (235) cfu or MPN per one hundred (100) milliliters where the:

(i) E. coli exceedances are incidental and attributable solely to E. coli resulting from the discharge of treated wastewater from a wastewater treatment plant as defined at IC 13-11-2-258; and

(ii) criterion in clause (A) is met.

However, a single sample shall be used for making beach notification and closure decisions.

If a geometric mean cannot be calculated because five (5) equally spaced samples are not available, then the criterion stated in clause (B) must be met.

(4) For demonstrating compliance with wastewater treatment requirements, sanitary wastewater dischargers shall ensure the following:

(A) The concentration of E. coli in the undiluted discharge does not exceed one hundred twenty-five (125) cfu or MPN per one hundred (100) milliliters as a geometric mean of the effluent samples taken in a calendar month.

(B) Not more than ten percent (10%) of all samples when not less than ten (10) samples are taken and analyzed for E. coli in a calendar month exceed two hundred thirty-five (235) cfu or MPN per one hundred (100) milliliters as a daily maximum. Under this clause, the calculation of ten percent (10%) of the samples taken shall be limited to the lowest whole number result.

(5) Effluent limits to implement the criteria in subdivision (3) during the recreational season shall be established in NPDES permits by incorporating the following that are to be applied to the undiluted discharge:

(A) The concentration of E. coli in the undiluted discharge shall not exceed one hundred twenty-five (125) cfu or MPN per one hundred (100) milliliters as a geometric mean of the effluent samples taken in a calendar month.

(B) Not more than ten percent (10%) of all samples in a calendar month exceed two hundred thirty-five (235) cfu or MPN per one hundred (100) milliliters as a daily maximum. Under this clause, the calculation of ten percent (10%) of the samples taken shall be limited to the lowest whole number result.

(e) This subsection establishes surface water quality for public water supply. In addition to subsections (a) and (d), the following criteria are established to protect the surface water quality at the point at which water is withdrawn for treatment for public supply:

(1) The coliform bacteria group shall not exceed the following:

(A) Five thousand (5,000) per one hundred (100) milliliters as a monthly average value (either MPN or MF count).

(B) Five thousand (5,000) per one hundred (100) milliliters in more than twenty percent (20%) of the samples examined during any month.

(C) Twenty thousand (20,000) per one hundred (100) milliliters in more than five percent (5%) of the samples examined during any month.

(2) Taste and odor producing substances, other than naturally occurring, shall not interfere with the production of a finished water by conventional treatment consisting of the following:

(A) Coagulation.

(B) Sedimentation.

(C) Filtration.

(D) Disinfection.

(3) The concentrations of either chloride or sulfate shall not exceed two hundred fifty (250) milligrams per liter unless due to naturally occurring sources.

(4) The concentration of dissolved solids shall not exceed seven hundred fifty (750) milligrams per liter unless due to naturally occurring sources. A specific conductance of one thousand two hundred (1,200) micromhos per centimeter (at twenty-five (25) degrees Celsius) may be considered equivalent to a dissolved solids concentration of seven hundred fifty (750) milligrams per liter.

(5) Surface waters shall be considered acceptable for public water supply if radium-226 and strontium-90 are present in amounts not exceeding three (3) and ten (10) picocuries per liter, respectively. In the known absence of strontium-90 and alpha emitters, the water supply is acceptable when the gross beta concentrations do not exceed one thousand (1,000) picocuries per liter.

(6) Chemical constituents in the waters shall not be present in such levels as to prevent, after conventional treatment, meeting the drinking water standards contained in 327 IAC 8-2, due to other than natural causes.

(f) This subsection establishes surface water quality for industrial water supply. In addition to subsection (a), the criterion to ensure protection of water quality at the point at which water is withdrawn for use (either with or without treatment) for industrial cooling and processing is that, other than from naturally occurring sources, the dissolved solids shall not exceed seven hundred fifty (750) milligrams per liter at any time. A specific conductance of one thousand two hundred (1,200) micromhos per centimeter (at twenty-five (25) degrees Celsius) may be considered equivalent to a dissolved solids concentration of seven hundred fifty (750) milligrams per liter.

(g) This subsection establishes surface water quality for agricultural uses. The criteria to ensure water quality conditions necessary for agricultural use are the same as those in subsection (a).

(h) This subsection establishes surface water quality for limited uses. The quality of waters classified for limited uses under section 3(a)(5) of this rule shall, at a minimum, meet the following criteria:

(1) The criteria contained in subsection (a).

(2) The criteria contained in subsection (d).

(3) The criteria contained in subsection (f), where applicable.

(4) The waters must be aerobic at all times.

(5) Notwithstanding subdivisions (1) through (4), the quality of a limited use stream at the point where it becomes physically or chemically capable of supporting a higher use or at its interface with a higher use water segment shall meet the criteria that are applicable to the higher use water.

(i) This subsection establishes surface water quality for exceptional uses. Waters classified for exceptional uses warrant extraordinary protection. Unless criteria are otherwise specified on a case-by-case basis, the quality of all waters designated for exceptional use shall be maintained without degradation. *(Water Pollution Control Board; 327 IAC 2-1-6; filed Sep 24, 1987, 3:00 p.m.: 11 IR 581; filed Feb 1, 1990, 4:30 p.m.: 13 IR 1020; errata, 13 IR 1861; errata filed Jul 6, 1990, 5:00 p.m.: 13 IR 2003; filed Feb 26, 1993, 5:00 p.m.: 16 IR 1725; errata filed May 7, 1993, 4:00 p.m.: 16 IR 2189; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1348; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3376; filed Feb 14, 2005, 10:05 a.m.: 28 IR 2047; errata filed Apr 6, 2006, 2:48 p.m.: 29 IR 2546; errata, 29 IR 3027; filed Mar 18, 2008, 2:26 p.m.: 20080416-IR-327060573FRA; filed May 22, 2008, 10:40 a.m.:*

20080618-IR-327070185FRA)

327 IAC 2-1-7 Interim ground water quality standards (Repealed)

Sec. 7. *(Repealed by Water Pollution Control Board; filed Feb 4, 2002, 11:00 a.m.: 25 IR 1882)*

327 IAC 2-1-8 Methods of analysis

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4

Sec. 8. The analytical procedures used as methods of analysis to determine the chemical, bacteriological, biological, and radiological quality of waters sampled shall be in accordance with 40 CFR 136 or methods approved by the commissioner. *(Water Pollution Control Board; 327 IAC 2-1-8; filed Sep 24, 1987, 3:00 p.m.: 11 IR 583; filed Feb 1, 1990, 4:30 p.m.: 13 IR 1033; filed Feb 14, 2005, 10:05 a.m.: 28 IR 2055)*

327 IAC 2-1-8.1 Calculation of criteria for toxic substances; general

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4

Sec. 8.1. (a) Water quality standards for the state of Indiana indicate that all surface waters at all times and at all places, including the mixing zone, shall be free of substances or combinations of substances that are in amounts sufficient to be acutely toxic to humans, other animals, plants, or aquatic life. Toxic substances include, but are not limited to, those substances identified under Section 307(a) of the Clean Water Act. The allowable concentration of a toxic substance in surface water shall be determined for that substance by the procedures in sections 8.2 through 8.9 of this rule.

(b) The use of dissolved metal to set and measure compliance with water quality standards for aquatic life is the recommended approach because dissolved metal more closely approximates the bioavailable fraction of metal in the water column than does total recoverable metal. Reasons for the consideration of total recoverable metals criteria include risk management considerations not covered by evaluation of water column toxicity. The commissioner may, after considering sediment and food chain effects for a particular metal, decide to take a more conservative approach for the metal. This approach could include the expression of aquatic life criteria for the metal in the form of total recoverable metal. If the commissioner determines that it is appropriate to express aquatic life criteria for a particular metal in the form of dissolved metal, the criteria shall be determined as follows:

(1) If sufficient toxicological data in the form of dissolved metal are available, these data shall be used in sections 8.2, 8.3, and 8.9 of this rule to derive aquatic life criteria directly in the form of dissolved metal.

(2) If sufficient toxicological data in the form of dissolved metal are not available, aquatic life criteria shall be derived in the form of total recoverable metal using the procedures in sections 8.2, 8.3, and 8.9 of this rule and then multiplied by criteria conversion factors approved by the commissioner to express the criteria in the form of dissolved metal.

(3) If sufficient toxicological data in the form of dissolved metal are not available and criteria conversion factors for the particular metal have not been approved by the commissioner, aquatic life criteria shall be derived in the form of total recoverable metal using the procedures in sections 8.2, 8.3, and 8.9 of this rule and expressed in the form of total recoverable metal.

(Water Pollution Control Board; 327 IAC 2-1-8.1; filed Feb 1, 1990, 4:30 p.m.: 13 IR 1033; errata filed Jul 6, 1990, 5:00 p.m.: 13 IR 2003; filed Feb 14, 2005, 10:05 a.m.: 28 IR 2055)

327 IAC 2-1-8.2 Determination of acute aquatic criteria (AAC)

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4

Sec. 8.2. In order to ensure that the concentration of a substance or combination of substances does not become acutely toxic to aquatic organisms, an acute aquatic criterion (AAC) will be determined by one (1) of the following methods:

(1) The following for Method 1:

(A) If no AAC is available in section 6(a)(3), Table 6-1 of this rule or section 6(a)(3), Table 6-2 of this rule for the

substance, an AAC can be calculated using the procedures in this subdivision.

(B) An acute criterion can be calculated using modified U.S. EPA procedures when acute toxicity data are available for at least five (5) North American genera of freshwater organisms, including representatives of the following families:

(i) The family Salmonidae.

(ii) The family Cyprinidae or Centrarchidae.

(iii) Another family, not represented in item (i) or (ii), in the Class Osteichthyes.

(iv) The family Daphnidae.

(v) Another aquatic macroinvertebrate family.

(C) Resident species data are preferred for the required data set in clause (B). If one (1) or more of the required families are not a site resident, the requirement may be waived and appropriate substitution will be made. If data are not available for resident species, data for nonresident species may be substituted and will be assumed to be representative of resident species. The AAC is calculated using the following procedures:

(i) If the acute toxicity of the chemical has not been adequately shown to be related to a water quality characteristic, such as hardness, pH, or temperature, the AAC is calculated using the following procedures:

(AA) For each species for which at least one (1) acute value is available, the species mean acute value (SMAV) is calculated as the geometric mean of the results of all tests in which the concentrations of test material were stable as shown by measured values. For a species for which no such result is available, the SMAV should be calculated as the geometric mean of all available acute values, for example, results of flow-through tests in which the concentrations were not measured and results of static and renewal tests based on initial concentrations of test material.

(BB) For each genus for which one (1) or more SMAVs are available, the genus mean acute value (GMAV) is calculated as the geometric mean of the SMAVs available for the genus.

(CC) The GMAVs are ordered from high to low.

(DD) Ranks (R) are assigned to the GMAVs from "1" for the lowest to "N" for the highest. If two (2) or more GMAVs are identical, successive ranks are arbitrarily assigned.

(EE) The cumulative probability, P, is calculated for each GMAV as R/(N + 1).

(FF) The (T) GMAVs (T = 2 for N = 5; T = 3 for N = 6 or 7; T = 4 for N = 8 or greater) are selected that have cumulative probabilities closest to five-hundredths (0.05). If there are fewer than fifty-nine (59) GMAVs, these will always be the two (2) (for N = 5), three (3) (for N = 6 or 7), or four (4) (for N = 8 or greater) lowest GMAVs.

(GG) Using the selected GMAVs and Ps, the final acute value (FAV) is calculated as:

$$S^2 = \frac{{}^*E((\ln GMAV)^2) - ((E(\ln GMAV))^2/T)}{E(P) - ((E(\sqrt{P}))^2/T)}$$

$$L = (E(\ln GMAV) - S(E(\sqrt{P})))/T$$

$$A = S(\sqrt{0.05}) + L$$

$$FAV = e^A$$

$$AAC = FAV/2$$

$${}^*E = \text{Summation}$$

(HH) If, for a commercially, recreationally, or ecologically important species, the geometric mean of the acute values from flow-through tests in which the concentrations of test material were measured is lower than the calculated FAV, then that geometric mean is used as the FAV instead of the calculated FAV.

(ii) If data are available to show that acute toxicity to two (2) or more species is similarly related to a water quality characteristic, the AAC is calculated using the procedures as follows:

(AA) For each species for which comparable acute toxicity values are available at two (2) or more different values of the water quality characteristic, a least squares regression of the acute toxicity values on the corresponding values of the water quality characteristic is performed to obtain the slope of the curve that describes the relationship. Because the best documented relationship is that between hardness and acute toxicity of metals and a log-log relationship fits these data, geometric means and natural logarithms of both toxicity and water quality are used in the rest of this procedure to illustrate the method. For relationships based on other water quality characteristics, such as pH or temperature, no transformation or a different

transformation might fit the data better, and appropriate changes will be made as necessary throughout this method.

(BB) Each acute slope is evaluated as to whether or not it is meaningful, taking into account the range and number of tested values of the water quality characteristic and the degree of agreement within and between species. If meaningful slopes are not available for at least one (1) fish and one (1) invertebrate, or if the available slopes are too dissimilar, or if too few data are available to adequately define the relationship between acute toxicity and the water quality characteristic, the AAC is calculated using the procedures in item (i).

(CC) Individually, for each species, the geometric mean of the available acute values is calculated and then each of the acute values for a species is divided by the mean for the species. This normalizes the acute values so that the geometric mean of the normalized values for each species individually and for any combination of species is one (1.0).

(DD) The values of the water quality characteristic are similarly normalized for each species individually.

(EE) All the normalized data are treated as if they were for the same species and a least squares regression of all the normalized acute values on the corresponding normalized values of the water quality characteristic is performed to obtain the pooled acute slope, V.

(FF) For each species the geometric mean, W, of the acute toxicity values and the geometric mean, X, of the water quality characteristic are calculated. (These were calculated in subitems (CC) through (DD).)

(GG) For each species the logarithmic intercept, Y, is calculated using the equation:

$$Y = \ln W - V(\ln X - \ln Z)$$

(HH) For each species calculate the SMAV at Z using the equation:

$$SMAV = e^{Y}$$

(II) Obtain the FAV at Z by using the procedures described in subitems (BB) through (HH), replacing "value" with "intercept".

(JJ) The final acute equation is written as:

$$\text{final acute value (FAV)} = e^{(V\,(\ln(\text{water quality characteristic}) + \ln A - V\,(\ln Z))}$$

Where: V = pooled acute slope (from subitem (EE))

A = FAV at Z (from subitem (II))

Since V, A, and Z are known, the FAV can be calculated for any selected value of the water quality characteristic.

(KK) The AAC is equal to the FAV/2.

(D) If data are not available for at least five (5) North American freshwater genera meeting the requirements in clause (B), go to subdivision (2).

(2) The following for Method 2:

(A) If the required data to derive the AAC in subdivision (1)(C) are not present in the acute toxicity data base and at least one (1) LC_{50} value is available for a daphnid species and either fathead minnow, bluegill, or rainbow trout, an FAV is calculated by dividing the lowest SMAV for the daphnid species, fathead minnow, bluegill, and rainbow trout by five (5) if rainbow trout are represented or ten (10) if rainbow trout are not represented. The AAC equals the FAV divided by two (2). If appropriate, the AAC will be made a function of a water quality characteristic in a manner similar to that described in subdivision (1)(C)(ii).

(B) If the data required in clause (A) are not available, no AAC can be calculated and the discharger will be required to develop the minimum data base (ninety-six (96) hour LC_{50} for rainbow trout, fathead minnow, or bluegill and a forty-eight (48) hour LC_{50} for a daphnid) needed to calculate the AAC.

(Water Pollution Control Board; 327 IAC 2-1-8.2; filed Feb 1, 1990, 4:30 p.m.: 13 IR 1033; errata filed Jul 6, 1990, 5:00 p.m.: 13 IR 2004; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1357; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3376; filed Feb 14, 2005, 10:05 a.m.: 28 IR 2056)

327 IAC 2-1-8.3 Determination of chronic aquatic criteria (CAC)

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3

Affected: IC 13-18-4

Sec. 8.3. In order to ensure that the concentration of a substance or combination of substances does not produce chronic effects on aquatic organisms, a chronic aquatic criterion (CAC) will be determined by one (1) of the following methods:

(1) The following for Method 1:

(A) If no CAC is given for the substance in section 6(a)(3), Table 6-1 of this rule, or section 6(a)(3), Table 6-2 of this rule, a CAC can be calculated using the procedures in this subdivision.

(B) The CAC is derived in the same manner as the FAV in section 8.2(1) of this rule by substituting CAC for FAV, chronic for acute, MATC (maximum acceptable toxicant concentration) for LC_{50}, SMCV (species mean chronic value) for SMAV, and GMCV (genus mean chronic value) for GMAV.

(C) If chronic toxicity data are not available for at least five (5) North American freshwater genera meeting the requirements in section 8.2(1)(B) of this rule, go to subdivision (2).

(2) The following for Method 2:

(A) The CAC can be calculated by dividing the FAV by an acute-chronic ratio (or geometric mean of the acute-chronic ratios if more than one (1) is available) for at least one (1) North American freshwater species.

(B) If no acute-chronic ratio is available for at least one (1) North American freshwater species, go to subdivision (3).

(3) The following for Method 3:

(A) The CAC can be calculated by dividing the FAV by a factor of forty-five (45). If, for a commercially, recreationally, or ecologically important species, the geometric mean of the chronic values is lower than the calculated CAC, then that geometric mean is used as the CAC instead of the calculated CAC.

(B) If the data needed in clause (A) are not available, no CAC can be calculated and the discharger will be required to develop the minimum data base necessary to calculate the CAC (ninety-six (96) hour LC_{50} for rainbow trout, fathead minnow, or bluegill and a forty-eight (48) hour LC_{50} for a daphnid).

(Water Pollution Control Board; 327 IAC 2-1-8.3; filed Feb 1, 1990, 4:30 p.m.: 13 IR 1035; errata, 13 IR 1861; errata filed Jul 6, 1990, 5:00 p.m.: 13 IR 2004; errata filed Jul 24, 1990, 4:55 p.m.: 13 IR 2138; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1359; filed Feb 14, 2005, 10:05 a.m.: 28 IR 2057)

327 IAC 2-1-8.4 Determination of the terrestrial life cycle safe concentration (TLSC)

Authority: IC 13-1-3-7; IC 13-7-7-5
Affected: IC 13-1-3-7; IC 13-7-7-5

Sec. 8.4. The concentration to protect wildlife is the terrestrial life cycle safe concentration (TLSC). The minimum toxicity data requirement for derivation of a TLSC shall consist of an acute oral LD_{50} for rats. When mammalian and avian toxicity data are available, a TLSC shall be calculated for both groups. The final TLSC is the lowest of the two (2) values. The TLSC shall be derived by one (1) of the following methods, depending on the type and quality of the toxicity data base:

(1) If a chronic, subchronic, or subacute no observable adverse effect level (NOAEL) from mammalian or avian species exposed to toxicant contaminated water is available:

$$TLSC = \frac{NOAEL\ (mg/l)}{U}$$

Where: U = uncertainty factor (U = 10-100 depending on quality of study)

(2) If a chronic, subchronic, or subacute NOAEL from mammalian or avian species exposed to toxicant contaminated feed is available:

$$TLSC = \frac{NOAEL(ppm) \times C \times \frac{W_a}{V_w}}{U}$$

Where: C = weight of feed consumed daily expressed as a fraction of test animal's body weight
W_a = weight of test animal (kg)
V_w = volume of water consumed daily by the test animal

(3) If a chronic, subchronic, or subacute NOAEL from mammalian or avian species exposed to toxicant by gavage is available:

$$TLSC = \frac{NOAEL\,(mg/kg/day) \times \frac{W_a}{V_w} \times Fw}{U}$$

Where: Fw = fraction of days dosed per week

(4) If an oral rat LD_{50} is available:

$$TLSC = \frac{LD_{50}\,(mg/kg) \times \frac{W_a}{V_w} \times M}{10}$$

Where: M = one ten-thousandth (0.0001), acute to chronic application factor

(5) TLSCs are best derived from data involving oral exposure. However, if available oral data are insufficient, it may be useful to use data from other exposure routes. Use of such data will depend on the specific pharmacokinetic and toxicological properties of each chemical.

(6) If an acceptable NOAEL is lacking, the lowest observable adverse effect level (LOAEL) may be substituted in some cases for NOAEL, with an additional uncertainty factor of one (1) to ten (10).

(7) On the basis of available information, the TLSC is evaluated as to whether it is consistent with sound scientific judgment. If not, the commissioner will direct the evaluation of appropriate modifications of these procedures.

(Water Pollution Control Board; 327 IAC 2-1-8.4; filed Feb 1, 1990, 4:30 p.m.: 13 IR 1036; errata, 13 IR 1861; errata filed Jul 6, 1990, 5:00 p.m.: 13 IR 2004)

327 IAC 2-1-8.5 Determination of the human life cycle safe concentration (HLSC)

Authority: IC 13-1-3-7; IC 13-7-7-5

Affected: IC 13-1-3-7; IC 13-7-7-5

Sec. 8.5. The concentration to protect public health from threshold effect toxicants is the human life cycle safe concentration (HLSC). The minimum toxicity data requirement for derivation of an HLSC shall consist of an acute oral LD_{50} for rats. The HLSC shall be derived in the following manner:

(1) The HLSC shall be derived from appropriate toxicological data using the following formula:

$$HLSC = \frac{MgT\,(mg/day)}{WC + (F \times BCF)}$$

Where: MgT = maximum milligrams of toxicant per day causing no adverse effects to humans when ingested daily for lifetime

WC = volume of water consumed daily in liters (two (2) liters per day for surface water protected for drinking water supply; one-hundredth (0.01) liter per day for surface water not protected for drinking water supply)

F = sixty-five ten-thousandths (0.0065) kilograms per day, daily consumption of fish by humans

BCF = bioconcentration factor in $\frac{mg/kg}{mg/l}$ as determined in section 8.7 of this rule

(2) The MgT shall be derived by one (1) of the following methods depending on the type and quality of the toxicity data base:

(A) If a scientifically valid maximum contaminant level (MCL) from the national interim primary drinking water regulations is available:

$$MgT = MCL\ (mg/l) \times V_h$$

Where: V_h = two (2) liters per day, volume of water consumed daily by humans

(B) If a chronic, subchronic, or subacute no observable adverse effect level (NOAEL) for humans exposed to toxicant contaminated drinking water is available:

$$MgT = \frac{NOAEL\ (mg/l) \times V_h}{U}\ (1/day)$$

Where: U = uncertainty factor (U = 10 - 100)

(C) If a scientifically valid acceptable daily intake (ADI) is available from the federal Food and Drug Administration regulations: MgT = ADI.

(D) If a chronic, subchronic, or subacute NOAEL from mammalian test species exposed to toxicant contaminated drinking water is available:

$$MgT = \frac{NOAEL\,(mg/l) \times \frac{V_w}{W_a} \times W_h}{B}$$

Where: V_w = volume of water consumed daily by test animal (liters per day)
W_a = weight of test animal (kg)
W_h = seventy (70) kilograms, weight of human
B = uncertainty factor (B = 100–1,000 depending on quality of study)

(E) If a chronic, subchronic, or subacute NOAEL from mammalian test species exposed to toxicant contaminated food is available:

$$MgT = \frac{NOAEL\,(ppm) \times C \times W_h}{B}$$

Where: C = daily food consumption expressed as a fraction of the animal's body weight

(F) If a chronic, subchronic, or subacute NOAEL from mammalian test species exposed to toxicant by gavage is available:

$$MgT = \frac{NOAEL\,(mg/kg/day) \times F_w \times W_h}{B}$$

Where: F_w = fraction of days dosed per week

(G) If an oral rat LD_{50} is available:

$$MgT = \frac{LD_{50}\,(mg/kg) \times M \times W_h}{100}$$

Where: M = one-ten thousandth (0.0001), acute to chronic application factor

(H) If an acceptable NOAEL is lacking, the lowest observable adverse effect level (LOAEL) may be substituted in some cases for NOAEL, with an additional uncertainty factor of one (1) to ten (10).

(I) HLSCs are best derived from data involving oral exposure. However, if available oral data are insufficient, it may be useful to use data from other exposure routes. Use of such data will depend on the specific pharmacokinetic and toxicological properties of each chemical.

(J) On the basis of available information, the HLSC is evaluated as to whether it is consistent with sound scientific judgment. If not, the commissioner will direct the evaluation of appropriate modifications of these procedures.

(Water Pollution Control Board; 327 IAC 2-1-8.5; filed Feb 1, 1990, 4:30 p.m.: 13 IR 1037; errata filed Jul 6, 1990, 5:00 p.m.: 13 IR 2004)

327 IAC 2-1-8.6 Determination of concentration providing an acceptable degree of protection to public health for cancer

Authority: IC 13-1-3-7; IC 13-7-7-5
Affected: IC 13-1-3-7; IC 13-7-7-5

Sec. 8.6. (a) The concentration providing an acceptable degree of protection to public health for cancer shall be derived as provided in subsection (b)(1). For carcinogens that are assumed to cause cancer by a nonthreshold mechanism, a greater degree of protection than that derived in subsection (b)(1) may be proposed where this greater protection is achievable through utilization of control measures already in place.

(b) Initially, any chemical for which at least one (1) published mammalian carcinogenicity study of suitable quality demonstrates an association between exposure to the chemical and a statistically or biologically significant increase in the incidence of malignant or benign tumors shall be considered a carcinogen. With respect to "suitable quality," the only type of carcinogenicity study which will be automatically excluded from consideration as sole evidence of the carcinogenic properties of a particular chemical will be studies in which the tested chemical was administered via an injection route of exposure and an increase in malignant or benign tumors was produced only at the site of injection. Not included in this category are studies in which an injection dosing was administered intratracheally or by gavage. The commissioner shall reevaluate the carcinogenic potential of substances

when new data of suitable quality become available.

(1) A water concentration of the carcinogen shall be derived from human epidemiological data or from appropriate animal research data using the following formula:

$$C = \frac{D \times W_h}{WC + (F \times BCF)}$$

Where:

C	=	concentration of the carcinogen (mg/l)
D	=	dose derived in clause (A), (B), or (C) (mg/kg/day)
W_h	=	seventy (70) kilograms, weight of an average human
WC	=	daily water consumption (0.01 liters per day for surface water not protected for drinking water supply; 2.0 liters per day for surface waters protected for drinking water supply)
F	=	sixty-five ten-thousandths (0.0065) kilograms per day, daily fish consumption
BCF	=	bioconcentration factor in $\frac{mg/kg}{mg/l}$ as determined in section 8.7 of this rule

(A) The dose (D) may be derived from appropriate human epidemiological data on a case-by-case basis by the commissioner.

(B) Whenever appropriate human epidemiological data are not available, a nonthreshold mechanism shall be assumed for carcinogens which have not been adequately demonstrated to cause cancer by a threshold mechanism. The dose (D) shall be the concentration estimated to cause one (1) additional cancer over the background rate in one hundred thousand (100,000) individuals exposed to that concentration calculated using the following method:

(i) All carcinogenesis bioassay data are reviewed and data of appropriate quality are used for the quantitative risk estimations. The data are fitted into the multistage model using the computer model GLOBAL 82 developed by Howe and Crump (1982). The upper ninety-five percent (95%) confidence limit on risk at the one (1) in one hundred (100) risk level is divided by the maximum likelihood dose at the same level of risk which determines the slope, q_1^*. This is taken as an upper bound of the potency of the chemical in inducing cancer at low doses. Whenever the multistage model does not fit the data, as determined by the Chi-square goodness of fit statistical test, the model is refitted to the data omitting the highest dose. This is continued until an acceptable fit is determined as described in the U.S. EPA 1980 water quality criteria documents (45 Fed. Reg. 79316-79379). If a single study in which a chemical induces more than one (1) type of tumor is available, then the response for the tumor type predicting the highest estimate of q_1^* is generally used for the risk assessment. If two (2) or more studies of equal quality are available, but vary in any of the following: species, strain, sex, or tumor type, then the data set giving the highest estimate of q_1^* is generally used for the risk assessment. If two (2) or more studies exist which are identical regarding species, strain, sex, tumor type, and are of equal quality, then the geometric mean of the q_1^* values from these data sets is used.

(ii) The dose corresponding to an estimated one (1) additional cancer in one hundred thousand (100,000) exposed test organisms is determined by dividing 10^{-5} by the value for q_1^*.

(iii) A species sensitivity factor is used to account for differences between test species and man. It is assumed that milligrams per surface area per day is an equivalent dose between species. The value may be calculated by dividing the average weight of a human seventy (70) kilograms by the weight of the test species and taking the cube root of this value; the slope q_1^* is multiplied by this factor. However, if adequate pharmacokinetic and metabolism studies are available, this data may be factored into the adjustment for species differences on a case-by-case basis.

(iv) All doses are adjusted to give a lifetime average daily dose. If dosing was only for a fraction of a lifetime, then the total dose is averaged over the entire life span.

(v) If the duration of experiment (L_e) is less than the natural life span of the test animal (L), the slope, q_1^*, is multiplied by the factor

$$\left(\frac{L}{L_e}\right)^{3.}$$

(C) Whenever appropriate human epidemiological data are not available, and the preponderance of data suggests that the chemical causes cancer by a threshold mechanism and does not interact with DNA, the dose (D) for chemicals shall

be calculated from animal research data by applying a safety factor to an appropriate toxicity end point.

(i) The appropriate toxicity end point shall be determined by the commissioner on a case-by-case basis.

(ii) The safety factor shall be determined by the commissioner based on an evaluation of appropriate toxicological and pharmacological considerations including, mechanism of carcinogenesis, number and type of tumors induced, the spontaneous incidence of tumors, the number of animal species tested and affected, metabolic considerations, epidemiologic observation on exposed humans, extent of the data supporting a nongenetic mechanism, and other pertinent information.

(iii) A species sensitivity factor may be used to account for differences between test species and man.

(2) On the basis of available information, the concentration providing an acceptable degree of protection to public health for cancer is evaluated as to whether it is consistent with sound scientific judgment. If not, the commissioner will direct the evaluation of appropriate modifications of these procedures.

(Water Pollution Control Board; 327 IAC 2-1-8.6; filed Feb 1, 1990, 4:30 p.m.: 13 IR 1038; errata filed Jul 6, 1990, 5:00 p.m.: 13 IR 2004)

327 IAC 2-1-8.7 Determination of bioconcentration factor

Authority: IC 13-1-3-7; IC 13-7-7-5
Affected: IC 13-1-3-7; IC 13-7-7-5

Sec. 8.7. The final bioconcentration factor (BCF_f) standardized to reflect the value for fresh fish tissue having a lipid content of nine and six-tenths percent (9.6%) shall be determined as follows in order of preference:

(1) Measured, steady-state bioconcentration factors from standardized laboratory tests shall be recorded as BCF_m. If more than a single value is available, the BCF_m shall be equal to the geometric mean of the reported values.

(2) If bioconcentration factors are available from other laboratory tests, the BCF_m will be the projected steady-state BCF as extrapolated from the test data.

(3) If measured bioconcentration factors (BCF_m) are not available from laboratory studies, a calculated bioconcentration factor (BCF_c) will be determined by the following equation:

$$\log BCF_c = 0.847 \log Kow - 0.628$$

(A) If a measured Kow is not available for the chemical of interest the Kow may be calculated according to standard references and used in the regression equation in this subdivision.

(B) If a Kow cannot be calculated, BCF_c may be estimated on a case-by-case basis using other regression equations or correlations as appropriate.

(4) The final bioconcentration factor (BCF_f) will be obtained by normalization to nine and six-tenths percent (9.6%) lipids as follows:

(A) For measured bioconcentration factors:

$$\mathbf{BCF_f = BCF_m \frac{(9.6)}{L}}$$

Where: BCF_m = measured bioconcentration factor
L = percent lipid content of fish used in the test

(B) For bioconcentration factors calculated from Kow:

$$\mathbf{BCF_f = BCF_c \frac{(9.6)}{4.8}}$$

Where: BCF_c = calculated bioconcentration factor from log Kow or other regression equations
4.8 = average percent lipid for test fish used to develop the regression equation in subdivision (3)

(5) The commissioner shall direct the evaluation of the final bioconcentration factor (BCF_f) calculated above to determine if a trophic level adjustment is warranted.

(Water Pollution Control Board; 327 IAC 2-1-8.7; filed Feb 1, 1990, 4:30 p.m.: 13 IR 1039)

327 IAC 2-1-8.8 Variances from water quality standards; conditions

Authority: IC 13-1-3-7; IC 13-7-7-5; IC 13-7-7-6; IC 13-7-10-1
Affected: IC 4-22-2; IC 13-1-3; IC 13-7-4-1; IC 13-7-7.1

Sec. 8.8. (a) A permit applicant or permittee may apply to the commissioner for a variance from the water quality standard used to derive a water quality-based effluent limitation (WQBEL) contained in a NPDES permit for a specific substance. The application for such a variance shall be submitted in accordance with the requirements specified in 327 IAC 5-3-4.1.

(b) The commissioner may approve all or part of a requested variance, or modify and approve a requested variance, if the permit applicant demonstrates that implementing a proposed methodology, which includes any production process(es), wastewater treatment technology, or combination thereof used to reduce pollutants discharged in the wastewater from a facility, as identified pursuant to 327 IAC 5-3-4.1(b)(2)(A), will cause an undue hardship or burden upon the applicant.

(c) In making a determination on a variance application, the commissioner shall balance the environmental impact likely to result if the variance is granted against the hardship or burden upon the applicant if the variance is not granted. In balancing these factors, the commissioner shall consider the following to determine if the hardship or burden upon the applicant is undue:

(1) The cost and cost effectiveness of pollutant removal by implementing the methodologies proposed by the applicant and the methodology capable of attaining the WQBEL.

(2) The reduction in concentrations and loadings of pollutants attainable by the methodologies proposed by the applicant as compared with the reduction attainable by use of the methodology capable of attaining the WQBEL.

(3) The impact of the proposed methodologies and the methodology capable of attaining the WQBEL on the price of the goods or services provided by the applicant.

(4) Information on the relative price of goods or services in the same market as the applicant.

(5) The overall impact of attaining the WQBEL and implementing the proposed methodologies on employment at the facility.

(6) Information on the type and magnitude of adverse or beneficial environmental impacts, including the net impact on the receiving water, resulting from the proposed methodologies that could be applied to the control of the substance for which a variance is applied.

(7) Other relevant information requested by the commissioner or supplied by the applicant or the public.

(d) The commissioner may grant the variance when the requirements of subsections (b) and (c) are met.

(e) A determination to grant or deny a requested variance shall be made in accordance with the procedures specified in 327 IAC 5-3-4.1. In making this determination, the commissioner may also consider other information available to the agency or supplied by the applicant or the public.

(f) A variance applies only to the permit applicant requesting the variance and only to the substance specified in the variance application. The granting of a variance does not imply or require that the water quality standard corresponding to the variance be modified through a rulemaking in accordance with IC 4-22-2 and IC 13-7-7.1.

(g) A variance or any renewal thereof shall not be granted for a term greater than that allowed by IC 13-7-7-6. Notwithstanding the time at which the application for a variance is submitted under 327 IAC 5-3-4.1, a variance shall not be granted for a term greater than the term remaining under the permit to which the variance is attached.

(h) Neither the filing of a variance application nor the granting of a variance shall be grounds for the staying or dismissing of or a defense in a pending enforcement action. A variance shall be prospective only. *(Water Pollution Control Board; 327 IAC 2-1-8.8; filed Feb 1, 1990, 4:30 p.m.: 13 IR 1040; errata filed Jul 6, 1990, 5:00 p.m.: 13 IR 2004; filed Feb 26, 1993, 5:00 p.m.: 16 IR 1733; errata filed Mar 10, 1993, 5:00 p.m.: 16 IR 1832; filed Feb 15, 1995, 1:30 p.m.: 18 IR 1820)*

327 IAC 2-1-8.9 Site-specific modifications to criteria

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-15-4-1; IC 13-18-4

Sec. 8.9. (a) Site-specific modifications to criteria must be protective of designated uses and aquatic life or human health. In addition, any site-specific modifications that result in less stringent criteria must be based on a sound scientific rationale and shall not be likely to jeopardize the continued existence of endangered or threatened species listed or proposed under Section 4 of the Endangered Species Act (ESA) or result in the destruction or adverse modification of the species' critical habitats. More stringent modifications shall be developed to protect endangered or threatened species listed or proposed under Section 4 of the ESA, where the modifications are necessary to ensure that water quality is not likely to jeopardize the continued existence of the species or result

in the destruction or adverse modification of the species' critical habitats. More stringent modifications may also be developed to protect candidate (C1) species being considered by the U.S. Fish and Wildlife Service (FWS) for listing under Section 4 of the ESA, where the modifications are necessary to protect the species. Criteria may be modified on a site-specific basis to reflect local environmental conditions as restricted by the following provisions:

(1) Aquatic life criteria may be modified on a site-specific basis as follows:

(A) To provide an additional level of protection.

(B) Less stringent site-specific modifications to chronic or acute aquatic life criteria may be developed when either of the following conditions applies:

(i) The local water quality characteristics, such as pH, hardness, temperature, or color, alter the biological availability or toxicity of a pollutant.

(ii) The sensitivity of the aquatic organisms species that occur at the site differs from the species actually tested in developing the criteria.

(C) Less stringent modifications may also be developed to acute and chronic aquatic life criteria to reflect local physical and hydrological conditions.

(D) Any modifications to protect threatened or endangered aquatic species required by this subsection may be accomplished using either of the following procedures:

(i) If the species mean acute value (SMAV) for a listed or proposed species or for a surrogate of the species is lower than the calculated final acute value (FAV), the lower SMAV may be used instead of the calculated FAV in developing site-specific modified criteria.

(ii) The site-specific criteria may be calculated using the recalculation procedure for site-specific modifications under section 13 of this rule.

(2) Human health criteria may be modified on a site-specific basis as follows:

(A) To provide an additional level of protection in accordance with the following:

(i) Human health criteria shall be modified on a site-specific basis to provide additional protection appropriate for highly exposed subpopulations.

(ii) Any person may request the commissioner to develop a site-specific modification of a human health criterion to make it more stringent.

(iii) The commissioner shall develop the site-specific modification of the human health criterion to make it more stringent when local fish consumption rates are higher than the rate used to derive human health criteria under sections 8.5 and 8.6 of this rule.

(B) Less stringent site-specific modifications to human health criteria may be developed when local fish consumption rates are lower than the rate used to derive human health criteria under sections 8.5 and 8.6 of this rule.

(C) Local fish consumption rates referenced in clauses (A) and (B) shall be determined by a fish consumption survey applicable to the site.

(b) The application requirements for site-specific modifications to criteria allowed under subsection (a) are as follows:

(1) Except as provided in subdivision (2), the application requirements for site-specific modifications to criteria shall be determined by the commissioner on a case-by-case basis.

(2) Applications for site-specific modifications to criteria allowed under subsection (a)(1)(B)(ii) and determined using the recalculation procedure under section 13 of this rule shall include the following:

(A) A list of all species of aquatic invertebrates, amphibians, and fishes that are known to occur at the site, along with the source of the information.

(B) A list of all aquatic plant, invertebrate, amphibian, and fish species that are critical species at the site, including all species that:

(i) occur at the site; and

(ii) are listed as threatened or endangered under Section 4 of the ESA.

(C) A site-specific version of Table 1 from a criteria document produced by the U.S. EPA after 1984.

(D) A site-specific version of Table 3 from a criteria document produced by the U.S. EPA after 1984.

(E) A list of all species that were deleted.

(F) Each new calculated criterion (FAV, AAC, or CAC).

(G) Each lowered criterion if one (1) or more were lowered to protect a specific species.

(c) Upon receipt of an application for a site-specific modification to a criterion, the commissioner shall do the following:

(1) For a site-specific modification listed under subsection (d):

(A) provide notice, request comment, and, if requested, schedule and hold a public meeting on the application in accordance with 327 IAC 5-2-11.2(b); and

(B) publish all pertinent information about the proposed site-specific modification on the department's Web site.

(2) For a site-specific modification not listed under subsection (d):

(A) approve or deny the application; and

(B) if the application is approved, initiate a rulemaking to have the site-specific modification incorporated into the water quality standards.

(d) Site-specific modifications to criteria do not require a rulemaking if they are:

(1) allowed under:

(A) subsection (a) and to a criterion not specifically listed in this rule;

(B) subsection (a)(1)(B)(i) and determined using a WER; or

(C) subsection (a)(1)(B)(ii) and determined using the recalculation procedure under section 13 of this rule; or

(2) required under subsection (a) and determined under subsection (a)(1)(D).

(e) Upon approval of a site-specific modification listed in subsection (d), the commissioner shall do the following:

(1) Publish a notice in the Indiana Register.

(2) Place all pertinent information about the approved site-specific modification on the department's Web site.

(3) Submit the site-specific modification to U.S. EPA for approval if it is for a site-specific modification to a criterion specifically listed in this rule but not for a site-specific modification to a criterion specifically listed in this rule and expressed as a function of the WER.

(4) Incorporate the site-specific modification into the water quality standards during the next revision of the water quality standards if it is for a site-specific modification to a criterion specifically listed in this rule.

(f) Site-specific modifications to criteria specifically listed in this rule, except for site-specific modifications to criteria:

(1) specifically listed in this rule; and

(2) expressed as a function of the WER;

shall not be incorporated into a final NPDES permit or used for other Clean Water Act purposes until approved by U.S. EPA.

(g) The following site-specific modifications to water quality criteria have been granted:

Table 8.9-1

Site-Specific Surface Water Quality Criteria[1]

Waterbody	Starting Location	Ending Location	Substances	AAC (Maximum) (µg/l)	AAC Conversion Factors	CAC (4-Day Average) (µg/l)	CAC Conversion Factors
Richland Creek	The outfall of the Princeton POTW	The confluence of Richland Creek with McCarty Ditch	Copper (Dissolved)	$WER^{[2]}(e^{(0.9422[\ln(\text{hardness})]-1.4076)})$	0.960	$WER^{[2]}(e^{(0.8545[\ln(\text{hardness})]-1.4097)})$	0.960
			Cyanide (Free)	45.8		10.7	
			Lead (Dissolved)	$WER^{[2]}(e^{(1.273[\ln(\text{hardness})]-1.2554)})$	1.46203-[(ln hardness)(0.145712)]	$WER^{[2]}(e^{(1.273[\ln(\text{hardness})]-3.7561)})$	1.46203-[(ln hardness)(0.145712)]
Wabash River	The outfall of the Bluegrass Mills Holdings Company (river mile 387)	A point two (2) miles downstream	Cyanide (Free)	45.8		10.7	
Wabash River	The outfall of Eli-Lilly and Company (river mile 309)	A point two (2) miles downstream	Copper (Dissolved)	$WER^{[2]}(e^{(0.9422[\ln(\text{hardness})]-1.4076)})$	0.960	$WER^{[2]}(e^{(0.8545[\ln(\text{hardness})]-1.4097)})$	0.960

Wabash River	The outfall of Eli-Lilly and Company (river mile 236)	A point two (2) miles downstream	Lead (Dissolved)	$WER^{[2]}(e^{(1.273[\ln(\text{hardness})]-1.2554)})$	1.46203-[(ln hardness)(0.145712)]	$WER^{[2]}(e^{(1.273[\ln(\text{hardness})]-3.7561)})$	1.46203-[(ln hardness)(0.145712)]
West Fork White River	The outfall of the Belmont POTW (river mile 227)	The Marion-Johnson County line (river mile 220)	Copper (Dissolved)	$WER^{[2]}(e^{(0.9422[\ln(\text{hardness})]-1.4076)})$	0.960	$WER^{[2]}(e^{(0.8545[\ln(\text{hardness})]-1.4097)})$	0.960
			Cyanide (Free)	45.8		10.7	
			Lead (Dissolved)	$WER^{[2]}(e^{(1.273[\ln(\text{hardness})]-1.2554)})$	1.46203-[(ln hardness)(0.145712)]	$WER^{[2]}(e^{(1.273[\ln(\text{hardness})]-3.7561)})$	1.46203-[(ln hardness)(0.145712)]

[1] The AAC and CAC columns of this table contain hardness-based total recoverable metals criteria for copper and lead. The criterion for the dissolved metal is calculated by multiplying the appropriate conversion factor by the AAC or CAC. This dissolved AAC or CAC shall be rounded to two (2) significant digits, except when the criteria are used as intermediate values in a calculation, such as in the calculation of water quality-based effluent limitations (WQBELs).

[2] A value of one (1) shall be used for the water-effect ratio (WER) unless an alternate value is established under this section.

(Water Pollution Control Board; 327 IAC 2-1-8.9; filed Feb 14, 2005, 10:05 a.m.: 28 IR 2058; errata filed Jul 6, 2005, 3:12 p.m.: 28 IR 3582; filed Mar 21, 2007, 2:51 p.m.: 20070418-IR-327060181FRA)

327 IAC 2-1-9 Definitions

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-11-2-265; IC 13-18-3-2; IC 13-18-4

Sec. 9. In addition to the definitions contained in IC 13-11-2 and 327 IAC 1, the following definitions apply throughout this title:

(1) "Acceptable daily intake" or "ADI" represents the maximum amount of a substance that if ingested daily for a lifetime results in no adverse effects to humans.

(2) "Acute aquatic criterion" or "AAC" means the highest concentration of chemical that if met instream will protect the aquatic life present from mortality or other irreversible effects due to short term exposure. The AAC is equal to one-half (½) the final acute value (FAV).

(3) "Acute toxicity" means concurrent and delayed adverse effects that result from an acute exposure and occur within any short observation period, which begins when the exposure begins, may extend beyond the exposure period, and usually does not constitute a substantial portion of the life span of the organism.

(4) "Adverse effect" means any deleterious effect to organisms due to exposure to a substance. The term includes effects that are or may become debilitating, harmful, or toxic to the normal functions of the organism, but does not include nonharmful effects, such as tissue discoloration alone or the induction of enzymes involved in the metabolism of the substance.

(5) "Bioaccumulative chemical of concern" or "BCC" refers to the following substances:

Table 9-1

Bioaccumulative Chemicals of Concern

CAS Number	Substance
309002	Aldrin
57749	Chlordane
72548	4,4'-DDD; p,p'-DDD; 4,4'-TDE; p,p'-TDE
72559	4,4'-DDE; p,p'-DDE
50293	4,4'-DDT; p,p'-DDT
60571	Dieldrin
72208	Endrin

76448	Heptachlor
118741	Hexachlorobenzene
87683	Hexachlorobutadiene; hexachloro-1,3-butadiene
608731	Hexachlorocyclohexanes; BHCs
319846	alpha-Hexachlorocyclohexane; alpha-BHC
319857	beta-Hexachlorocyclohexane; beta-BHC
319868	delta-Hexachlorocyclohexane; delta-BHC
58899	Lindane; gamma-Hexachlorocyclohexane; gamma-BHC
7439976	Mercury
2385855	Mirex
29082744	Octachlorostyrene
1336363	PCBs; polychlorinated biphenyls
608935	Pentachlorobenzene
39801144	Photomirex
1746016	2,3,7,8-TCDD; dioxin
634662	1,2,3,4-Tetrachlorobenzene
95943	1,2,4,5-Tetrachlorobenzene
8001352	Toxaphene

(6) "Bioconcentration" means the net accumulation of a substance by an aquatic organism as a result of uptake directly from the ambient water through gill membranes or other external body surfaces.
(7) "Bioconcentration factor" or "BCF" means the ratio (in liters per kilogram) of a substance's concentration in tissue of an aquatic organism to its concentration in the ambient water, in situations where the organism is exposed through the water only and the ratio does not change substantially over time.
(8) "Carcinogen" means a chemical that causes an increased incidence of benign or malignant neoplasms, or a substantial decrease in the latency period between exposure and onset of neoplasms through oral or dermal exposure, or through inhalation exposure when the cancer occurs at nonrespiratory sites in at least one (1) mammalian species or man through epidemiological studies or clinical studies, or both.
(9) "Chronic aquatic criterion" or "CAC" means the highest concentration of chemical that if met instream will protect the aquatic life present from toxic effects due to long term exposure, for example, adverse effects on growth and reproduction.
(10) "Chronic toxicity" means concurrent and delayed adverse effects that occur only as a result of a chronic exposure.
(11) "Coliform bacteria" means all the aerobic and facultatively anaerobic, gram-negative, nonsporeforming bacilli that produce acid and gas from the fermentation of lactose.
(12) "Community" means a general collective term to describe the varieties of aquatic species and associated organisms living together in a waterbody.
(13) "Criteria conversion factors" refers to the conversion factors that are multiplied by acute and chronic aquatic criteria developed using toxicological data in the form of total recoverable metal to express the criteria in the form of dissolved metal. The conversion factor for a particular metal and criterion is the fraction of the metal corresponding to an estimate of the percent of the total recoverable metal that was dissolved in the aquatic toxicity tests that were most important in the derivation of the criterion for the metal.
(14) "Criterion" means a definite numerical value or narrative statement promulgated by the water pollution control board to maintain or enhance water quality to provide for and fully protect designated uses of the waters of the state.
(15) "Discharge-induced mixing" or "DIM" means mixing initiated by the use of submerged, high rate diffuser outfall structures (or the functional equivalent) that provide turbulent initial mixing and will minimize organism exposure time.
(16) "Effluent" means a wastewater discharge from a point source to the waters of the state.
(17) "Endangered or threatened species" includes those species that are listed as endangered or threatened under Section 4 of the Endangered Species Act (ESA).
(18) "ESA" means the Endangered Species Act (ESA), 16 U.S.C. 1531 et seq.
(19) "Exceptional use water" means any water designated as an exceptional use water by the water pollution control board, regardless of when the designation occurred.

(20) "Final acute value" or "FAV" means:

(A) a calculated estimate of the concentration of a test material such that ninety-five percent (95%) of the genera (with which acceptable acute toxicity tests have been conducted on the material) have higher genus mean acute values (GMAVs); or

(B) the species mean acute value (SMAV) of an important or critical species, if the SMAV is lower than the calculated estimate.

(21) "Full body contact" means direct contact with the water to the point of complete submergence.

(22) "Genus mean acute value" or "GMAV" means the geometric mean of the SMAVs for the genus.

(23) "Genus mean chronic value" or "GMCV" means the geometric mean of the SMCVs for the genus.

(24) "Geometric mean" means the Nth root of the product of N quantities. Alternatively, the geometric mean can be calculated by adding the logarithms of the N numbers, dividing the sum by N, and taking the antilog of the quotient.

(25) "Great Lakes system" has the meaning set forth in 327 IAC 2-1.5-2(44).

(26) "Ground water" means water located below the ground surface in interconnected voids and pore spaces in the zone of saturation.

(27) "Human life cycle safe concentration" or "HLSC" is the highest concentration of a chemical to which a human is exposed continuously for a lifetime and that results in no observable adverse effects to a human and its progeny.

(28) "Indigenous" means, generally, an organism native to and growing and reproducing in a particular region. For purposes of this rule, the term also includes historically nonnative species introduced by the Indiana department of natural resources as part of a program of wildlife management whether such species reproduce or not.

(29) "LC_{50}" refers to a statistically or graphically estimated concentration that is expected to be lethal to fifty percent (50%) of a group of organisms under specified conditions.

(30) "LD_{50}" means the median lethal dose of a chemical, which is the amount of a test material per body weight that, when administered, results in fifty percent (50%) mortality to the organisms during a specified time period.

(31) "Life cycle safe concentration" means the highest concentration of a chemical to which an organism is exposed continuously for a lifetime and that results in no observable adverse effects to the organism and its progeny.

(32) "Lowest observable adverse effect level" or "LOAEL" means the lowest tested dose or concentration of a substance that resulted in an observed adverse effect in exposed test organisms when all higher doses or concentrations resulted in the same or more severe effects.

(33) "MATC" means the maximum acceptable toxicant concentration obtained by calculating the geometric mean of the lower and upper chronic limits from a chronic test. A lower chronic limit is the highest tested concentration that did not cause the occurrence of a specified adverse effect. An upper chronic limit is the lowest tested concentration that did cause the occurrence of a specified adverse effect and above which all tested concentrations caused such an occurrence.

(34) "Maximum contaminant level" or "MCL" means the maximum permissible level of a contaminant in water that is delivered to the free-flowing outlet of the ultimate user of a public water system.

(35) "Mixing zone" means an area contiguous to a discharge where the discharged wastewater mixes with the receiving water. Where the quality of the effluent is lower than that of the receiving water, it may not be possible to attain within the mixing zone all beneficial uses attained outside the zone. The mixing zone should not be considered a place where effluents are treated.

(36) "Nonthreshold mechanism" means a process that results in some possible effect no matter what level is present. There is no level that may not produce an effect.

(37) "No observed adverse effect level" or "NOAEL" is the highest tested dose or concentration of a substance that resulted in no observed adverse effect in exposed test organisms where higher doses or concentrations resulted in an adverse effect.

(38) "Occur at the site" includes the species, genera, families, orders, classes, and phyla that:

(A) are usually present at the site;

(B) are present at the site only seasonally due to migration;

(C) are present intermittently because they periodically return to or extend their ranges into the site;

(D) were present at the site in the past, are not currently present at the site due to degraded conditions, and are expected to return to the site when conditions improve; or

(E) are present in nearby bodies of water, are not currently present at the site due to degraded conditions, and are expected to be present at the site when conditions improve.

The taxa that occur at the site cannot be determined merely by sampling downstream and upstream of the site at one (1) point

in time. The term does not include taxa that were once present at the site but cannot exist at the site now due to permanent physical alteration of the habitat at the site, for example, alterations resulting from dams.

(39) "Octanol-water partition coefficient" or "K_{OW}" means the ratio of the concentration of a substance in the n-octanol phase to its concentration in the aqueous phase in an equilibrated two-phase octanol-water system. For log K_{OW}, the log of the octanol-water partition coefficient is a base ten (10) logarithm.

(40) "Outstanding national resource water" means a water designated as such by the general assembly after recommendations by the water pollution control board and the environmental quality service council under IC 13-18-3-2(o) and IC 13-18-3-2(p). The designation must describe the quality of the outstanding national resource water to serve as the benchmark of the water quality that shall be maintained and protected. Waters that may be considered for designation as outstanding national resource waters include waterbodies that are recognized as:

(A) important because of protection through official action, such as:

(i) federal or state law;

(ii) presidential or secretarial action;

(iii) international treaty; or

(iv) interstate compact;

(B) having exceptional recreational significance;

(C) having exceptional ecological significance;

(D) having other special environmental, recreational, or ecological attributes; or

(E) waters with respect to which designation as an outstanding national resource water is reasonably necessary for protection of other waterbodies designated as outstanding national resource waters.

(41) "Outstanding state resource water" means any water designated as such by the water pollution control board regardless of when the designation occurred or occurs. Waters that may be considered for designation as outstanding state resource waters include waterbodies that have unique or special ecological, recreational, or aesthetic significance.

(42) "Persistent substance" means a chemical that is long-lived in soil, aquatic environments, and animal and plant tissues and is not readily broken down by biological or physiochemical processes.

(43) "Point source" means the following:

(A) Any discernible, confined, and discrete conveyance, including, but not limited to, any of the following from which pollutants are or may be discharged:

(i) Pipe.

(ii) Ditch.

(iii) Channel.

(iv) Tunnel.

(v) Conduit.

(vi) Well.

(vii) Discrete fissure.

(viii) Container.

(ix) Rolling stock.

(x) Concentrated animal feeding operation.

(xi) Landfill leachate collection system.

(xii) Vessel.

(xiii) Other floating craft.

(B) The term does not include return flows from irrigated agriculture or agricultural storm run-off. See 327 IAC 5-2-4(a)(4) for other exclusions.

(44) "Policy" means a statement of administrative practice or decision making guidelines to be followed or implemented to the maximum extent feasible with respect to an identified problematic situation but to be less than strictly enforceable in contrast to a standard or rule of law.

(45) "Public water supply" means a source of water for a public water system.

(46) "Public water system" has the meaning set forth in 42 U.S.C. 300f.

(47) "Risk" means the probability that a substance, when released to the environment, will cause an adverse effect in exposed humans or other living organisms.

(48) "Risk assessment" means the analytical process used to determine the level of risk.

(49) "Species mean acute value" or "SMAV" means the geometric mean of the results of all acceptable flow-through acute toxicity tests (for which the concentrations of the test material were measured) with the most sensitive tested life stage of the species. For a species for which no such result is available for the most sensitive tested life stage, the SMAV is the geometric mean of the results of all acceptable acute toxicity tests with the most sensitive tested life stage.

(50) "Species mean chronic value" or "SMCV" means the geometric mean of the results of all acceptable life-cycle and partial life-cycle toxicity tests with the species; for a species of fish for which no such result is available, the SMCV is the geometric mean of all acceptable early life-stage tests.

(51) "Steady-state" means an equilibrium condition has been achieved in the body burden of a substance in an organism. Steady-state is assumed when the rate of loss of a substance matches its rate of uptake.

(52) "Surface waters of the state" or "surface water" has the meaning set forth in IC 13-11-2-265, except that the term does not include underground waters with the exception of the following:

(A) The underground portion of the Lost River and its underground tributaries.

(B) Any other underground stream that supports fish or other higher aquatic life forms and its underground tributaries.

(53) "Terrestrial life cycle safe concentration" or "TLSC" is the highest concentration of chemical to which wildlife is exposed continuously for a lifetime and that results in no observable adverse effects to wildlife and its progeny.

(54) "Threshold mechanism" means a process that results in some effect if a certain level is exceeded, but that produces no effect below that level.

(55) "Toxic substances" means substances that are or may become harmful to:

(A) aquatic life;

(B) humans;

(C) other animals;

(D) plants; or

(E) food chains;

when present in sufficient concentrations or combinations. Toxic substances include, but are not limited to, those pollutants identified as toxic under Section 307(a)(1) of the Clean Water Act.

(56) "Variance" means a deviation from a water quality standard.

(57) "Water-effect ratio" or "WER" means the ratio that is computed as a specific pollutant's acute or chronic toxicity endpoint measured in water from the site covered by the criterion, divided by the respective acute or chronic toxicity endpoint in laboratory dilution water.

(58) "Waters of the state" has the meaning set forth in IC 13-11-2-265.

(59) "Water use designations" means a use of the waters of the state as established by this rule, including, but not limited to, the following:

(A) Industrial water supply.

(B) Agricultural use.

(C) Public water supply.

(D) Full body contact.

(E) Aquatic life.

(F) Limited use.

(G) Exceptional use.

(60) "Well-balanced aquatic community" means an aquatic community that:

(A) is diverse in species composition;

(B) contains several different trophic levels; and

(C) is not composed mainly of pollution tolerant species.

(61) "Zone of initial dilution" or "ZID" means the area of the receiving water directly after the end of the pipe where an instantaneous volume of water gives up to a one-to-one (1:1) dilution of the discharge.

(Water Pollution Control Board; 327 IAC 2-1-9; filed Sep 24, 1987, 3:00 p.m.: 11 IR 584; filed Feb 1, 1990, 4:30 p.m.: 13 IR 1041; errata filed Jul 6, 1990, 5:00 p.m.: 13 IR 2004; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1360; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3376; filed Feb 14, 2005, 10:05 a.m.: 28 IR 2060)

327 IAC 2-1-10 Reclassification proposals for limited or exceptional use designation

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4

Sec. 10. (a) Except as provided in subsection (c), a person who wishes to propose that a particular body of the waters of the state be considered by the commissioner for limited use or exceptional use classification must submit to the commissioner a written proposal identifying the waterbody and the proposed classification, stating the rationale for the proposal, and including any other supporting documentation. After receiving the commissioner's recommendation on a proposal, if the board determines that a waterbody is appropriate for reclassification for limited use or exceptional use, it will initiate a rulemaking for that purpose.

(b) The commissioner will consider factors such as the factors listed in subdivisions (1) and (2) in making recommendations to the board with regard to proposals for the reclassification of a waterbody for limited use or exceptional use. These factors are listed as guidelines to provide some insight into the way the commissioner's recommendations may be made, but are not intended to be all encompassing. Irrespective of these factors, the commissioner's recommendations generally will be case-by-case determinations based on professional judgment after on-site evaluations. The commissioner will consider factors relating to the following:

(1) Limited use designations such as any of the following:

(A) The waterway has a Q(7),(10) low flow upstream of any existing or proposed discharge of one-tenth (0.1) cubic feet per second or less.

(B) Suitable habitat to support a well-balanced fish community is severely limited or absent.

(C) The waterway is affected by irreversible conditions, natural or man-induced, that:

(i) came into existence before January 1, 1983;

(ii) are not practicably controllable; and

(iii) prevent establishment of a well-balanced fish community.

(D) The waterbody has no unique or exceptional features.

(E) Potential or existing uses made of the waterbody by people in the immediate area would not be adversely affected by a limited use designation.

(2) Exceptional use designations such as any of the following:

(A) The presence of any of the following:

(i) A unique or exceptional habitat or species in the waterbody.

(ii) A rare or endangered species in the waterbody.

(iii) Exceptional aesthetic quality in the immediate environs of the waterbody.

(B) The waterbody:

(i) is within the boundaries of or flows through a designated natural area, nature preserve, or state or national park or forest;

(ii) supports an excellent sports fishery; or

(iii) possesses exceptional quality.

(C) Intensive recreational use is made of the waterbody.

(c) A person seeking to obtain a CSO wet weather limited use subcategory designation shall do so in accordance with section 3.1 of this rule. *(Water Pollution Control Board; 327 IAC 2-1-10; filed Sep 24, 1987, 3:00 p.m.: 11 IR 585; filed Sep 6, 2007, 12:25 p.m.: 20071003-IR-327050218FRA)*

327 IAC 2-1-11 Limited and exceptional use; designated waters

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4

Sec. 11. (a) The following waters of the state are designated for limited use pursuant to section 3(a)(5) of this rule:

(1) Prides Creek in Pike County upstream from its confluence with White River.

(2) Redkey Run and Halfway Creek in Jay County from the Redkey STP to two (2) miles downstream.

(3) Kentland STP receiving stream along NYC railroad upstream from its confluence with Montgomery Ditch in Newton County.

(4) Buck Creek in Sullivan County from the Sullivan South STP to two and one-fourth (2.25) miles downstream.

(5) Arbogast Ditch upstream from its confluence with West Fork of White River in Randolph County.

(6) Jefferson Ditch in Grant County from the Upland STP to its confluence with Lake Branch.
(7) Vinson Drain and Mud Creek in Madison County from the Summitville STP to the confluence of Mud Creek and Star Creek.
(8) Ackerman Branch and Mill Creek in Dubois County to the confluence of Mill Creek and Little Creek.
(9) North Prong of Stotts Creek in Johnson County from the Bargersville STP to one and one-fourth (1.25) miles downstream.
(10) An unnamed tributary of Four Mile Creek in Greene County from the Lyons STP to its confluence with Four Mile Creek.
(11) An unnamed stream in Dubois County, which is the outlet of Huntingburg City Lake, from the City Lake Dam downstream to its confluence with Ell Creek.
(12) Leavell Ditch in Tipton County upstream from its confluence with Buck Creek.
(13) Buck Creek in Tipton County upstream from its confluence with Cicero Creek.
(14) Schlatter Ditch which becomes Bacon Prairie Creek in Tipton County upstream from a point one (1) mile upstream of the confluence of Bacon Prairie Creek and Cicero Creek.
(15) An unnamed ditch in Posey County flowing north out of the town of Cynthiana along the Chicago and Eastern Illinois Railroad then west along the Posey-Gibson County Line to its confluence with Black River.
(16) Laughery Creek in Ripley county from the Napoleon STP to a point three (3.0) miles downstream. (County Road 300 West Extended.)
(17) An unnamed tributary and Hurricane Creek in Gibson County from the Haubstadt STP to the confluence of Hurricane Creek and the West Fork of Pigeon Creek.
(18) Plasterers Creek in Martin County from the Loogootee STP downstream to the confluence with Friends Creek.
(19) Montgomery Ditch and Black River in Gibson County from the Owensville STP to the Antioch Road Bridge.
(20) Brewer Ditch in Johnson County from the Whiteland STP to the County Road 250 N bridge.
(21) An unnamed tributary of Little Otter Creek in Ripley County from the Holton STP to its confluence with Little Otter Creek.
(22) The Silverthorn Branch of Wildcat Creek in Clinton County from the Rossville STP to its confluence with the Middle Fork of Wildcat Creek.
(23) An unnamed tributary of the West Fork of White River in Randolph County from the Farmland STP to its confluence with the West Fork of White River.
(24) Hawk Run and Blackhawk Creek in Dubois and Spencer counties from the Schuler Packing Company discharge downstream to the Anderson River.
(25) Spring Creek in Vigo County from the Hercules, Inc., outfall downstream to the Wabash River.
(26) Little Buck Creek in Henry County to its confluence with Hillside Brook.
(27) Francis Dutro Ditch in Blackford County from the Blackford Canning Company discharge downstream to its confluence with Prairie Creek.
(28) The unnamed ditch receiving the Sperry Rubber Company discharge and Richland Creek in Franklin County from the confluence of the unnamed tributary downstream to the Whitewater River.
(29) Eight Mile Creek in Wells County to the confluence of Eight Mile Creek and Maple Creek.
(b) The following waters of the state are designated for exceptional use under section 3(a)(6) of this rule:
(1) Big Pine Creek in Warren County downstream of the State Road 55 bridge near the town of Pine Village to its confluence with the Wabash River.
(2) Mud Pine Creek in Warren County from the bridge on the County Road between Brisco and Rainsville to its confluence with Big Pine Creek.
(3) Fall Creek in Warren County from the old C.R. 119 bridge in the NW quarter of Section 21, Township 22N, Range 8W downstream to its confluence with Big Pine Creek.
(4) Indian Creek in Montgomery County from the County Road 650 West bridge downstream to its confluence with Sugar Creek.
(5) Clifty Creek in Montgomery County within the boundaries of Pine Hills Nature Preserve.
(6) Bear Creek in Fountain County from the bridge on County Road 450 North to its confluence with the Wabash River.
(7) Rattlesnake Creek in Fountain County from the bridge on County Road 450 North to its confluence with Bear Creek.
(8) The small tributary to Bear Creek in Fountain County within the Portland Arch Nature Preserve which enters Bear Creek at the sharpest bend and has formed the small natural bridge called Portland Arch.
(9) Blue River from the confluence of the West and Middle Forks of the Blue River in Washington County downstream to its

confluence with the Ohio River.

(10) The South Fork of Blue River in Washington County from the Horner's Chapel Road bridge downstream to its confluence with Blue River.

(11) Lost River and all surface and underground tributaries upstream from the Orangeville Rise (T2N, R1W, Section 6) and the Rise of Lost River (T2N, R1W, Section 7) and the mainstem of the Lost River from the Orangeville Rise downstream to its confluence with the East Fork of White River.

(Water Pollution Control Board; 327 IAC 2-1-11; filed Sep 24, 1987, 3:00 p.m.: 11 IR 585; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1362; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3376)

327 IAC 2-1-12 Incorporation by reference

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4

Sec. 12. The following materials have been incorporated by reference into this rule. Each of the following items, in addition to its title, will list the name and address of where it may be located for inspection and copying:

(1) Clean Water Act (CWA) 33 U.S.C. 1251 et seq. in effect July 1, 2004, available from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402, or from the Indiana Department of Environmental Management, Office of Water Quality, Indiana Government Center-North, 100 North Senate Avenue, Room N1255, Indianapolis, Indiana 46204.

(2) Code of Federal Regulations (40 CFR 136) in effect July 1, 2004, available from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402, or the Indiana Department of Environmental Management, Office of Water Quality, Indiana Government Center-North, 100 North Senate Avenue, Room N1255, Indianapolis, Indiana 46204.

(Water Pollution Control Board; 327 IAC 2-1-12; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1363; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3376; filed Feb 14, 2005, 10:05 a.m.: 28 IR 2064; errata filed Feb 6, 2006, 11:15 a.m.: 29 IR 1936)

327 IAC 2-1-13 Development of site-specific aquatic life criteria using the recalculation procedure

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3-1; IC 13-18-3-2; IC 13-18-3-3
Affected: IC 13-18-4

Sec. 13. (a) The definitions in section 9 of this rule and 327 IAC 2-1.5-2 and the following apply throughout this section:

(1) "Critical species" means a species:

(A) that is commercially or recreationally important at the site;

(B) that occurs at the site and is listed as threatened or endangered under Section 4 of the Endangered Species Act; or

(C) for which there is evidence that the loss of the species from the site is likely to cause an unacceptable impact on:

(i) a commercially or recreationally important species;

(ii) a threatened or endangered species;

(iii) the abundance of a variety of other species; or

(iv) the structure or function of the aquatic community.

(2) "Minimum data requirements" or "MDRs" means the minimum amount of toxicity data required under subsection (c) to develop a valid site-specific aquatic life criterion using the recalculation procedure. The initial MDRs for the recalculation procedure are listed in subsection (c).

(b) The recalculation procedure is intended to allow site-specific criteria to differ from the aquatic life criteria in this rule and 327 IAC 2-1.5. The site-specific criteria may be allowed if justified by demonstrated pertinent toxicological differences between the aquatic species that occur at the site and those that were used in the derivation of the criteria in this rule or 327 IAC 2-1.5. The recalculation procedure involves the recalculation of water quality criteria for a given site through the modification of the toxicity data set used to originally calculate the criteria. The process of modifying a toxicity data set for this procedure involves one (1) or more of the following steps:

(1) Correction of toxicity data in the criterion's data set.

(2) Addition of toxicity data to the criterion's data set.

(3) Deletion of toxicity data in the criterion's data set.

(c) Except as provided in subsection (g), the following MDRs must be available to calculate site-specific aquatic life criteria using the recalculation procedure:

(1) Results of acceptable acute or chronic tests with at least one (1) species of freshwater animal in at least eight (8) different families such that all of the following are included:

(A) The family Salmonidae in the class Osteichthyes.

(B) One (1) other family, preferably a commercially or recreationally important, warmwater species, in the class Osteichthyes, for example:

(i) bluegill; or

(ii) channel catfish.

(C) A third family in the phylum Chordata, for example:

(i) fish; or

(ii) amphibian.

(D) A planktonic crustacean, for example, a:

(i) cladoceran; or

(ii) copepod.

(E) A benthic crustacean, for example:

(i) ostracod;

(ii) isopod;

(iii) amphipod; or

(iv) crayfish.

(F) An insect, for example:

(i) mayfly;

(ii) dragonfly;

(iii) damselfly;

(iv) stonefly;

(v) caddisfly;

(vi) mosquito; or

(vii) midge.

(G) A family in a phylum other than Arthropoda or Chordata, for example:

(i) Rotifera;

(ii) Annelida; or

(iii) Mollusca.

(H) A family in any order of insect or any phylum not already represented.

(2) Acute-chronic ratios (ACRs) with at least one (1) species of aquatic animal in at least three (3) different families provided that of the three (3) species at least one (1) is:

(A) a fish;

(B) an invertebrate; and

(C) an acutely sensitive freshwater species.

(3) Results of at least one (1) acceptable test with a freshwater algae or vascular plant is desirable but not required for criterion derivation. If plants are among the aquatic organisms most sensitive to the material, results of a test with a plant in another phylum (division) should also be available.

(d) If a specific requirement in subsection (c) cannot be satisfied, after deletion of toxicity data described in subsection (e), because that kind of species does not occur at the site, toxicity data from a taxonomically similar sensitive species must be substituted in order to meet the MDRs. The following procedures, listed in order of preference, shall be used to substitute a taxonomically similar species in order to meet the MDRs under subsection (c):

(1) If no species of the kind required occurs at the site, but a species in the same order does, the MDR can only be satisfied by toxicity data for a sensitive species that occurs at the site and is in that order.

(2) If no species in the order occurs at the site, but a sensitive species in the class does, the MDR can only be satisfied by toxicity data for a species that occurs at the site and is in that class.

(3) If no species in the same class occurs at the site, but a species in the phylum does, the MDR can only be satisfied by toxicity data for a sensitive species in that phylum.

(4) If no species in the same phylum occurs at the site, toxicity data from any sensitive species that occurs at the site and is not used to satisfy a different MDR can be used to satisfy the MDR.

(e) The following procedures in this subsection shall be used to develop the toxicity data set that must be used to recalculate a site-specific aquatic life water quality criterion:

(1) For each criterion to be recalculated that meets the MDRs in subsection (c), the original data set that was used to develop the criterion must first be corrected for any errors. Corrections to the data set involve modifying or removing toxicity data, SMAVs, GMAVs, or ACRs that have been found to be incorrect or in some way inappropriate for inclusion in the criterion's data set. Only corrections approved by the commissioner may be used.

(2) After corrections to the original data set have been made, additions to the data set must be made according to the following:

(A) Additions to the data set include adding new toxicity data:

(i) for species that have been determined by the commissioner to occur at the site but are not represented by the original data set; and

(ii) developed to meet the MDRs.

(B) Toxicity data added to a criterion's data set must meet the minimum data quality requirements in 327 IAC 2-1.5-11(c), 327 IAC 2-1.5-11(e)(3) through 2-1.5-11(e)(5), and 327 IAC 2-1.5-11(g) and be approved by the commissioner.

(C) Selective additions to the toxicity data set may not be made. The addition of toxicity data from resistant or insensitive species shall not be allowed. Only the addition of pertinent toxicity data approved by the commissioner shall be included in the calculation of the site-specific criterion.

(3) After corrections and additions to the data set have been made, deletions of toxicity data for species that have been determined by the commissioner not to occur at the site may be made subject to the following:

(A) Comprehensive information on which species occur at the site must be available before deletions from the data set will be permitted.

(B) A species may not be deleted from the data set based on incomplete information on that species.

(C) Acceptable pertinent toxicological data must be available for at least one (1) species in each class of aquatic plants, invertebrates, amphibians, and fish that contains a species that is a critical species at the site.

(D) For each aquatic plant, invertebrate, amphibian, and fish species that occurs at the site and is listed as threatened or endangered under Section 4 of the Endangered Species Act, data must be available or generated for an acceptable surrogate species. Data for each surrogate species must be used as if they are data for species that occur at the site.

(4) To generate the site-specific data set, species shall be deleted from the original data set using the following procedures:

(A) Once corrections and additions have been made to the original data set, species in the data set are grouped taxonomically by:

(i) phylum;

(ii) class;

(iii) order;

(iv) family;

(v) genus; and

(vi) species.

(B) All species that satisfy the definition of occur at the site, including any toxicity data for species that are surrogates of threatened or endangered species that occur at the site, must be included in the final site-specific data set.

(C) Circle each species that satisfies the definition of occur at the site including any surrogates of threatened or endangered species.

(D) The following procedures must be used to determine which of the remaining species from the original toxicity data set must be kept and which must be deleted:

(i) Use the following STEPS to determine which of the remaining species must be deleted and which must not be deleted:

STEP 1. Does the genus occur at the site?

If "No", go to STEP 2.

If "Yes", is there one (1) or more species in the genus that occurs at the site but is not in the data set?

If "No", delete the uncircled species*.

If "Yes", retain the uncircled species*.

STEP 2. Does the family occur at the site?

If "No", go to STEP 3.

If "Yes", is there one (1) or more genera in the family that occurs at the site but is not in the data set?

If "No", delete the uncircled species*.
If "Yes", retain the uncircled species*.
STEP 3. Does the order occur at the site?
If "No", go to STEP 4.
If "Yes", does the data set contain a circled species that is in the same order?
If "No", retain the uncircled species*.
If "Yes", delete the uncircled species*.
STEP 4. Does the class occur at the site?
If "No", go to STEP 5.
If "Yes", does the data set contain a circled species that is in the same class?
If "No", retain the uncircled species*.
If "Yes", delete the uncircled species*.
STEP 5. Does the phylum occur at the site?
If "No", delete the uncircled species*.
If "Yes", does the data set contain a circled species that is in the same phylum?
If "No", retain the uncircled species*.
If "Yes", delete the species*.

* = Continue the deletion process by starting at STEP 1 for any remaining species unless all species in the data set have been considered. The species that are circled and those that are retained constitute the site-specific data set.

(ii) This deletion process must be interpreted to ensure the following:

(AA) Each species that occurs both in the original data set and at the site also occurs in the site-specific data set.

(BB) Each species that occurs at the site but does not occur in the original data set is represented in the site-specific data set by all species in the original data set that are in the same genus.

(CC) Each genus that occurs at the site but does not occur in the original data set is represented in the site-specific data set by all genera in the original data set that are in the same family.

(DD) Each order, class, and phylum that occurs both in the original data set and at the site is represented in the site-specific data set by the one (1) or more species in the original data set that is most closely related to a species that occurs at the site.

(E) After deletion of species that do not occur at the site, if the data remaining in the site-specific data set do not meet the MDRs, additional toxicity testing shall be performed using acceptable procedures.

(F) Chronic tests do not have to be conducted because the original final acute-chronic ratio (FACR) may be used in the derivation of the site-specific final chronic value (FCV). If ACRs are available or are generated so that the chronic MDRs are satisfied using only species that occur at the site, a site-specific FACR may be derived and used in place of the original FACR.

(f) The following procedures in this subsection must be used to calculate the site-specific final acute value (FAV), the acute aquatic criterion (AAC) or criterion maximum concentration (CMC), and the chronic aquatic criterion (CAC) or criterion continuous concentration (CCC) using the site-specific data set developed using the procedures in subsection (e):

(1) The FAV and AAC or CMC must be calculated using the procedures in this subdivision. If the minimum toxicity data set requirements in subsection (c) are met following addition or deletion of one (1) or more sensitive species representative at the site, the site-specific FAV must be recalculated using all the available representative resident species toxicity data and the following procedures:

(A) For each genus for which one (1) or more species mean acute value (SMAV) is available, calculate a genus mean acute value (GMAV) first.

(B) Arrange in order all GMAVs from high to low.

(C) Assign a rank (R) to the GMAV from "1" for the lowest to "n" for the highest.

(D) Calculate the cumulative probability (P) for each GMAV rank ((R) / (n +1)).

(E) Select the four (4) lowest GMAVs that have cumulative probability closest to five-hundredths (0.05).

(F) Using the selected GMAVs and the cumulative probabilities, calculate the following:

(i) $FAV = e^{A}$

(ii) $A = S(\sqrt{0.05}) + L$

(iii) $L = \frac{\sum(\ln GMAV) - S(\sum(\sqrt{P}))}{4}$

(iv) $S^2 = \frac{\sum((\ln GMAV)^2) - \frac{(\sum(\ln GMAV))^2}{4}}{\sum(P) - \frac{(\sum(\sqrt{P}))^2}{4}}$

Where: e^A = natural logarithm (ln) of A
GMAV = genus mean acute value
S^2 = variance (S = standard deviation)
P = cumulative probability for each GMAV at rank (R)/(n + 1)
$\sum$ = summation

(G) If the toxicity data show that acute toxicity for a substance is related to a water characteristic such as hardness, then a final acute equation must be calculated using the procedures in 327 IAC 2-1.5-11(f).

(H) To derive the site-specific AAC or CMC, the site-specific FAV is divided by two (2).

(2) The CAC or CCC shall be calculated using one (1) of the following procedures:

(A) The site-specific FAV will be divided by the FACR calculated as the geometric mean of the ACRs for a toxicant available in the original toxicity data set as well as new ACRs derived from acceptable aquatic toxicity tests. The geometric mean of the ACRs will be calculated from ACRs that do not differ by a factor of ten (10) from all the freshwater aquatic species. This will also include the ACRs from coldwater aquatic organisms even if they were deleted from the original data set as being not representative of the site. The site-specific CAC or CCC shall be calculated as follows:

$$\text{Site-specific CAC or CCC} = \frac{\text{Site-specific FAV}}{\text{FACR}}$$

(B) If chronic toxicity data are available for at least eight (8) families as defined in subsection (c), a CAC or CCC can be derived in the same manner as the FAV by substituting:

(i) CAC or CCC for FAV;

(ii) chronic for acute;

(iii) maximum acceptable toxicant concentration for LC_{50};

(iv) species mean chronic value for SMAV; and

(v) genus mean chronic value for GMAV.

(C) If the toxicity data show that chronic toxicity for a substance is related to a water characteristic such as hardness, then a final chronic equation must be calculated using the procedures in 327 IAC 2-1.5-11(h).

(3) The site-specific FAV must be divided by the geometric mean of the ACRs for a toxicant. The geometric mean of the ACRs will be calculated from ACRs that do not differ by a factor of ten (10) from all the freshwater aquatic species. A minimum of three (3) ACRs must be available from three (3) species in three (3) different families, including a fish, an invertebrate, and an acutely sensitive freshwater species. This will also include the ACRs from coldwater aquatic organisms even if they were deleted from the original toxicity database in the recalculation of a site-specific criterion as not occurring at the site.

(4) The calculated FAV, AAC or CMC, and CAC or CCC must be lowered, if necessary, to:

(A) protect an aquatic plant, invertebrate, amphibian, or fish species that is a critical species at the site; and

(B) ensure that the criterion is not likely to jeopardize the continued existence of any endangered or threatened species listed under Section 4 of the Endangered Species Act or result in the destruction or adverse modification of such species' critical habitats.

(g) If the variety of aquatic invertebrates, amphibians, and fish is so limited that species in fewer than eight (8) families occur at the site, the following procedures must be used:

(1) For site-specific criteria that will be applicable outside the Great Lakes System, the following procedures must be used:

(A) Toxicity data must be available for at least one (1) species in each of the families that occurs at the site.

(B) The site-specific FAV shall be set equal to the lowest SMAV for the most sensitive aquatic species that occurs at the site.

(C) To derive the site-specific AAC, the site-specific FAV is divided by two (2).

(D) The site-specific CAC will be obtained as provided by subsection (f)(2) by dividing the site-specific FAV by the geometric mean ACR from all freshwater aquatic species or by a factor of eighteen (18) if no ACR is available from at least one (1) freshwater species.

(2) For site-specific criteria that will be applicable inside the Great Lakes System, Tier II values can be calculated using the site-specific data set developed in subsection (e) and the procedures in 327 IAC 2-1.5-12.

(Water Pollution Control Board; 327 IAC 2-1-13; filed Feb 14, 2005, 10:05 a.m.: 28 IR 2065)

Rule 1.5. Water Quality Standards Applicable to All State Waters Within the Great Lakes System

327 IAC 2-1.5-1 Applicability of rule

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4

Sec. 1. The water quality standards established by this rule shall apply to all waters of the state within the Great Lakes system.

(Water Pollution Control Board; 327 IAC 2-1.5-1; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1363)

327 IAC 2-1.5-2 Definitions

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-11-2-265; IC 13-18-3-2; IC 13-18-4

Sec. 2. In addition to the definitions contained in IC 13-11-2 and 327 IAC 1, the following definitions apply throughout this article, 327 IAC 5, and 327 IAC 15:

(1) "Acceptable daily exposure" or "ADE" means an estimate of the maximum daily dose of a substance that is not expected to result in adverse noncancer effects to the general human population, including sensitive subgroups.

(2) "Acceptable endpoints" (subchronic and chronic), for the purpose of wildlife criteria derivation, means those endpoints that affect reproductive or developmental success, organismal viability or growth, or any other endpoint that is, or is directly related to, a parameter that influences population dynamics.

(3) "Acute-chronic ratio" or "ACR" means a standard measure of the acute toxicity of a material divided by an appropriate measure of the chronic toxicity of the same material under comparable conditions.

(4) "Acute toxicity" means concurrent and delayed adverse effects that result from an acute exposure and occur within any short observation period, which begins when the exposure begins, may extend beyond the exposure period, and usually does not constitute a substantial portion of the life span of the organism.

(5) "Acute toxic unit" or "TU_a" means $100/LC_{50}$ where the LC_{50} is expressed as a percent effluent in the test medium of an acute whole effluent toxicity (WET) test that is statistically or graphically estimated to be lethal to fifty percent (50%) of the test organisms.

(6) "Adverse effect" means any deleterious effect to organisms due to exposure to a substance. The term includes effects that are or may become debilitating, harmful, or toxic to the normal functions of the organism, but does not include nonharmful effects, such as tissue discoloration alone or the induction of enzymes involved in the metabolism of the substance.

(7) "Alternate mixing zone" means a mixing zone granted by the commissioner under 327 IAC 5-2-11.4(b)(4) for a particular pollutant and a particular criterion or value that is larger than that specified in 327 IAC 5-2-11.4(b)(2) or 327 IAC 5-2-11.4(b)(3).

(8) "Baseline BAF" means the following:

(A) For organic chemicals, a BAF that is based on the concentration of freely dissolved chemical in the ambient water and takes into account the partitioning of the chemical within the organism.

(B) For inorganic chemicals, a BAF that is based on the wet weight of the tissue.

(9) "Baseline BCF" means the following:

(A) For organic chemicals, a BCF that is based on the concentration of freely dissolved chemical in the ambient water and takes into account the partitioning of the chemical within the organism.

(B) For inorganic chemicals, a BCF that is based on the wet weight of the tissue.

(10) "Bioaccumulation" means the net accumulation of a substance by an organism as a result of uptake from all environmental

sources.
(11) "Bioaccumulation factor" or "BAF" means the ratio (in L/kg) of a substance's concentration in tissue of an aquatic organism to its concentration in the ambient water, in situations where both the organism and its food are exposed and the ratio does not change substantially over time.
(12) "Bioaccumulative chemical of concern" or "BCC" has the meaning set forth in section 6 of this rule.
(13) "Bioconcentration" means the net accumulation of a substance by an aquatic organism as a result of uptake directly from the ambient water through gill membranes or other external body surfaces.
(14) "Bioconcentration factor" or "BCF" means the ratio (in liters per kilogram) of a substance's concentration in tissue of an aquatic organism to its concentration in the ambient water, in situations where the organism is exposed through the water only and the ratio does not change substantially over time.
(15) "Biota-sediment accumulation factor" or "BSAF" means the ratio (in kilograms of organic carbon per kilogram of lipid) of a substance's lipid-normalized concentration in tissue of an aquatic organism to its organic carbon-normalized concentration in surface sediment, in situations where:
(A) the ratio does not change substantially over time;
(B) both the organism and its food are exposed; and
(C) the surface sediment is representative of average surface sediment in the vicinity of the organism.
(16) "Carcinogen" means a substance that causes an increased incidence of benign or malignant neoplasms, or substantially decreases the time to develop neoplasms, in animals or humans. The classification of carcinogens is discussed in section 14(b)(1) of this rule.
(17) "Chronic effect", for purposes of wildlife criteria derivation, means:
(A) an adverse effect that is measured by assessing an acceptable endpoint; and
(B) results from continual exposure over several generations, or at least over a significant part of the test species' projected life span or life stage.
(18) "Chronic toxicity" means concurrent and delayed adverse effects that occur only as a result of a chronic exposure.
(19) "Chronic toxic unit" or "TU_c" means 100/NOEC or $100/IC_{25}$, where the NOEC and IC_{25} are expressed as a percent effluent in the test medium.
(20) "Clean Water Act" or "CWA" means the federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq.).
(21) "Coliform bacteria" means all the aerobic and facultatively anaerobic, gram-negative, nonsporeforming bacilli that produce acid and gas from the fermentation of lactose.
(22) "Community" means a general collective term to describe the varieties of aquatic species and associated organisms living together in a waterbody.
(23) "Criteria conversion factors" refers to the conversion factors that are multiplied by acute and chronic aquatic criteria developed using toxicological data in the form of total recoverable metal to express the criteria in the form of dissolved metal. The conversion factor for a particular metal and criterion is the fraction of the metal corresponding to an estimate of the percent of the total recoverable metal that was dissolved in the aquatic toxicity tests that were most important in the derivation of the criterion for the metal.
(24) "Criterion" means a definite numerical value or narrative statement promulgated by the water pollution control board to maintain or enhance water quality to provide for and fully protect designated uses of the waters of the state.
(25) "Criterion continuous concentration" or "CCC" means an estimate of the highest concentration of a material in the water column to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect.
(26) "Criterion maximum concentration" or "CMC" means an estimate of the highest concentration of a material in the water column to which an aquatic community can be exposed briefly without resulting in an unacceptable effect.
(27) "Depuration" means the loss of a substance from an organism as a result of any active or passive process.
(28) "Designated uses" has the meaning set forth in section 5 of this rule, whether or not they are being attained.
(29) "EC_{50}" refers to a statistically or graphically estimated concentration that is expected to cause one (1) or more specified effects in fifty percent (50%) of a group of organisms under specified conditions.
(30) "Effluent" means a wastewater discharge from a point source to the waters of the state.
(31) "Endangered or threatened species" includes those species that are listed as endangered or threatened under Section 4 of the Endangered Species Act (ESA).
(32) "ESA" means the Endangered Species Act (ESA), 16 U.S.C. 1531 et seq.
(33) "Existing uses" includes those uses actually attained in the waterbody on or after November 28, 1975, whether or not they

are included under section 5 of this rule.

(34) "Final acute value" or "FAV" means:

(A) a calculated estimate of the concentration of a test material such that ninety-five percent (95%) of the genera (with which acceptable acute toxicity tests have been conducted on the material) have higher GMAVs; or

(B) the SMAV of an important or critical species, if the SMAV is lower than the calculated estimate.

(35) "Final chronic value" or "FCV" means:

(A) a calculated estimate of the concentration of a test material such that ninety-five percent (95%) of the genera (with which acceptable chronic toxicity tests have been conducted on the material) have higher GMCVs;

(B) the quotient of an FAV divided by an appropriate acute-chronic ratio; or

(C) the SMCV of an important or critical species, if the SMCV is lower than the calculated estimate or the quotient, whichever is applicable.

(36) "Final plant value" or "FPV" means the lowest plant value that was obtained with an important aquatic plant species in an acceptable toxicity test for which the concentrations of the test material were measured and the adverse effect was biologically important.

(37) "Food-chain multiplier" or "FCM" means the ratio of a BAF to an appropriate BCF.

(38) "Full body contact" means direct contact with the water to the point of complete submergence.

(39) "Genus mean acute value" or "GMAV" means the geometric mean of the SMAVs for the genus.

(40) "Genus mean chronic value" or "GMCV" means the geometric mean of the SMCVs for the genus.

(41) "Geometric mean" means the Nth root of the product of N quantities. Alternatively, the geometric mean can be calculated by adding the logarithms of the N numbers, dividing the sum by N, and taking the antilog of the quotient.

(42) "Great Lakes" means Lake Erie and Lake Michigan.

(43) "Great Lakes states" means:

(A) Illinois;

(B) Indiana;

(C) Michigan;

(D) Minnesota;

(E) New York;

(F) Ohio;

(G) Pennsylvania; and

(H) Wisconsin.

(44) "Great Lakes system" means all the streams, rivers, lakes, and other waters of the state within the drainage basin of the Great Lakes within Indiana.

(45) "Great Lakes water quality wildlife criterion" or "GLWC" means the concentration of a substance that is likely to, if not exceeded, protect avian and mammalian wildlife populations inhabiting the Great Lakes basin from adverse effects resulting from the ingestion of water and aquatic prey taken from surface waters of the Great Lakes system. These criteria are based on existing toxicological studies of the substance of concern and quantitative information about the exposure of wildlife species to the substance, that is, food and water consumption rates. Since toxicological and exposure data for individual wildlife species are limited, a GLWC is derived using a methodology similar to that used to derive noncancer human health criteria. Separate avian and mammalian values are developed using taxonomic class-specific toxicity data and exposure data for five (5) representative Great Lakes basin wildlife species. The following wildlife species selected are representative of avian and mammalian species resident in the Great Lakes basin that are likely to experience the highest exposures to bioaccumulative contaminants through the aquatic food web:

(A) Bald eagle.

(B) Herring gull.

(C) Belted kingfisher.

(D) Mink.

(E) River otter.

(46) "Ground water" means water located below the ground surface in interconnected voids and pore spaces in the zone of saturation.

(47) "High quality waters" means waterbodies in which, on a parameter by parameter basis, the quality of the waters exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water. The term includes

any waterbody for which the pollutant has not been detected in:

(A) the water column; and

(B) nontransient aquatic organisms at levels that would indicate that a water quality criterion is not being met.

(48) "Human cancer criterion" or "HCC" refers to a human cancer value (HCV) for a pollutant that meets the minimum data requirements for Tier I specified in section 14 of this rule.

(49) "Human cancer value" or "HCV" means the maximum ambient water concentration of a substance at which a lifetime of exposure will represent a plausible upper-bound risk of contracting cancer of one (1) in one hundred thousand (100,000) using the exposure assumptions specified in section 14 of this rule from either:

(A) drinking the water, consuming fish from the water, and water-related recreational activities; or

(B) consuming fish from the water and water-related recreational activities.

(50) "Human noncancer criterion" or "HNC" refers to a human noncancer value (HNV) for a pollutant that meets the minimum data requirements for Tier I specified in section 14 of this rule.

(51) "Human noncancer value" or "HNV" means the maximum ambient water concentration of a substance at which adverse noncancer effects are not likely to occur in the human population from lifetime exposure using section 14 of this rule from either:

(A) drinking the water, consuming fish from the water, and water-related recreational activities; or

(B) consuming fish from the water and water-related recreation activities.

(52) "Inhibition concentration 25" or "IC_{25}" means the toxicant concentration that would cause a twenty-five percent (25%) reduction in a nonquantal biological measurement for the test population. For example, the IC_{25} is the concentration of toxicant that would cause a twenty-five percent (25%) reduction in mean young per female or in growth for the test population.

(53) "LC_{50}" refers to a statistically or graphically estimated concentration that is expected to be lethal to fifty percent (50%) of a group of organisms under specified conditions.

(54) "Linearized multistage model" means a conservative mathematical model for cancer risk assessment. This model fits linear dose-response curves to low doses. It is consistent with a no-threshold model of carcinogenesis, that is, exposure to even a very small amount of the substance is assumed to produce a finite increased risk of cancer.

(55) "Lowest observed adverse effect level" or "LOAEL" means the lowest tested dose or concentration of a substance that resulted in an observed adverse effect in exposed test organisms when all higher doses or concentrations resulted in the same or more severe effects.

(56) "Maximum contaminant level" or "MCL" means the maximum permissible level of a contaminant in water that is delivered to the free-flowing outlet of the ultimate user of a public water system.

(57) "Mixing zone" means an area contiguous to a discharge where the discharged wastewater mixes with the receiving water. Where the quality of the effluent is lower than that of the receiving water, it may not be possible to attain within the mixing zone all beneficial uses attained outside the zone. The mixing zone should not be considered a place where effluents are treated.

(58) "New Great Lakes discharger" has the meaning set forth in 327 IAC 5-1.5-36.

(59) "Nonthreshold mechanism" means a process that results in some possible effect no matter what level is present. There is no level that may not produce an effect.

(60) "No observed adverse effect level" or "NOAEL" is the highest tested dose or concentration of a substance that resulted in no observed adverse effect in exposed test organisms where higher doses or concentrations resulted in an adverse effect.

(61) "No observed effect concentration" or "NOEC" is the highest concentration of toxicant to which organisms are exposed in a full life cycle or partial life cycle (short term) test, that causes no observable adverse effects on the test organisms, that is, the highest concentration of toxicant in which the values for the observed responses are not statistically significantly different from the controls.

(62) "Occur at the site" includes the species, genera, families, orders, classes, and phyla that:

(A) are usually present at the site;

(B) are present at the site only seasonally due to migration;

(C) are present intermittently because they periodically return to or extend their ranges into the site;

(D) were present at the site in the past, are not currently present at the site due to degraded conditions, and are expected to return to the site when conditions improve; or

(E) are present in nearby bodies of water, are not currently present at the site due to degraded conditions, and are expected to be present at the site when conditions improve.

The taxa that occur at the site cannot be determined merely by sampling downstream and upstream of the site at one (1) point in time. The term does not include taxa that were once present at the site but cannot exist at the site now due to permanent physical alteration of the habitat at the site, for example, alterations resulting from dams.

(63) "Octanol-water partition coefficient" or "K_{OW}" means the ratio of the concentration of a substance in the n-octanol phase to its concentration in the aqueous phase in an equilibrated two-phase octanol-water system. For log K_{OW}, the log of the octanol-water partition coefficient is a base ten (10) logarithm.

(64) "Open waters of Lake Michigan" means all of the waters within Lake Michigan lakeward from a line drawn across the mouth of tributaries to the lake, including all waters enclosed by constructed breakwaters. For the Indiana Harbor Ship Canal, the boundary of the open waters of Lake Michigan is delineated by a line drawn across the mouth of the harbor from the East Breakwater Light (1995 United States Coast Guard Light List No. 19675) to the northernmost point of the LTV Steel property along the west side of the harbor.

(65) "Outstanding national resource water" means a water designated as such by the general assembly after recommendations by the water pollution control board and the environmental quality service council under IC 13-18-3-2(o) and IC 13-18-3-2(p). The designation must describe the quality of the outstanding national resource water to serve as the benchmark of the water quality that shall be maintained and protected. Waters that may be considered for designation as outstanding national resource waters include waterbodies that are recognized as:

(A) important because of protection through official action, such as:

(i) federal or state law;

(ii) presidential or secretarial action;

(iii) international treaty; or

(iv) interstate compact;

(B) having exceptional recreational significance;

(C) having exceptional ecological significance;

(D) having other special environmental, recreational, or ecological attributes; or

(E) waters with respect to which designation as an outstanding national resource water is reasonably necessary for protection of other waterbodies designated as outstanding national resource waters.

(66) "Outstanding state resource water" means any water designated as such by the water pollution control board regardless of when the designation occurred or occurs. Waters that may be considered for designation as outstanding state resource waters include waterbodies that have unique or special ecological, recreational, or aesthetic significance.

(67) "Point source" has the meaning set forth in 327 IAC 5-1.5-40.

(68) "Policy" means a statement of administrative practice or decision making guidelines to be followed or implemented to the maximum extent feasible with respect to an identified problematic situation but to be less than strictly enforceable in contrast to a standard or rule of law.

(69) "Public water supply" means a source of water for a public water system.

(70) "Public water system" has the meaning set forth in 42 U.S.C. 300f.

(71) "Quantitative structure activity relationship" or "QSAR" or "structure activity relationship" or "SAR" refers to a mathematical relationship between a property (activity) of a chemical and a number of descriptors of the chemical. These descriptors are chemical or physical characteristics obtained experimentally or predicted from the structure of the chemical.

(72) "Relative source contribution" or "RSC" means the factor (percentage) used in calculating an HNV or HNC to account for all sources of exposure to a contaminant. The RSC reflects the percent of total exposure that may be attributed to surface water through water intake and fish consumption.

(73) "Risk" means the probability that a substance, when released to the environment, will cause an adverse effect in exposed humans or other living organisms.

(74) "Risk assessment" means the analytical process used to determine the level of risk.

(75) "Risk associated dose" or "RAD" refers to a dose of a known or presumed carcinogenic substance in milligrams per kilogram per day, which, over a lifetime of exposure, is estimated to be associated with a plausible upper bound incremental cancer risk equal to one (1) in one hundred thousand (100,000).

(76) "Secondary continuous concentration" or "SCC" means an estimate of the highest concentration of a material in the water column to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect. The SCC differs from the CCC in that fewer data are required to calculate the SCC than the CCC.

(77) "Secondary maximum concentration" or "SMC" means an estimate of the highest concentration of a material in the water

column to which an aquatic community can be exposed briefly without resulting in an unacceptable effect. The SMC differs from the CMC in that fewer data are required to calculate the SMC than the CMC.

(78) "Slope factor", also known as "q_1*", means the incremental rate of cancer development calculated through use of a linearized multistage model or other appropriate model. Slope factor is expressed in milligrams per kilogram per day of exposure to the chemical in question.

(79) "Species mean acute value" or "SMAV" means the geometric mean of the results of all acceptable flow-through acute toxicity tests (for which the concentrations of the test material were measured) with the most sensitive tested life stage of the species. For a species for which no such result is available for the most sensitive tested life stage, the SMAV is the geometric mean of the results of all acceptable acute toxicity tests with the most sensitive tested life stage.

(80) "Species mean chronic value" or "SMCV" means the geometric mean of the results of all acceptable life-cycle and partial life-cycle toxicity tests with the species; for a species of fish for which no such result is available, the SMCV is the geometric mean of all acceptable early life-stage tests.

(81) "Steady-state" means an equilibrium condition has been achieved in the body burden of a substance in an organism. Steady-state is assumed when the rate of loss of a substance matches its rate of uptake.

(82) "Stream design flow" means the stream flow that represents critical conditions, upstream from the source, for protection of aquatic life, human health, or wildlife.

(83) "Subchronic effect" means an adverse effect, measured by assessing an acceptable endpoint, resulting from continual exposure for a period of time less than that deemed necessary for a chronic test.

(84) "Surface waters of the state" or "surface water" has the meaning set forth in IC 13-11-2-265 except that the term does not include underground waters with the exception of the following:

(A) The underground portion of the Lost River and its underground tributaries.

(B) Any other underground stream that supports fish or other higher aquatic life forms and its underground tributaries.

(85) "Threshold effect" means an effect of a substance for which there is a theoretical or empirically established dose or concentration below which the effect does not occur.

(86) "Tier I criteria" means numeric values derived by use of the Tier I procedures in sections 11 and 13 through 16 of this rule that either have been adopted as numeric criteria into a water quality standard or are used to implement narrative water quality criteria.

(87) "Tier II values" means numeric values derived by use of the Tier II procedures in sections 12 through 16 of this rule that are used to implement narrative water quality criteria.

(88) "Toxic substances" means substances that are or may become harmful to:

(A) aquatic life;

(B) humans;

(C) other animals;

(D) plants; or

(E) food chains;

when present in sufficient concentrations or combinations. Toxic substances include, but are not limited to, those pollutants identified as toxic under Section 307(a)(1) of the Clean Water Act.

(89) "Tributaries of the Great Lakes system" means all waters of the Great Lakes system that are not open waters of Lake Michigan.

(90) "Trophic level" means a functional classification of taxa within a community that is based on feeding relationships, for example, aquatic green plants comprise the first trophic level and herbivores comprise the second.

(91) "Uncertainty factor" or "UF" means one (1) of several numeric factors used in operationally deriving criteria from experimental data to account for the quality or quantity of the available data.

(92) "Uptake" means acquisition of a substance from the environment by an organism as a result of any active or passive process.

(93) "Variance" means a deviation from a water quality standard.

(94) "Water-effect ratio" or "WER" means the ratio that is computed as a specific pollutant's acute or chronic toxicity endpoint measured in water from the site covered by the criterion, divided by the respective acute or chronic toxicity endpoint in laboratory dilution water.

(95) "Waters of the state" has the meaning set forth in IC 13-11-2-265.

(96) "Water use designations" means a use of the waters of the state as established by this rule, including, but not limited to,

the following:

(A) Industrial water supply.

(B) Agricultural use.

(C) Public water supply.

(D) Full body contact.

(E) Aquatic life.

(F) Limited use.

(97) "Well-balanced aquatic community" means an aquatic community that:

(A) is diverse in species composition;

(B) contains several different trophic levels; and

(C) is not composed mainly of pollution tolerant species.

(98) "Wildlife criterion" or "WC" means the criterion used to denote the number derived from data meeting the Tier I minimum database requirements and will be protective of the two (2) classes of wildlife. The term is synonymous with GLWC, and the two (2) are used interchangeably.

(99) "Wildlife value" or "WV" means:

(A) a value used to denote each representative species that results from using the equation presented in section 15 of this rule;

(B) the value obtained from averaging species values within a class; or

(C) any value derived from application of the site-specific procedure provided in section 16 of this rule.

The WVs calculated for the representative species are used to calculate taxonomic class-specific WVs. The WV is the concentration of a substance that, if not exceeded, should better protect the taxon in question.

(100) "Zone of initial dilution" or "ZID" means the area of the receiving water directly after the end of the pipe where an instantaneous volume of water gives up to a one-to-one (1:1) dilution of the discharge.

(Water Pollution Control Board; 327 IAC 2-1.5-2; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1363; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3376; filed Feb 14, 2005, 10:05 a.m.: 28 IR 2068)

327 IAC 2-1.5-3 Water quality goals

Authority: IC 13-12-3-1; IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4; IC 13-30-2-1

Sec. 3. The goal of the state is to restore and maintain the chemical, physical, and biological integrity of the waters of the state within the Great Lakes system. In furtherance of this primary goal, it is the public policy of the state that the discharge of:

(1) toxic substances in toxic amounts be prohibited; and

(2) persistent and bioaccumulating toxic substances be reduced or eliminated.

(Water Pollution Control Board; 327 IAC 2-1.5-3; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1368; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3376)

327 IAC 2-1.5-4 Antidegradation standard

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4; IC 13-30-2-1

Sec. 4. (a) For all surface waters of the state within the Great Lakes system, existing instream water uses and the level of water quality necessary to protect existing uses shall be maintained and protected. Where designated uses of the waterbody are impaired, there shall be no lowering of the water quality with respect to the pollutant or pollutants that are causing the impairment.

(b) Any surface water of the state within the Great Lakes system whose existing quality for any parameter exceeds the criteria established within this rule shall be considered high quality for that parameter consistent with the definition of high quality water found in this rule; and that quality shall be maintained and protected unless the commissioner finds, after full satisfaction of intergovernmental coordination and public participation provisions under 327 IAC 5-2-11.3, that allowing lower water quality is necessary and accomodates *[sic.]* important economic or social development in the area in which the waters are located. In allowing such degradation, the commissioner shall assure water quality adequate to protect existing uses fully. Further, the commissioner shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all

cost-effective and reasonable best management practices for nonpoint source control. The commissioner shall utilize the antidegradation implementation procedures under 327 IAC 5-2-11.3 in determining if a significant lowering of water quality will be allowed.

(c) From the effective date of this section until the expiration date of 327 IAC 5-2-11.7, all high quality waters designated under section 19(b) of this rule as an outstanding state resource water shall be maintained and protected in their present high quality without degradation. Upon expiration of 327 IAC 5-2-11.7, all high quality waters designated under section 19(b) of this rule as an outstanding state resource water shall be maintained in their present high quality without degradation.

(d) High quality waters designated as an outstanding national resource water (such as waters of national and state parks and wildlife refuges and waters of exceptional recreational or ecological significance) shall be maintained and protected in their present high quality without degradation.

(e) In those cases where the potential lowering of water quality is associated with a thermal discharge, the decision to allow such degradation shall be consistent with Section 316 of the Clean Water Act and 327 IAC 5-7. *(Water Pollution Control Board; 327 IAC 2-1.5-4; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1369; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3376)*

327 IAC 2-1.5-5 Surface water use designations; multiple uses

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4; IC 13-30-2-1

Sec. 5. (a) The following water uses are designated by the board:

(1) Except as provided in subsection (c), surface waters of the state within the Great Lakes system are designated for full-body contact recreation.

(2) All surface waters, except as described in subdivision (7), shall be capable of supporting a well-balanced, warm water aquatic community.

(3) Where natural temperatures will permit, surface waters shall be capable of supporting put-and-take trout fishing. All waters capable of supporting the natural reproduction of trout shall be so maintained. The following waters are designated as salmonid waters and shall be capable of supporting a salmonid fishery:

(A) Trail Creek and its tributaries downstream to Lake Michigan.

(B) East Branch of the Little Calumet River and its tributaries downstream to Lake Michigan via Burns Ditch.

(C) Salt Creek above its confluence with the Little Calumet River.

(D) Kintzele Ditch (Black Ditch) from Beverly Drive downstream to Lake Michigan.

(E) The Galena River and its tributaries in LaPorte County.

(F) The St. Joseph River and its tributaries in St. Joseph County from the Twin Branch Dam in Mishawaka downstream to the Indiana/Michigan state line.

(G) The Indiana portion of the open waters of Lake Michigan.

(H) Those waters designated by the Indiana department of natural resources for put-and-take trout fishing.

(4) All surface waters used for public water supply are designated as a public water supply. This use designation and its corresponding water quality criteria are not to be construed as imposing a user restriction on those exercising or desiring to exercise the use.

(5) All surface waters used for industrial water supply are designated as an industrial water supply. This use designation and its corresponding water quality criteria are not to be construed as imposing a user restriction on those exercising or desiring to exercise the use.

(6) All surface waters used for agricultural purposes are designated as an agricultural use water.

(7) Limited use waters are designated under section 19(a) of this rule pursuant to section 18 of this rule. All waters that are designated as a limited use water under section 19(a) of this rule must be evaluated for restoration and upgrading at each triennial review of this rule.

(8) Outstanding state resource waters are designated under section 19(b) of this rule pursuant to section 18 of this rule.

(b) Where multiple uses have been designated for a body of water, the most protective of all simultaneously applicable standards will apply.

(c) A CSO wet weather limited use designation is established as a subcategory of the recreational use designation established under subsection (a). This subcategory shall be applied in accordance with 327 IAC 2-1-3.1. *(Water Pollution Control Board; 327 IAC 2-1.5-5; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1369; filed Sep 6, 2007, 12:25 p.m.: 20071003-IR-327050218FRA)*

327 IAC 2-1.5-6 Bioaccumulative chemicals of concern

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4; IC 13-30-2-1

Sec. 6. (a) A bioaccumulative chemical of concern (BCC) is any chemical that meets the following requirements:

(1) Has the potential to cause adverse effects.

(2) Has a half-life of at least eight (8) weeks in the water column, sediment, and biota.

(3) Upon entering the surface waters, by itself or as its toxic transformation product, accumulates in aquatic organisms by a human health bioaccumulation factor (BAF) greater than one thousand (1,000) after considering metabolism and other physicochemical properties that might enhance or inhibit bioaccumulation, in accordance with the procedure in section 13 of this rule. The minimum BAF information needed to define a chemical as a BCC is either of the following:

(A) For an organic chemical, either a field-measured BAF or a BAF derived using the BSAF methodology.

(B) For an inorganic chemical, including an organometal, either a field-measured BAF or a laboratory-measured BCF.

(b) Pollutants that are BCCs include, but are not limited to, the following:

Table 6-1
Bioaccumulative Chemicals of Concern

CAS Number	Substance
57749	Chlordane
72548	4,4'-DDD; p,p'-DDD; 4,4'-TDE; p,p'-TDE
72559	4,4'-DDE; p,p'-DDE
50293	4,4'-DDT; p,p'-DDT
60571	Dieldrin
118741	Hexachlorobenzene
87683	Hexachlorobutadiene; hexachloro-1,3-butadiene
608731	Hexachlorocyclohexanes; BHCs
319846	alpha-Hexachlorocyclohexane; alpha-BHC
319857	beta-Hexachlorocyclohexane; beta-BHC
319868	delta-Hexachlorocyclohexane; delta-BHC
58899	Lindane; gamma-Hexachlorocyclohexane; gamma-BHC
7439976	Mercury
2385855	Mirex
29082744	Octachlorostyrene
1336363	PCBs; polychlorinated biphenyls
608935	Pentachlorobenzene
39801144	Photomirex
1746016	2,3,7,8-TCDD; dioxin
634662	1,2,3,4-Tetrachlorobenzene
95943	1,2,4,5-Tetrachlorobenzene
8001352	Toxaphene

(c) The substances established in this subsection shall be treated as BCCs under this rule and under 327 IAC 5-2-11.3 through 327 IAC 5-2-11.6. If additional data becomes available (such as a field-measured BAF) for a substance established in this subsection that conclusively demonstrates that the substance should not be treated as a BCC, the commissioner may determine that it is not necessary to treat the substance as a BCC. Substances treated as BCCs include the following:

Table 6-2
Substances Treated as Bioaccumulative Chemicals of Concern

CAS Number	Substance
309002	Aldrin
72208	Endrin
76448	Heptachlor

(Water Pollution Control Board; 327 IAC 2-1.5-6; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1370; errata filed Aug 11, 1997, 4:15 p.m.:

20 IR 3376; filed Feb 14, 2005, 10:05 a.m.: 28 IR 2074)

327 IAC 2-1.5-7 Mixing zone guidelines

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4

Sec. 7. (a) All surface water quality criteria in this rule, except as provided in section 8(b)(1) of this rule, are to be applied at a point outside of the mixing zone as determined under 327 IAC 5-2-11.4 to allow for a reasonable admixture of waste effluents with the receiving waters.

(b) The commissioner may deny any mixing zone for a discharge or for certain substances in a discharge in accordance with 327 IAC 5-2-11.4(b)(5) and 327 IAC 5-2-11.4(b)(6). *(Water Pollution Control Board; 327 IAC 2-1.5-7; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1370)*

327 IAC 2-1.5-8 Minimum surface water quality criteria

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-11-2-258; IC 13-18-4; IC 13-30-2-1; IC 14-22-9

Sec. 8. (a) All surface water quality criteria in this section, except those provided in subsection (b)(1), will cease to be applicable when the stream flows are less than the applicable stream design flow for the particular criterion as determined under 327 IAC 5-2-11.4.

(b) The following are minimum surface water quality conditions:

(1) All surface waters within the Great Lakes system at all times and at all places, including waters within the mixing zone, shall meet the minimum conditions of being free from substances, materials, floating debris, oil, or scum attributable to municipal, industrial, agricultural, and other land use practices, or other discharges that do any of the following:

(A) Will settle to form putrescent or otherwise objectionable deposits.

(B) Are in amounts sufficient to be unsightly or deleterious.

(C) Produce:

(i) color;

(ii) visible oil sheen;

(iii) odor; or

(iv) other conditions;

in such degree as to create a nuisance.

(D) Are in concentrations or combinations that will cause or contribute to the growth of aquatic plants or algae to such degree as to:

(i) create a nuisance;

(ii) be unsightly; or

(iii) otherwise impair the designated uses.

(E) Are in amounts sufficient to be acutely toxic to, or to otherwise severely injure or kill, aquatic life, other animals, plants, or humans. To assure protection of aquatic life, the waters shall meet the following requirements:

(i) Concentrations of toxic substances shall not exceed the CMC or SMC outside the zone of initial dilution or the final acute value (FAV = 2 (CMC) or 2 (SMC)) in the undiluted discharge unless, for a discharge to a receiving stream or Lake Michigan, an alternate mixing zone demonstration is conducted and approved in accordance with 327 IAC 5-2-11.4(b)(4), in which case, the CMC or SMC shall be met outside the applicable alternate mixing zone:

(AA) for certain substances, a CMC is established and set forth in subdivision (3), Table 8-1 (which table incorporates subdivision (4), Table 8-2);

(BB) for substances for which a CMC is not specified in subdivision (3), Table 8-1, a CMC shall be calculated by the commissioner using the procedures in section 11 of this rule, or, if the minimum data requirements to calculate a CMC are not met, an SMC shall be calculated using the procedures in section 12 of this rule; and

(CC) the CMC or SMC determined under subitem (AA) or (BB) may be modified on a site-specific basis

to reflect local conditions in accordance with section 16 of this rule.

(ii) A discharge shall not cause acute toxicity, as measured by whole effluent toxicity tests, at any point in the waterbody. Compliance with this criterion shall be demonstrated if a discharge does not exceed one and zero-tenths (1.0) TU_a in the undiluted discharge. For a discharge into a receiving stream or Lake Michigan, for which an alternate mixing zone demonstration is conducted and approved in accordance with 327 IAC 5-2-11.4(b)(4), compliance with this criterion shall be demonstrated if three-tenths (0.3) TU_a is not exceeded outside the applicable alternate mixing zone.

This clause shall not apply to the chemical control of plants and animals when that control is performed in compliance with approval conditions specified by the Indiana department of natural resources as provided by IC 14-22-9.

(2) At all times, all surface waters outside of the applicable mixing zones determined in accordance with section 7 of this rule shall be free of substances in concentrations that, on the basis of available scientific data, are believed to be sufficient to injure, be chronically toxic to, or be carcinogenic, mutagenic, or teratogenic to humans, animals, aquatic life, or plants. To assure protection against the adverse effects identified in this subdivision, a toxic substance or pollutant shall not be present in such waters in concentrations that exceed the most stringent of the following:

(A) A CCC or an SCC to protect aquatic life from chronic toxic effects as follows:

(i) For certain substances, a CCC is established and set forth in subdivision (3), Table 8-1 (which table incorporates subdivision (4), Table 8-2).

(ii) For substances for which a CCC is not specified in subdivision (3), Table 8-1, a CCC shall be calculated by the commissioner using the procedures in section 11 of this rule, or, if the minimum data requirements to calculate a CCC are not met, an SCC shall be calculated using the procedures in section 12 of this rule.

(iii) The CCC or SCC determined under item (i) or (ii) may be modified on a site-specific basis to reflect local conditions in accordance with section 16 of this rule.

(iv) To assure protection of aquatic life, a discharge shall not cause chronic toxicity, as measured by whole effluent toxicity tests, outside of the applicable mixing zone. Compliance with this criterion shall be demonstrated if the waterbody does not exceed one and zero-tenths (1.0) TU_c at the edge of the mixing zone.

(B) An HNC or HNV to protect human health from adverse noncancer effects that may result from the consumption of aquatic organisms or drinking water from the waterbody determined as follows:

(i) For certain substances, an HNC is established and set forth in subdivision (5), Table 8-3.

(ii) For substances for which an HNC is not specified in subdivision (5), Table 8-3, an HNC shall be calculated by the commissioner using the procedures in section 14 of this rule, or, if the minimum data requirements to calculate an HNC are not met, an HNV shall be calculated using the procedures in section 14 of this rule.

(iii) The HNC or HNV determined under item (i) or (ii) may be modified on a site-specific basis to reflect local conditions in accordance with section 16 of this rule.

(iv) The HNC-nondrinking or HNV-nondrinking for a substance shall apply to all surface waters outside the applicable mixing zone for a discharge of that substance. The HNC-drinking or HNV-drinking shall apply at the point of the public water system intake.

(C) For carcinogenic substances, an HCC or HCV to protect human health from unacceptable cancer risk of greater than one (1) additional occurrence of cancer per one hundred thousand (100,000) population as follows:

(i) For certain substances, an HCC is established and set forth in subdivision (5), Table 8-3.

(ii) For substances for which an HCC is not specified in subdivision (5), Table 8-3, an HCC shall be calculated by the commissioner using the procedures in section 14 of this rule or, if the minimum data requirements to calculate an HCC are not met, an HCV shall be calculated using the procedures in section 14 of this rule.

(iii) The HCC or HCV determined under item (i) or (ii) may be modified on a site-specific basis to reflect local conditions in accordance with section 16 of this rule.

(iv) The HCC-nondrinking or HCV-nondrinking for a substance shall apply to all surface waters outside the applicable mixing zone for a discharge of that substance. The HCC-drinking or HCV-drinking shall apply at the point of the public water system intake.

(D) A WC to protect avian and mammalian wildlife populations from adverse effects that may result from the consumption of aquatic organisms or water from the waterbody as follows:

(i) For certain substances, a WC is established and set forth in subdivision (6), Table 8-4.

(ii) For substances for which a WC is not specified in subdivision (6), Table 8-4, a WC shall be calculated by the

commissioner using the procedures in section 15 of this rule or, if the minimum data requirements to calculate a WC are not met, a WV may be calculated using the procedures in section 15 of this rule.

(iii) The WC or WV determined under item (i) or (ii) may be modified on a site-specific basis to reflect local conditions in accordance with section 16 of this rule.

(3) The following establishes surface water quality criteria for protection of aquatic life:

Table 8-1

Surface Water Quality Criteria for Protection of Aquatic Life[1]

CAS Number	Substances	CMC (Maximum) (µg/l)	CMC Conversion Factors	CCC (4-Day Average) (µg/l)	CCC Conversion Factors
	Metals (dissolved)[2]				
7440382	Arsenic (III)	WER[3](339.8)	1.000	WER[3](147.9)	1.000
7440439	Cadmium	WER[3]($e^{(1.128\ [\ln(\text{hardness})]-3.6867)}$)	1.136672-[(ln hardness)(0.041838)]	WER[3]($e^{(0.7852\ [\ln(\text{hardness})]-2.715)}$)	1.101672-[(ln hardness)(0.041838)]
7440473	Chromium (III)	WER[3]($e^{(0.819\ [\ln(\text{hardness})]+3.7256)}$)	0.316	WER[3]($e^{(0.819\ [\ln(\text{hardness})]+0.6848)}$)	0.860
7440473	Chromium (VI)	WER[3](16.02)	0.982	WER[3](10.98)	0.962
7440508	Copper	WER[3]($e^{(0.9422\ [\ln(\text{hardness})]-1.700)}$)	0.960	WER[3]($e^{(0.8545\ [\ln(\text{hardness})]-1.702)}$)	0.960
7439976	Mercury	WER[3](1.694)	0.85	WER[3](0.9081)	0.85
7440020	Nickel	WER[3]($e^{(0.846\ [\ln(\text{hardness})]+2.255)}$)	0.998	WER[3]($e^{(0.846\ [\ln(\text{hardness})]+0.0584)}$)	0.997
7782492	Selenium			5	0.922
7440666	Zinc	WER[3]($e^{(0.8473\ [\ln(\text{hardness})]+0.884)}$)	0.978	WER[3]($e^{(0.8473\ [\ln(\text{hardness})]+0.884)}$)	0.986
	Organics (total)				
60571	Dieldrin	0.24	NA	0.056	NA
72208	Endrin	0.086	NA	0.036	NA
56382	Parathion	0.065	NA	0.013	NA
87865	Pentachlorophenol [4]	$e^{(1.005[\text{pH}]-4.869)}$	NA	$e^{(1.005[\text{pH}]-5.134)}$	NA
	Other Substances				
	Chlorides (total)	860000	NA	230000	NA
	Chlorine (total residual)	19	NA	11	NA
	Chlorine (intermittent, total residual) [5]	200	NA		NA
57125	Cyanide (free)	22	NA	5.2	NA

[1] Aquatic organisms should not be affected unacceptably if the four (4) day average concentration of any substance in this table does not exceed the CCC more than once every three (3) years on the average and if the one (1) hour average concentration does not exceed the CMC more than once every three (3) years on the average, except possibly where a commercially or recreationally important species is very sensitive.

[2] The CMC and CCC columns of this table contain total recoverable metals criteria (numeric and hardness-based). The criterion for the dissolved metal is calculated by multiplying the appropriate conversion factor by the CMC or CCC. This dissolved CMC or CCC shall be rounded to two (2) significant digits, except when the criteria are used as intermediate values in a calculation, such as in the calculation of water quality-based effluent limitations (WQBELs).

[3] A value of one (1) shall be used for the WER unless an alternate value is established under section 16 of this rule.

[4] A CMC and CCC calculated for pentachlorophenol using the equation in this table shall be rounded to two (2) significant digits, except when the criteria are used as intermediate values in a calculation, such as in the calculation of WQBELs.

[5] To be considered an intermittent discharge, total residual chlorine shall not be detected in the discharge for a period of more than forty (40) minutes in duration, and such periods shall be separated by at least five (5) hours.

(4) The following establishes dissolved CMCs and CCCs for certain metals at selected hardness values calculated from the equations and conversion factors in subdivision (3), Table 8-1 and using a value of one (1) for the WER, where applicable:

Table 8-2

Metals Concentrations in Micrograms Per Liter; Hardness in Milligrams Per Liter $CaCO_3$[1]

	Arsenic (III)		Cadmium		Chromium (III)		Chromium (VI)		Copper		Mercury		Nickel		Selenium		Zinc	
Hardness	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC
50	340	150	2.0	1.3	320	42	16	11	7.0	5.0	1.4	0.77	260	29	–	4.6	65	66
100	340	150	4.3	2.2	570	74	16	11	13	9.0	1.4	0.77	470	52	–	4.6	120	120
150	340	150	6.6	3.0	790	100	16	11	20	13	1.4	0.77	660	73	–	4.6	170	170
200	340	150	9.0	3.7	1,000	130	16	11	26	16	1.4	0.77	840	93	–	4.6	210	210
250	340	150	12	4.4	1,200	160	16	11	32	20	1.4	0.77	1,000	110	–	4.6	250	260
300	340	150	14	5.0	1,400	180	16	11	38	23	1.4	0.77	1,200	130	–	4.6	300	300
350	340	150	17	5.6	1,600	210	16	11	44	26	1.4	0.77	1,400	150	–	4.6	340	340
400	340	150	19	6.2	1,800	230	16	11	50	29	1.4	0.77	1,500	170	–	4.6	380	380
450	340	150	22	6.8	2,000	250	16	11	55	32	1.4	0.77	1,700	190	–	4.6	420	420
500	340	150	24	7.3	2,100	280	16	11	61	35	1.4	0.77	1,800	200	–	4.6	460	460

[1] The dissolved metals criteria in this table have been rounded to two (2) significant digits in accordance with subdivision (3), Table 8-1. The equations and conversion factors in subdivision (3), Table 8-1 shall be used instead of the criteria in this table when dissolved metals criteria are used as intermediate values in a calculation, such as in the calculation of WQBELs.

(5) The following establishes surface water quality criteria for protection of human health:

Table 8-3

Surface Water Quality Criteria for Protection of Human Health[1]

		Human Noncancer Criteria (HNC)		Human Cancer Criteria (HCC)	
CAS Number	Substances	Drinking (µg/l)	Nondrinking (µg/l)	Drinking (µg/l)	Nondrinking (µg/l)
	Metals (total recoverable)				
7439976	Mercury (including methylmercury)	0.0018	0.0018		
	Organics (total)				
71432	Benzene	19	510	12	310
57749	Chlordane	0.0014	0.0014	0.00025	0.00025
108907	Chlorobenzene	470	3,200		
50293	DDT	0.002	0.002	0.00015	0.00015
60571	Dieldrin	0.00041	0.00041	6.5×10^{-6}	6.5×10^{-6}
105679	2,4-dimethylphenol	450	8,700		
51285	2,4-dinitrophenol	55	2,800		
118741	Hexachlorobenzene	0.046	0.046	0.00045	0.00045
67721	Hexachloroethane	6	7.6	5.3	6.7
58899	Lindane	0.47	0.5		
75092	Methylene chloride	1,600	90,000	47	2600
1336363	PCBs (class)			6.8×10^{-6}	6.8×10^{-6}
1746016	2,3,7,8-TCDD (dioxin)	6.7×10^{-8}	6.7×10^{-8}	8.6×10^{-9}	8.6×10^{-9}
108883	Toluene	5,600	51,000		
8001352	Toxaphene			6.8×10^{-5}	6.8×10^{-5}
79016	Trichloroethylene			29	370

	Other Substances		
57125	Cyanide (total)	600	48,000

[1]The HNC and HCC are thirty (30) day average criteria.

(6) The following establishes surface water quality criteria for protection of wildlife:

Table 8-4

Surface Water Quality Criteria for Protection of Wildlife[1]

CAS Number	Substances	Wildlife Criteria (µg/l)
	Metals (total recoverable)	
7439976	Mercury (including methylmercury)	0.0013
	Organics (total)	
50293	DDT and metabolites	1.1×10^{-5}
1336363	PCBs (class)	1.2×10^{-4}
1746016	2, 3, 7, 8-TCDD (dioxin)	3.1×10^{-9}

[1]The WC are thirty (30) day average criteria.

(c) This subsection establishes minimum surface water quality criteria for aquatic life. In addition to the criteria in subsection (b), this subsection ensures conditions necessary for the maintenance of a well-balanced aquatic community. The following conditions are applicable at any point in the waters outside of the applicable mixing zone, as determined in accordance with section 7 of this rule:

(1) There shall be no substances that:

(A) impart unpalatable flavor to food fish; or

(B) result in offensive odors in the vicinity of the water.

(2) No pH values below six (6.0) or above nine (9.0), except daily fluctuations that:

(A) exceed pH nine (9.0); and

(B) are correlated with photosynthetic activity;

shall be permitted.

(3) Concentrations of dissolved oxygen shall:

(A) average at least five (5.0) milligrams per liter per calendar day; and

(B) not be less than four (4.0) milligrams per liter at any time.

(4) The following are conditions for temperature:

(A) There shall be no abnormal temperature changes that may adversely affect aquatic life unless caused by natural conditions.

(B) The normal daily and seasonal temperature fluctuations that existed before the addition of heat due to other than natural causes shall be maintained.

(C) Water temperatures shall not exceed the maximum limits in the following table during more than one percent (1%) of the hours in the twelve (12) month period ending with any month. At no time shall the water temperature at such locations exceed the maximum limits in the following table by more than three (3) degrees Fahrenheit (one and seven-tenths (1.7) degrees Celsius):

Table 8-5

Maximum Instream Water Temperatures

Month	St. Joseph River Tributary to Lake Michigan Upstream of the Twin Branch Dam °F(°C)	All Other Indiana Streams in the Great Lakes System °F(°C)
January	50 (10)	50 (10)
February	50 (10)	50 (10)
March	55 (12.8)	60 (15.6)
April	65 (18.3)	70 (21.1)
May	75 (23.9)	80 (26.7)
June	85 (29.4)	90 (32.2)
July	85 (29.4)	90 (32.2)
August	85 (29.4)	90 (32.2)
September	84 (29.4)	90 (32.2)
October	70 (21.1)	78 (25.5)

November	60 (15.6)	70 (21.1)
December	50 (10)	57 (14.0)

(D) The following temperature criteria shall apply to Lake Michigan:

(i) In all receiving waters, the points of measurement normally shall be in the first meter below the surface at such depths necessary to avoid thin layer surface warming due to extreme ambient air temperatures, but, where required to determine the true distribution of heated wastes and natural variations in water temperatures, measurements shall be at a greater depth and at several depths as a thermal profile.

(ii) There shall be no abnormal temperature changes so as to be injurious to fish, wildlife, or other aquatic life, or the growth or propagation thereof. In addition, plume interaction with the bottom shall:

(AA) be minimized; and

(BB) not injuriously affect fish, shellfish, and wildlife spawning or nursery areas.

(iii) The normal daily and seasonal temperature fluctuations that existed before the addition of heat shall be maintained.

(iv) At any time and at a maximum distance of a one thousand (1,000) foot arc inscribed from a fixed point adjacent to the discharge or as agreed upon by the commissioner and federal regulatory agencies, the following shall apply:

(AA) The receiving water temperature shall not be more than three (3) degrees Fahrenheit (one and seven-tenths (1.7) degrees Celsius) above the existing natural water temperature.

(BB) Thermal discharges to Lake Michigan shall comply with the following maximum temperature requirements:

(aa) Thermal discharges to Lake Michigan shall not raise the maximum temperature in the receiving water above those listed in the following table, except to the extent the permittee adequately demonstrates that the exceedance is caused by the water temperature of the intake water:

Table 8-6
Maximum Water Temperatures

Month	°F(°C)
January	45 (7)
February	45 (7)
March	45 (7)
April	55 (13)
May	60 (16)
June	70 (21)
July	80 (27)
August	80 (27)
September	80 (27)
October	65 (18)
November	60 (16)
December	50 (10)

(bb) If the permittee demonstrates that the intake water temperature is within three (3) degrees Fahrenheit below an applicable maximum temperature under subitem (aa), Table 8-6, then not more than a three (3) degree Fahrenheit exceedance of the maximum water temperature shall be permitted.

(v) The facilities described as follows that discharge into the open waters of Lake Michigan shall be limited to the amount essential for blowdown in the operation of a closed cycle cooling facility:

(AA) All facilities that have new waste heat discharges exceeding a daily average of five-tenths (0.5) billion British thermal units per hour. As used in this item, "new waste heat discharge" means a discharge that had not begun operations as of February 11, 1972.

(BB) All facilities with existing waste heat discharges that increase the quantity of waste heat discharged by more than a daily average of five-tenths (0.5) billion British thermal units per hour.

(vi) Water intakes shall be designed and located to minimize entrainment and damage to desirable organisms. Requirements may vary depending upon local conditions, but, in general, intakes shall:

(AA) have minimum water velocity; and

(BB) not be located in spawning or nursery areas of important fishes.

Water velocity at screens and other exclusion devices shall also be at a minimum.

(vii) Discharges other than those now in existence shall be such that the thermal plumes do not overlap or intersect.

(viii) Facilities discharging more than a daily average of five-tenths (0.5) billion British thermal units of waste heat shall:

(AA) continuously record intake and discharge temperature and flow; and

(BB) make those records available to the public or regulatory agencies upon request.

(5) The following criteria shall be used to regulate ammonia:

(A) Concentrations of total ammonia (as N) shall not exceed the CMC outside the zone of initial dilution or the final acute value (FAV = 2 (CMC)) in the undiluted discharge unless, for a discharge to a receiving stream or Lake Michigan, an alternate mixing zone demonstration is conducted and approved in accordance with 327 IAC 5-2-11.4(b)(4), in which case, the CMC shall be met outside the applicable alternate mixing zone. The CMC of total ammonia (as N) is determined using the following equation:

$$CMC = \frac{(0.822)(0.52)\left(10^{(pK_a - pH)} + 1\right)}{(FT)(FPH)(2)}$$

Where:

FT = $10^{0.03(20-T)}$

FPH = 1; when: $8 \leq pH \leq 9$; or

$$\frac{1 + 10^{(7.4 - pH)}}{1.25}$$; when: $6.5 \leq pH \leq 8$

pK_a = $$0.09018 + \frac{2729}{T + 273.2}$$

T = Temperature in °C

(B) The CCC of total ammonia (as N) is determined using the following equation:

$$CCC = \frac{(0.822)(0.80)\left(10^{(pK_a - pH)} + 1\right)}{(FT)(FPH)(RATIO)}$$

Where:

FT = $10^{0.03(20-T)}$

FPH = 1; when: $8 \leq pH \leq 9$; or

$$\frac{1 + 10^{(7.4 - pH)}}{1.25}$$; when: $6.5 \leq pH \leq 8$

RATIO = 13.5; when: $7.7 \leq pH \leq 9$; or

$$\frac{(20)\left(10^{(7.7 - pH)}\right)}{1 + 10^{(7.4 - pH)}}$$; when: $6.5 \leq pH \leq 7.7$

pK_a = $$0.09018 + \frac{2729}{T + 273.2}$$

T = Temperature in °C

(C) The use of the equations in clause (A) results in the following CMCs for total ammonia (as N) at different

temperatures and pHs:

Table 8-7
Criterion Maximum Concentrations for
Total Ammonia (as N)
Temperature (°C)

pH	0	5	10	15	20	25	30
6.5	28.48	26.61	25.23	24.26	23.64	23.32	23.29
6.6	27.68	25.87	24.53	23.59	22.98	22.68	22.65
6.7	26.74	24.99	23.69	22.78	22.20	21.92	21.90
6.8	25.64	23.96	22.72	21.85	21.30	21.03	21.01
6.9	24.37	22.78	21.60	20.78	20.26	20.01	20.00
7.0	22.95	21.45	20.35	19.58	19.09	18.86	18.86
7.1	21.38	19.98	18.96	18.24	17.80	17.59	17.60
7.2	19.68	18.40	17.46	16.81	16.40	16.22	16.24
7.3	17.90	16.73	15.88	15.29	14.93	14.78	14.81
7.4	16.06	15.02	14.26	13.74	13.42	13.30	13.35
7.5	14.23	13.31	12.64	12.19	11.92	11.81	11.88
7.6	12.44	11.65	11.07	10.67	10.45	10.37	10.45
7.7	10.75	10.06	9.569	9.238	9.052	9.003	9.088
7.8	9.177	8.597	8.181	7.907	7.760	7.734	7.830
7.9	7.753	7.268	6.924	6.701	6.589	6.584	6.689
8.0	6.496	6.095	5.813	5.636	5.555	5.569	5.683
8.1	5.171	4.857	4.639	4.508	4.457	4.486	4.602
8.2	4.119	3.873	3.707	3.612	3.584	3.625	3.743
8.3	3.283	3.092	2.967	2.900	2.891	2.942	3.061
8.4	2.618	2.472	2.379	2.335	2.340	2.399	2.519
8.5	2.091	1.979	1.911	1.886	1.903	1.968	2.089
8.6	1.672	1.588	1.540	1.529	1.555	1.625	1.747
8.7	1.339	1.277	1.246	1.246	1.279	1.353	1.475
8.8	1.075	1.030	1.011	1.021	1.060	1.137	1.260
8.9	0.8647	0.8336	0.8254	0.8418	0.8862	0.9650	1.088
9.0	0.6979	0.6777	0.6777	0.6998	0.7479	0.8286	0.9521

(D) The use of the equations in clause (B) results in the following CCCs for total ammonia (as N) at different temperatures and pHs:

Table 8-8
Criterion Continuous Concentrations for
Total Ammonia (as N)
Temperature (°C)

pH	0	5	10	15	20	25	30
6.5	2.473	2.310	2.191	2.106	2.052	2.025	2.022
6.6	2.473	2.311	2.191	2.107	2.053	2.026	2.023
6.7	2.473	2.311	2.191	2.107	2.054	2.027	2.025
6.8	2.473	2.311	2.192	2.108	2.055	2.028	2.027
6.9	2.474	2.312	2.193	2.109	2.056	2.030	2.030
7.0	2.474	2.312	2.193	2.110	2.058	2.033	2.033
7.1	2.475	2.313	2.195	2.112	2.060	2.036	2.037
7.2	2.475	2.314	2.196	2.114	2.063	2.040	2.043

7.3	2.476	2.315	2.198	2.116	2.066	2.044	2.050
7.4	2.477	2.317	2.200	2.119	2.070	2.050	2.058
7.5	2.478	2.319	2.202	2.123	2.075	2.058	2.069
7.6	2.480	2.321	2.206	2.128	2.082	2.067	2.082
7.7	2.450	2.294	2.181	2.106	2.063	2.052	2.071
7.8	2.092	1.959	1.865	1.802	1.769	1.763	1.785
7.9	1.767	1.657	1.578	1.527	1.502	1.501	1.525
8.0	1.481	1.389	1.325	1.285	1.266	1.269	1.295
8.1	1.179	1.107	1.057	1.027	1.016	1.022	1.049
8.2	0.9387	0.8828	0.8450	0.8232	0.8169	0.8263	0.8531
8.3	0.7481	0.7048	0.6762	0.6610	0.6589	0.6705	0.6976
8.4	0.5968	0.5634	0.5421	0.5321	0.5334	0.5468	0.5741
8.5	0.4766	0.4511	0.4357	0.4298	0.4337	0.4485	0.4760
8.6	0.3811	0.3619	0.3511	0.3485	0.3545	0.3704	0.3981
8.7	0.3052	0.2910	0.2839	0.2839	0.2916	0.3083	0.3362
8.8	0.2450	0.2347	0.2305	0.2326	0.2417	0.2591	0.2871
8.9	0.1971	0.1900	0.1881	0.1919	0.2020	0.2199	0.2480
9.0	0.1591	0.1545	0.1545	0.1595	0.1705	0.1889	0.2170

(d) This subsection establishes surface water quality for cold-water fish. The waters listed in section 5(a)(3) of this rule are designated as salmonid waters and shall be protected for cold-water fish. In addition to subsections (b) and (c), the following criteria are established to ensure conditions necessary for the maintenance of a well-balanced, cold-water fish community and are applicable at any point in the waters outside of the applicable mixing zone:

(1) Dissolved oxygen concentrations shall not be less than:

(A) six (6.0) milligrams per liter at any time; and

(B) seven (7.0) milligrams per liter in areas where spawning occurs during the spawning season and in areas used for imprinting during the time salmonids are being imprinted.

Dissolved oxygen concentrations in the open waters of Lake Michigan shall not be less than seven (7.0) milligrams per liter at any time.

(2) The maximum temperature rise above natural shall not exceed two (2) degrees Fahrenheit (one and one-tenth (1.1) degrees Celsius) at any time or place and, unless due to natural causes, the temperature shall not exceed the following:

(A) Seventy (70) degrees Fahrenheit (twenty-one and one-tenth (21.1) degrees Celsius) at any time.

(B) Sixty-five (65) degrees Fahrenheit (eighteen and three-tenths (18.3) degrees Celsius) during spawning or imprinting periods.

(e) This subsection establishes bacteriological quality for recreational uses during the recreational season as follows:

(1) The recreational season is defined as the months of April through October, inclusive.

(2) In addition to subsection (b), the criteria in this subsection shall be used to do the following:

(A) Evaluate waters for full body contact recreational uses.

(B) Establish wastewater treatment requirements.

(C) Establish effluent limits during the recreational season.

(3) For full body contact recreational uses, E. coli bacteria shall not exceed the following:

(A) One hundred twenty-five (125) per one hundred (100) milliliters as a geometric mean based on not less than five (5) samples equally spaced over a thirty (30) day period.

(B) Two hundred thirty-five (235) per one hundred (100) milliliters in any one (1) sample in a thirty (30) day period, except that in cases where there are at least ten (10) samples at a given site, up to ten percent (10%) of the samples may exceed two hundred thirty-five (235) cfu or MPN per one hundred (100) milliliters where:

(i) the E. coli exceedances are incidental and attributable solely to E. coli resulting from the discharge of treated wastewater from a wastewater treatment plant as defined at IC 13-11-2-258; and

(ii) the criterion in clause (A) is met.

However, a single sample shall be used for making beach notification and closure decisions.

If a geometric mean cannot be calculated because five (5) equally spaced samples are not available, then the criterion stated in clause (B) must be met.

(4) For demonstrating compliance with wastewater treatment requirements, sanitary wastewater dischargers shall ensure the following:

(A) The concentration of E. coli in the undiluted discharge does not exceed one hundred twenty-five (125) cfu or MPN per one hundred (100) milliliters as a geometric mean of the effluent samples taken in a calendar month.

(B) Not more than ten percent (10%) of all samples when not less than ten (10) samples are taken and analyzed for E. coli in a calendar month exceed two hundred thirty-five (235) cfu or MPN per one hundred (100) milliliters as a daily maximum. Under this clause, the calculation of ten percent (10%) of the samples taken shall be limited to the lowest whole number result.

(5) Effluent limits to implement the criteria in subdivision (3) during the recreational season shall be established in NPDES permits by incorporating the following that are to be applied to the undiluted discharge:

(A) The concentration of E. coli in the undiluted discharge shall not exceed one hundred twenty-five (125) cfu or MPN per one hundred (100) milliliters as a geometric mean of the effluent samples taken in a calendar month.

(B) Not more than ten percent (10%) of all samples in a calendar month exceed two hundred thirty-five (235) cfu or MPN per one hundred (100) milliliters as a daily maximum. Under this clause, the calculation of ten percent (10%) of the samples taken shall be limited to the lowest whole number result.

(f) This subsection establishes surface water quality for public water supply. In addition to subsection (b), the following criteria are established to protect the surface water quality at the point at which water is withdrawn for treatment for public supply:

(1) The coliform bacteria group shall not exceed the following:

(A) Five thousand (5,000) per one hundred (100) milliliters as a monthly average value (either MPN or MF count).

(B) Five thousand (5,000) per one hundred (100) milliliters in more than twenty percent (20%) of the samples examined during any month.

(C) Twenty thousand (20,000) per one hundred (100) milliliters in more than five percent (5%) of the samples examined during any month.

(2) Taste and odor producing substances, other than those naturally occurring, shall not interfere with the production of a finished water by conventional treatment consisting of the following:

(A) Coagulation.

(B) Sedimentation.

(C) Filtration.

(D) Disinfection.

(3) The concentrations of either chlorides or sulfates shall not exceed two hundred fifty (250) milligrams per liter unless due to naturally occurring sources.

(4) The concentration of dissolved solids shall not exceed seven hundred fifty (750) milligrams per liter unless due to naturally occurring sources. A specific conductance of one thousand two hundred (1,200) micromhos per centimeter (at twenty-five (25) degrees Celsius) may be considered equivalent to a dissolved solids concentration of seven hundred fifty (750) milligrams per liter.

(5) Surface waters shall be considered acceptable for public water supply if radium-226 and strontium-90 are present in amounts not exceeding three (3) and ten (10) picocuries per liter, respectively. In the known absence of strontium-90 and alpha emitters, the water supply is acceptable when the gross beta concentrations do not exceed one thousand (1,000) picocuries per liter.

(6) The:

(A) combined concentration of nitrate-N and nitrite-N shall not exceed ten (10) milligrams per liter; and

(B) concentration of nitrite-N shall not exceed one (1) milligram per liter.

(7) Chemical constituents in the waters shall not be present in such levels as to prevent, after conventional treatment, meeting the drinking water standards contained in 327 IAC 8-2, due to other than natural causes.

(g) This subsection establishes surface water quality for industrial water supply. In addition to subsection (b), the criterion to ensure protection of water quality at the point at which water is withdrawn for use (either with or without treatment) for industrial cooling and processing is that, other than from naturally occurring sources, the dissolved solids shall not exceed seven hundred fifty (750) milligrams per liter at any time. A specific conductance of one thousand two hundred (1,200) micromhos per centimeter (at twenty-five (25) degrees Celsius) may be considered equivalent to a dissolved solids concentration of seven hundred fifty (750)

milligrams per liter.

(h) This subsection establishes surface water quality for agricultural uses. The criteria to ensure water quality conditions necessary for agricultural use are the same as those in subsection (b).

(i) This subsection establishes surface water quality for limited uses. The quality of waters designated for limited uses under section 19(a) of this rule shall, at a minimum, meet the following criteria:

(1) The criteria contained in subsection (b).

(2) The criteria contained in subsection (e).

(3) The criteria contained in subsection (g).

(4) The waters must be aerobic at all times.

(5) Notwithstanding subdivisions (1) through (4), the quality of a limited use stream at the point where it becomes physically or chemically capable of supporting a higher use or at its interface with a higher use water segment shall meet the criteria that are applicable to the higher use water.

(j) Additional requirements for the open waters of Lake Michigan are as follows:

(1) In addition to complying with all other applicable subsections, open waters in Lake Michigan shall meet the following criteria:

Table 8-9
Additional Criteria for Lake Michigan

Parameters	Criteria
Dissolved oxygen	Dissolved oxygen concentrations shall not be less than seven (7.0) milligrams per liter at any time at all places outside the applicable mixing zone.
pH	No pH values below six (6.0) or above nine (9.0), except daily fluctuations that exceed pH 9.0 and are correlated with photosynthetic activity, shall be permitted.
Chlorides	860 mg/l criterion maximum concentration 230 mg/l criterion continuous concentration
Phenols	See subsection (c)(1)
Sulfates	250 mg/l[1]
Total phosphorus	See 327 IAC 5-10-2
Total dissolved solids	750 mg/l[1]
Fluorides	1.0 mg/l[1]
Dissolved iron	300 µg/l[1]

[1] This criterion is established to minimize or prevent increased levels of this substance in Lake Michigan. For the purposes of establishing water quality-based effluent limitations based on this criterion, it shall be treated as a four (4) day average criterion.

(2) During each triennial review of the water quality standards, prior to preliminary adoption of revised rules, the department shall prepare a report for the water pollution control board on the monitoring data for the constituents in the following table (Table 8-10), as measured at the drinking water intakes in Lake Michigan. If these data indicate that the levels of the constituents are either increasing or exceed the levels in the table, the report shall provide available information on the known and potential causes of the increased levels of these parameters, the known and potential impacts on aquatic life, wildlife, and human health, and any recommended revisions of the criteria.

Table 8-10

Parameters	Levels
pH	7.5-8.5 s.u.
Chlorides	
Monthly average	15 mg/l
Daily maximum	20 mg/l
Sulfates	
Monthly average	26 mg/l
Daily maximum	50 mg/l
Total phosphorus	
Monthly average	0.03 mg/l
Daily maximum	0.04 mg/l
Total dissolved solids	

Monthly average	172 mg/l
Daily maximum	200 mg/l

(Water Pollution Control Board; 327 IAC 2-1.5-8; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1370; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3376; filed Feb 14, 2005, 10:05 a.m.: 28 IR 2074; errata filed Apr 6, 2006, 2:48 p.m.: 29 IR 2546; filed Mar 18, 2008, 2:26 p.m.: 20080416-IR-327060573FRA)

327 IAC 2-1.5-9 Interim ground water quality standards (Repealed)

Sec. 9. *(Repealed by Water Pollution Control Board; filed Feb 4, 2002, 11:00 a.m.: 25 IR 1882)*

327 IAC 2-1.5-10 Methods of analysis

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4

Sec. 10. The analytical procedures used as methods of analysis to determine the chemical, bacteriological, biological, and radiological quality of waters sampled shall be in accordance with 40 CFR 136 or methods approved by the commissioner. *(Water Pollution Control Board; 327 IAC 2-1.5-10; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1381; filed Feb 14, 2005, 10:05 a.m.: 28 IR 2084)*

327 IAC 2-1.5-11 Determination of Tier I aquatic life criteria

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18

Sec. 11. (a) The procedures in this section shall be used to determine acute and chronic Tier I aquatic life criteria.

(b) The following considerations regarding the toxic substance shall be considered during the development of Tier I criteria or Tier II values:

(1) Each separate chemical that does not ionize substantially in most natural bodies of water should usually be considered a separate substance, except possibly for structurally similar organic compounds that only exist in large quantities as commercial mixtures of the various compounds and apparently have similar biological, chemical, physical, and toxicological properties.

(2) For chemicals that ionize substantially in most natural bodies of water, for example:

(A) some phenols and organic acids;

(B) some salts of phenols and organic acids; and

(C) most inorganic salts and coordination complexes of metals and metalloid;

all forms that would be in chemical equilibrium should usually be considered one (1) substance. Each different oxidation state of a metal and each different nonionizable covalently bonded organometallic compound should usually be considered a separate substance.

(3) The definition of the toxic substance should include an operational analytical component. Identification of a substance simply as sodium, for example, implies total sodium, but leaves room for doubt. If total is meant, it must be explicitly stated. Even total has different operational definitions, some of which do not necessarily measure all that is there in all samples. Thus, it is also necessary to reference or describe the analytical method that is intended. The selection of the operational analytical component should take into account the analytical and environmental chemistry of the material and various practical considerations, such as labor and equipment requirements, and whether the method would require measurement in the field or would allow measurement after samples are transported to a laboratory. The operational analytical considerations shall be as follows:

(A) The primary requirements of the operational analytical component shall be as follows:

(i) Appropriate for use on samples of receiving water.

(ii) Rarely result in underprotection or overprotection of aquatic organisms and their uses.

(iii) Compatible with the available toxicity and bioaccumulation data without making extrapolations that are too hypothetical. Toxicity is the property of a substance, or combination of substances, to adversely affect organisms.

(B) Because an ideal analytical measurement will rarely be available, an appropriate compromise measurement will usually have to be used. This compromise measurement must fit with the general approach that if an ambient concentration is lower than the criterion or value, unacceptable effects will probably not occur, that is, the compromise

measure must not err on the side of underprotection when measurements are made on a surface water. What is an appropriate measurement in one (1) situation might not be appropriate for another. For example, because the chemical and physical properties of an effluent are usually quite different from those of the receiving water, an analytical method that is appropriate for analyzing an effluent might not be appropriate for expressing a criterion or value, and vice versa. A criterion or value should be based on an appropriate analytical measurement, but the criterion or value is not rendered useless if an ideal measurement either is not available or is not feasible. The analytical chemistry of the substance might have to be taken into account when defining the substance or when judging the acceptability of some toxicity tests, but a criterion or value must not be based on the sensitivity of an analytical method. When aquatic organisms are more sensitive than routine analytical methods, the proper solution is to develop better analytical methods.

(4) The use of dissolved metal to set and measure compliance with water quality standards for aquatic life is the recommended approach, because dissolved metal more closely approximates the bioavailable fraction of metal in the water column than does total recoverable metal. Reasons for the consideration of total recoverable metals criteria or values include risk management considerations not covered by evaluation of water column toxicity. The commissioner may, after considering sediment and food chain effects for a particular metal, decide to take a more conservative approach for the metal. This approach could include the expression of aquatic life criteria or values for the metal in the form of total recoverable metal. If the commissioner determines that it is appropriate to express aquatic life criteria or values for a particular metal in the form of dissolved metal, the criteria or values shall be determined as follows:

(A) If sufficient toxicological data in the form of dissolved metal are available, these data shall be used in this section and sections 12 and 16 of this rule to derive aquatic life criteria or values directly in the form of dissolved metal.

(B) If sufficient toxicological data in the form of dissolved metal are not available, aquatic life criteria or values shall be derived in the form of total recoverable metal using the procedures in this section and sections 12 and 16 of this rule and then multiplied by criteria conversion factors approved by the commissioner to express the criteria or values in the form of dissolved metal.

(C) If sufficient toxicological data in the form of dissolved metal are not available and criteria conversion factors for the particular metal have not been approved by the commissioner, aquatic life criteria or values shall be derived in the form of total recoverable metal using the procedures in this section and sections 12 and 16 of this rule and expressed in the form of total recoverable metal.

(c) The following data collection procedures shall be followed when developing Tier I aquatic life criteria:

(1) Collect all data available on the substance concerning toxicity to aquatic animals and plants.

(2) All data that are used should be available in typed, dated, and signed hard copy, for example:

(A) publication;

(B) manuscript;

(C) letter; or

(D) memorandum;

with enough supporting information to indicate that acceptable test procedures were used and that the results are reliable. In some cases, it may be appropriate to obtain written information from the investigator, if possible. Information that is not available for distribution shall not be used.

(3) Questionable data, whether published or unpublished, shall not be used. For example, data shall be rejected if they are from tests:

(A) that did not contain a control treatment;

(B) in which too many organisms in the control treatment died or showed signs of stress or disease; and

(C) in which distilled or deionized water was used as the dilution water without the addition of appropriate salts.

(4) Data on technical grade materials may be used if appropriate, but data on formulated mixtures and emulsifiable concentrates of the material shall not be used.

(5) For some highly volatile, hydrolyzable, or degradable materials, it may be appropriate to use only results of flow-through tests in which the concentrations of test material in test solutions were measured using acceptable analytical methods. A flow-through test is a test with aquatic organisms in which test solutions flow into constant-volume test chambers either intermittently, for example, every few minutes, or continuously, with the excess flowing out.

(6) Data shall be rejected if obtained using the following:

(A) Brine shrimp, because they usually only occur naturally in water with salinity greater than thirty-five (35) grams per kilogram.

(B) Species that do not have reproducing wild populations in North America.
(C) Organisms that were previously exposed to substantial concentrations of the test material or other contaminants.
(D) Saltwater species except for use in deriving ACR.

(7) Questionable data, data on formulated mixtures and emulsifiable concentrates, and data obtained with species nonresident to North America or previously exposed organisms may be used to provide auxiliary information but shall not be used in the derivation of criteria.

(d) This subsection establishes the data requirements for the development of Tier I aquatic life criteria as follows:

(1) Certain data should be available to help ensure that each of the major kinds of possible adverse effects receives adequate consideration. An adverse effect is a change in an organism that is harmful to the organism. Exposure means contact with a chemical or physical agent. Results of acute and chronic toxicity tests with representative species of aquatic animals are necessary so that data available for tested species can be considered a useful indication of the sensitivities of appropriate untested species. Fewer data concerning toxicity to aquatic plants are usually available because procedures for conducting tests with plants and interpreting the results of such tests are not as well developed.

(2) To derive a Tier I criterion for aquatic organisms and their uses, the following must be available:

(A) Results of acceptable acute (or chronic) tests (see subsections (e) and (g)) with at least one (1) species of freshwater animal in at least eight (8) different families such that all of the following are included:

(i) The family Salmonidae in the class Osteichthyes.

(ii) One (1) other family (preferably a commercially or recreationally important, warmwater species) in the class Osteichthyes, for example:

(AA) bluegill; or
(BB) channel catfish.

(iii) A third family in the phylum Chordata, for example:

(AA) fish; or
(BB) amphibian.

(iv) A planktonic crustacean, for example:

(AA) a cladoceran; or
(BB) copepod.

(v) A benthic crustacean, for example:

(AA) ostracod;
(BB) isopod;
(CC) amphipod; or
(DD) crayfish.

(vi) An insect, for example:

(AA) mayfly;
(BB) dragonfly;
(CC) damselfly;
(DD) stonefly;
(EE) caddisfly;
(FF) mosquito; or
(GG) midge.

(vii) A family in a phylum other than Arthropoda or Chordata, for example:

(AA) Rotifera;
(BB) Annelida; or
(CC) Mollusca.

(viii) A family in any order of insect or any phylum not already represented.

(B) Acute-chronic ratios (see subsection (g)) with at least one (1) species of aquatic animal in at least three (3) different families provided that of the three (3) species at least one (1) is:

(i) a fish;
(ii) an invertebrate; and
(iii) an acutely sensitive freshwater species (the other two (2) may be saltwater species).

(C) Results of at least one (1) acceptable test with a freshwater algae or vascular plant is desirable but not required for

criterion derivation (see subsection (i)). If plants are among the aquatic organisms most sensitive to the material, results of a test with a plant in another phylum (division) should also be available.

(3) If all required data are available, a numerical criterion can usually be derived except in special cases. For example, derivation of a chronic criterion might not be possible if the available ACRs vary by more than a factor of ten (10) with no apparent pattern. Also, if a criterion is to be related to a water quality characteristic (see subsections (f) and (h)), more data will be required.

(4) Confidence in a criterion usually increases as the amount of available pertinent information increases. Thus, additional data are usually desirable.

(e) The following procedures shall be used to calculate an FAV:

(1) Appropriate measures of the acute (short term) toxicity of the material to a variety of species of aquatic animals are used to calculate the FAV. The calculated FAV is a calculated estimate of the concentration of a test material such that ninety-five percent (95%) of the genera (with which acceptable acute toxicity tests have been conducted on the material) have higher GMAVs. An acute test is a comparative study in which organisms that are subjected to different treatments are observed for a short period usually not constituting a substantial portion of their life span. However, in some cases, the SMAV of a commercially or recreationally important species of the Great Lakes system is lower than the calculated FAV, then the SMAV replaces the calculated FAV in order to provide protection for that important species.

(2) Acute toxicity tests shall be conducted in accordance with this subsection.

(3) Except for results with saltwater annelids and mysids, results of acute tests during which the test organisms were fed should not be used, unless data indicate that the food did not affect the toxicity of the test material. (If the minimum acute-chronic ratio data requirements (as described in subsection (d)(2)(B)) are not met with freshwater data alone, saltwater data may be used.)

(4) Results of acute tests conducted in unusual dilution water, for example, dilution water in which total organic carbon or particulate matter exceeded five (5) milligrams per liter, shall not be used, unless a relationship is developed between acute toxicity and organic carbon or particulate matter or unless data show that the organic carbon or particulate matter do not affect toxicity.

(5) Acute values must be based upon endpoints that reflect the total severe adverse impact of the test material on the organisms used in the test. Therefore, only the following kinds of data on acute toxicity to aquatic animals shall be used:

(A) Tests with daphnids and other cladocerans must be started with organisms less than twenty-four (24) hours old, and tests with midges must be started with second or third instar larvae. It is preferred that the results should be the forty-eight (48) hour EC_{50} based on the total percentage of organisms killed and immobilized. If such an EC_{50} is not available for a test, the forty-eight (48) hour LC_{50} should be used in place of the desired forty-eight (48) hour EC_{50}. An EC_{50} or LC_{50} of longer than forty-eight (48) hours can be used as long as the animals were not fed and the control animals were acceptable at the end of the test.

(B) It is preferred that the results of a test with embryos and larvae of barnacles, bivalve molluscs (clams, mussels, oysters, and scallops), sea urchins, lobsters, crabs, shrimp, and abalones be the ninety-six (96) hour EC_{50} based on the percentage of organisms with incompletely developed shells plus the percentage of organisms killed. If such an EC_{50} is not available from a test, of the values that are available from the test, the lowest of the following should be used in place of the desired ninety-six (96) hour EC_{50}:

(i) Forty-eight (48) hour to ninety-six (96) hour EC_{50}s based on percentage of organisms with incompletely developed shells plus percentage of organisms killed.

(ii) Forty-eight (48) hour to ninety-six (96) hour EC_{50}s based upon percentage of organisms with incompletely developed shells.

(iii) Forty-eight (48) hour to ninety-six (96) hour LC_{50}s.

If the minimum acute-chronic ratio data requirements (as described in subsection (d)(2)(B)) are not met with freshwater data alone, saltwater data may be used.

(C) It is preferred that the result of tests with all other aquatic animal species and older life stages of barnacles, bivalve molluscs (clams, mussels, oysters, and scallops), sea urchins, lobsters, crabs, shrimp, and abalones be the ninety-six (96) hour EC_{50} based on percentage of organisms exhibiting loss of equilibrium plus percentage of organisms immobilized plus percentage of organisms killed. If such an EC_{50} is not available from a test, of the values that are available from a test, the lower of the following should be used in place of the desired ninety-six (96) hour EC_{50}:

(i) The ninety-six (96) hour EC_{50} based on percentage of organisms exhibiting loss of equilibrium plus percentage

of organisms immobilized.

(ii) The ninety-six (96) hour LC_{50}.

(D) Tests results that take into account the number of young produced, such as most tests with protozoans, are not considered acute tests, even if the duration was ninety-six (96) hours or less.

(E) If the tests were conducted properly, acute values reported as greater than values and those that are above the solubility of the test material should be used, because rejection of such acute values would bias the final acute value by eliminating acute values for resistant species.

(6) If the acute toxicity of the material to aquatic animals has been shown to be related to a water quality characteristic, such as hardness or particulate matter for freshwater animals, refer to subsection (f).

(7) The agreement of the data within and between species must be considered. Acute values that appear to be questionable in comparison with other acute and chronic data for the same species and for other species in the same genus must not be used. For example, if the acute values available for a species or genus differ by more than a factor of ten (10), rejection of some or all of the values would be appropriate, absent countervailing circumstances.

(8) If the available data indicate that one (1) or more life stages are at least a factor of two (2) more resistant than one (1) or more other life stages of the same species, the data for the more resistant life stages shall not be used in the calculation of the SMAV because a species cannot be considered protected from acute toxicity if all of the life stages are not protected.

(9) For each species for which at least one (1) acute value is available, the SMAV shall be calculated as the geometric mean of the results of all acceptable flow-through acute toxicity tests in which the concentrations of test material were measured with the most sensitive tested life stage of the species. For a species for which no such result is available, the SMAV shall be calculated as the geometric mean of all acceptable acute toxicity tests with the most sensitive tested life stage, for example, results of flow-through tests in which the concentrations were not measured and results of static and renewal tests based on initial concentrations (nominal concentrations are acceptable for most test materials if measured concentrations are not available) of test material. A renewal test is a test with aquatic organisms in which either the test solution in a test chamber is removed and replaced at least once during the test or the test organisms are transferred into a new test solution of the same composition at least once during the test. A static test is a test with aquatic organisms in which the solution and organisms that are in a test chamber at the beginning of the test remain in the chamber until the end of the test, except for removal of dead test organisms. The following conditions are applicable to this calculation:

(A) Data reported by original investigators must not be rounded off. Results of all intermediate calculations must not be rounded off to fewer than four (4) significant digits.

(B) The geometric mean of N numbers is the Nth root of the product of the N numbers. Alternatively, the geometric mean can be calculated by adding the logarithms of the N numbers, dividing the sum by N, and taking the antilog of the quotient. The geometric mean of two (2) numbers is the square root of the product of the two (2) numbers, and the geometric mean of one (1) number is that number. Either natural (base e) or common (base 10) logarithms can be used to calculate geometric means as long as they are used consistently within each set of data, for example, the antilog used must match the logarithms used.

(C) Geometric means, rather than arithmetic means, are used here because the distributions of sensitivities of individual organisms in toxicity tests on most materials and the distributions of sensitivities of species within a genus are more likely to be lognormal than normal. Similarly, geometric means are used for ACRs because quotients are likely to be closer to lognormal than normal distributions. In addition, division of the geometric mean of a set of numerators by the geometric mean of the set of denominators will result in the geometric mean of the set of corresponding quotients.

(10) For each genus for which one (1) or more SMAVs are available, the GMAV shall be calculated as the geometric mean of the SMAVs available for the genus.

(11) Order the GMAVs from high to low.

(12) Assign ranks, R, to the GMAVs from "1" for the lowest to "N" for the highest. If two (2) or more GMAVs are identical, assign them successive ranks.

(13) Calculate the cumulative probability, P, for each GMAV as R/(N + 1).

(14) Select the four (4) GMAVs that have cumulative probabilities closest to five-hundredths (0.05) (if there are fewer than fifty-nine (59) GMAVs, these will always be the four (4) lowest GMAVs).

(15) Using the four (4) selected GMAVs and Ps, calculate:

(A) $FAV = e^{A}$

(B) $A = S(\sqrt{0.05}) + L$

$$(C)\ L = \frac{\sum(\ln GMAV) - S(\sum(\sqrt{P}))}{4}$$

$$(D)\ S^2 = \frac{\sum((\ln GMAV)^2) - \frac{(\sum(\ln GMAV))^2}{4}}{\sum(P) - \frac{(\sum(\sqrt{P}))^2}{4}}$$

(16) If, for a commercially or recreationally important species of the Great Lakes system, the geometric mean of the acute values from flow-through tests in which the concentrations of test material were measured is lower than the calculated FAV, then that geometric mean must be used as the FAV instead of the calculated FAV.

(f) When enough data are available to show that acute toxicity to two (2) or more species is similarly related to a water quality characteristic, the relationship shall be taken into account as described in subdivisions (1) through (6) or using analysis of covariance. The two (2) methods are equivalent and produce identical results. The manual method described in this subsection provides an understanding of this application of covariance analysis, but computerized versions of covariance analysis are much more convenient for analyzing large data sets. If two (2) or more factors affect toxicity, multiple regression analysis shall be used. An acute criterion based on a water quality characteristic shall be determined as follows:

(1) For each species for which comparable acute toxicity values are available at two (2) or more different values of the water quality characteristic, perform a least squares regression of the acute toxicity values on the corresponding values of the water quality characteristic to obtain the slope and its ninety-five percent (95%) confidence limits for each species. (Because the best documented relationship is that between hardness and acute toxicity of metals in fresh water and a log-log relationship fits these data, geometric means and natural logarithms of both toxicity and water quality are used in the rest of this section. For relationships based on other water quality characteristics, such as pH or temperature, no transformation or a different transformation might fit the data better, and appropriate changes will be necessary throughout this section.)

(2) Decide whether the data for each species are relevant, taking into account the range and number of the tested values of the water quality characteristic and the degree of agreement within and between species. For example, a slope based on six (6) data points might be of limited value if it is based only on data for a very narrow range of values of the water quality characteristic. A slope based on only two (2) data points, however, might be useful if it is consistent with other information and if the two (2) points cover a broad enough range of the water quality characteristic. In addition, acute values that appear to be questionable in comparison with other acute and chronic data available for the same species and for other species in the same genus should not be used. For example, if after adjustment for the water quality characteristic, the acute values available for a species or genus differ by more than a factor of ten (10), rejection of some or all of the values would be appropriate, absent countervailing justification. Return to subsection (e)(7), using the results of tests conducted under conditions and in waters similar to those commonly used for toxicity tests with the species if any of the following occur:

(A) Useful slopes are not available for at least one (1) fish and one (1) invertebrate.

(B) The available slopes are too dissimilar.

(C) Too few data are available to adequately define the relationship between acute toxicity and the water quality characteristic.

(3) For each species, calculate the geometric mean of the available acute values and then divide each of the acute values for the species by the geometric mean for the species. This normalizes the acute values so that the geometric mean of the normalized values for each species individually and for any combination of species is one (1.0).

(4) Similarly normalize the values of the water quality characteristic for each species individually using the procedure in subdivisions (1) through (3).

(5) Individually for each species perform a least squares regression of the normalized acute values of the water quality characteristic. The resulting slopes and ninety-five percent (95%) confidence limits will be identical to those obtained in subdivision (1). If, however, the data are actually plotted, the line of best fit for each individual species will go through the point 1,1 in the center of the graph.

(6) Treat all of the normalized data as if they were all for the same species and perform a least squares regression of all of the normalized acute values on the corresponding normalized values of the water quality characteristic to obtain the pooled acute slope, V, and its ninety-five percent (95%) confidence limits. If all of the normalized data are actually plotted, the line of best fit will go through the point 1,1 in the center of the graph.

(7) For each species calculate the geometric mean, W, of the acute toxicity values and the geometric mean, X, of the values

of the water quality characteristic. (These were calculated in subdivisions (3) and (4)).

(8) For each species, calculate the logarithm, Y, of the SMAV at a selected value, Z, of the water quality characteristic using the equation:

$$Y = \ln W - V(\ln X - \ln Z)$$

(9) For each species calculate the SMAV at Z using the equation:

$$SMAV = e^{Y}$$

(10) Alternatively, the SMAVs at Z can be obtained by skipping the step in subdivision (7), using the equations in subdivisions (8) and (9) to adjust each acute value individually to Z, and then calculating the geometric mean of the adjusted values for each species individually. This alternative procedure allows an examination of the range of the adjusted acute values for each species.

(11) Obtain the FAV at Z by using the procedure described in subsection (e)(10) through (e)(15).

(12) If, for a commercially or recreationally important species of the Great Lakes system, the geometric mean of the acute values at Z from flow-through tests in which the concentrations of the test material were measured is lower than the FAV at Z, then the geometric mean must be used as the FAV instead of the FAV calculated in subdivision (11).

(13) The final acute equation is written as:

$$(FAV) = e^{(V[\ln(\text{water quality characteristic})] + A - V[\ln Z])}$$

Where: V = pooled acute slope.

A = ln(FAV at Z).

Because V, A, and Z are known, the FAV can be calculated for any selected value of the water quality characteristic.

(g) The following procedures shall be used to calculate an FCV:

(1) Depending on the data that are available concerning chronic toxicity to aquatic animals, the FCV can be calculated in the same manner as the FAV or by dividing the FAV by the final acute-chronic ratio (FACR). In some cases, it might not be possible to calculate an FCV. The FCV is one (1) of the following as applicable:

(A) A calculated estimate of the concentration of a test material such that ninety-five percent (95%) of the genera (with which acceptable chronic toxicity tests have been conducted on the material) have higher GMCVs.

(B) The quotient of an FAV divided by an appropriate ACR (ACR is a way of relating acute and chronic toxicities).

(C) The SMCV of an important or critical species, if the SMCV is lower than the calculated estimate or the quotient.

(2) Chronic values shall be based on results of flow-through (except renewal is acceptable for daphnids) chronic tests in which the concentrations of test material in the test solutions were properly measured at appropriate times during the test. A chronic test is a comparative study in which organisms that are subjected to different treatments are observed for a long period or a substantial portion of their life span.

(3) Results of chronic tests in which survival, growth, or reproduction in the control treatment was unacceptably low shall not be used. The limits of acceptability will depend on the species.

(4) Results of chronic tests conducted in unusual dilution water, for example, dilution water in which total organic carbon or particulate matter exceeded five (5) milligrams per liter, should not be used unless:

(A) a relationship is developed between chronic toxicity and organic carbon or particulate matter; or

(B) data show that the organic carbon or particulate matter do not affect toxicity.

(5) Chronic values must be based on endpoints and lengths of exposure appropriate to the species. Therefore, only results of the following kinds of chronic toxicity tests shall be used:

(A) Life-cycle toxicity tests consisting of exposures of each of two (2) or more groups of individuals of a species to a different concentration of the test material throughout a life cycle. To ensure that all life stages and life processes are exposed, the following procedures shall be followed:

(i) Tests with fish should:

(AA) begin with embryos or newly hatched young less than forty-eight (48) hours old;

(BB) continue through maturation and reproduction; and

(CC) end not less than twenty-four (24) days (ninety (90) days for salmonids) after the hatching of the next generation.

For fish, data should be obtained and analyzed on survival and growth of adults and young, maturation of males and females, eggs spawned per female, embryo viability (salmonids only), and hatchability.

(ii) Tests with daphnids should begin with young less than twenty-four (24) hours old and last for not less than twenty-one (21) days, and for ceriodaphnids not less than seven (7) days. For daphnids, data should be obtained

and analyzed on survival and young per female.

(iii) Tests with mysids should begin with young less than twenty-four (24) hours old and continue until seven (7) days past the median time of first brood release in the controls. For mysids, data should be obtained and analyzed on survival, growth, and young per female.

(B) Partial life-cycle toxicity tests consist of exposures of each of two (2) or more groups of individuals of a species of fish to a different concentration of the test material through most portions of a life cycle. Partial life-cycle tests are allowed with fish species that require more than a year to reach sexual maturity, so that all major life stages can be exposed to the test material in less than fifteen (15) months. A life-cycle test is a comparative study in which organisms that are subjected to different treatments are observed at least from a life stage in one (1) generation to the same life stage in the next generation. Exposure to the test material should:

(i) begin with immature juveniles at least two (2) months prior to active gonad development;

(ii) continue through maturation and reproduction; and

(iii) end not less than twenty-four (24) days (ninety (90) days for salmonids) after the hatching of the next generation.

Data should be obtained and analyzed on survival and growth of adults and young, maturation of males and females, eggs spawned per female, embryo viability (salmonids only), and hatchability.

(C) Early life-stage toxicity tests consisting of twenty-eight (28) to thirty-two (32) day (sixty (60) days post hatch for salmonids) exposures of the early life stages of a species of fish from shortly after fertilization through embryonic, larval, and early juvenile development. Data should be obtained and analyzed on survival and growth. (Note: Results of an early life-stage test are used as predictions of results of life-cycle and partial life-cycle tests with the same species. Therefore, when results of a life-cycle or partial life-cycle test are available, results of an early life-stage test with the same species should not be used. Also, results of early life-stage tests in which the incidence of mortalities or abnormalities increased substantially near the end of the test shall not be used because the results of such tests are possibly not good predictions of comparable life-cycle or partial life-cycle tests.)

(6) A chronic value may be obtained by analyzing chronic data using regression analysis or by calculating the geometric mean of the lower and upper chronic limits from a chronic test as follows:

(A) A lower chronic limit is the highest tested concentration:

(i) in an acceptable chronic test;

(ii) that did not cause an unacceptable amount of adverse effect on any of the specified biological measurements; and

(iii) below which no tested concentration caused an unacceptable effect.

(B) An upper chronic limit is the lowest tested concentration:

(i) in an acceptable chronic test;

(ii) that did cause an unacceptable amount of adverse effect on one (1) or more of the specified biological measurements; and

(iii) above which all tested concentrations also caused such an effect.

(C) Because various authors have used a variety of terms and definitions to interpret and report results of chronic tests, reported results should be reviewed carefully. The amount of effect that is considered unacceptable is often based on a statistical hypothesis test, but might also be defined in terms of a specified percent reduction from the controls. A small percent reduction (for example, three percent (3%)) might be considered acceptable even if it is statistically significantly different from the control, whereas a large percent reduction (for example, thirty percent (30%)) might be considered unacceptable even if it is not statistically significant.

(7) If the chronic toxicity of the material to aquatic animals has been shown to be related to a water quality characteristic, such as hardness or particulate matter for freshwater animals, refer to subsection (h).

(8) If chronic values are available for species in eight (8) families as described in subsection (d)(2)(A), an SMCV shall be calculated for each species for which at least one (1) chronic value is available by calculating the geometric mean of the results of all acceptable life-cycle and partial life-cycle toxicity tests with the species; for a species of fish for which no such result is available, the SMCV is the geometric mean of all acceptable early life-stage tests. Appropriate GMCVs shall also be calculated. A GMCV is the geometric mean of the SMCVs for the genus. The FCV shall be obtained using the procedure described in subsection (e)(10) through (e)(15), substituting SMCV and GMCV for SMAV and GMAV, respectively. See subdivision (10).

(9) The following procedures are for use when chronic values are not available for species in eight (8) taxonomic families as described in subsection (d)(2)(A):

(A) For each chronic value for which at least one (1) corresponding appropriate acute value is available, calculate an ACR, using for the numerator the geometric mean of the results of all acceptable flow-through (except static is acceptable for daphnids and midges) acute tests in the same dilution water in which the concentrations are measured. For fish, the acute tests should be conducted with juveniles. The acute tests should be part of the same study as the chronic test. If acute tests were not conducted as part of the same study, but were conducted as part of a different study in the same laboratory and dilution water, then they may be used. If no such acute tests are available, results of acute tests conducted in the same dilution water in a different laboratory may be used. If no such acute tests are available, an ACR shall not be calculated.

(B) For each species, calculate the SMACR as the geometric mean of all ACRs available for that species. If the minimum ACR data requirements (as described in subsection (d)(2)(B)) are not met with freshwater data alone, saltwater data may be used along with the freshwater data.

(C) For some materials, the ACR seems to be the same for all species, but for other materials the ratio seems to increase or decrease as the SMAV increases. Thus the FACR can be obtained in the following three (3) ways, depending on the data available (If the available SMACRs do not fit one (1) of these cases, a FACR may not be obtained and a Tier I FCV probably cannot be calculated.):

(i) If the species mean ACR seems to increase or decrease as the SMAVs increase, the FACR shall be calculated as the geometric mean of the ACRs for species whose SMAVs are close to the FAV.

(ii) If no major trend is apparent and the ACRs for all species are within a factor of ten (10), the FACR shall be calculated as the geometric mean of all of the SMACRs.

(iii) If the most appropriate SMACRs are less than two (2.0), and especially if they are less than one (1.0), acclimation has probably occurred during the chronic test. In this situation, because continuous exposure and acclimation cannot be assured to provide adequate protection in field situations, the FACR should be assumed to be two (2), so that the FCV is equal to the CMC. (See subsection (k)(1).)

(D) Calculate the FCV by dividing the FAV by the FACR. FCV = FAV ÷ FACR. If there is a final acute equation rather than an FAV, see also subsection (f).

(10) If the SMCV of a commercially or recreationally important species of the Great Lakes system is lower than the calculated FCV, then that SMCV must be used as the FCV instead of the calculated FCV.

(h) When enough data are available to show that toxicity to two (2) or more species is similarly related to a water quality characteristic, the relationship shall be taken into account as described in this subsection. A final chronic equation can be derived in two (2) ways. The procedure described in subdivision (1) will result in the chronic slope being the same as the acute slope. The procedure described in subdivision (2) will usually result in the chronic slope being different from the acute slope. A chronic criterion based on a water quality characteristic shall be determined as follows:

(1) If ACRs are available for enough species at enough values of the water quality characteristic to indicate that the ACR appears to be the same for all species and appears to be independent of the water quality characteristic, then:

(A) calculate the FACR as the geometric mean of the available SMACRs;

(B) calculate the FCV at the selected value Z of the water quality characteristic by dividing the FAV at Z (see subsection (f)(11)) by the FACR; and

(C) use V = pooled acute slope (see subsection (f)(6)), and L = pooled chronic slope (see subdivision (2)(F)).

(2) When enough data are available to show that chronic toxicity to at least one (1) species is related to a water quality characteristic, the relationship should be taken into account as described in clauses (A) through (E) or using analysis of covariance. The two (2) methods are equivalent and produce identical results. The manual method described in this subdivision provides an understanding of this application of covariance analysis, but computerized versions of covariance analysis are much more convenient for analyzing large data sets. If two (2) or more factors affect toxicity, multiple regression analysis shall be used. The manual method for taking into account the relationship of chronic toxicity to a water quality characteristic is the following:

(A) For each species for which comparable chronic toxicity values are available at two (2) or more different values of the water quality characteristic, perform a least squares regression of the chronic toxicity values on the corresponding values of the water quality characteristic to obtain the slope and its ninety-five percent (95%) confidence limits for each species. (Because the best documented relationship is that between hardness and acute toxicity of metals in fresh water

and a log-log relationship fits these data, geometric means and natural logarithms of both toxicity and water quality are used in the rest of this section. For relationships based on other water quality characteristics, such as pH or temperature, no transformation, or a different transformation might fit the data better, and appropriate changes will be necessary throughout this section. It is probably preferable, but not necessary, to use the same transformation that was used with the acute values in subsection (f).)

(B) Decide whether the data for each species are relevant, taking into account the range and number of the tested values of the water quality characteristic and the degree of agreement within and between species. For example, a slope based on six (6) data points might be of limited value if it is based only on data for a very narrow range of values of the water quality characteristic. A slope based on only two (2) data points, however, might be more useful if it is consistent with other information and if the two (2) points cover a broad range of the water quality characteristic. In addition, chronic values that appear to be questionable in comparison with other acute and chronic data available for the same species and for other species in the same genus in most cases should not be used. For example, if after adjustment for the water quality characteristic, the chronic values available for a species or genus differ by more than a factor of ten (10), rejection of some or all of the values is, in most cases, absent countervailing circumstances, appropriate. If a useful chronic slope is not available for at least one (1) species or if the available slopes are too dissimilar or if too few data are available to adequately define the relationship between chronic toxicity and the water quality characteristic, it might be appropriate to assume that the chronic slope is the same as the acute slope, which is equivalent to assuming that the ACR is independent of the water quality characteristic. Alternatively, return to subsection (g)(8), using the results of tests conducted under conditions and in waters similar to those commonly used for toxicity tests with the species.

(C) Individually for each species, calculate the geometric mean of the available chronic values and then divide each chronic value for a species by the mean for the species. This normalizes the chronic values so that the geometric mean of the normalized values for each species individually, and for any combination of species, is one (1.0).

(D) Similarly, normalize the values of the water quality characteristic for each species individually.

(E) Individually for each species, perform a least squares regression of the normalized chronic toxicity values on the corresponding normalized values of the water quality characteristic. The resulting slopes and the ninety-five percent (95%) confidence limits will be identical to those obtained in this subdivision. Now, however, if the data are actually plotted, the line of best fit for each individual species will go through the point 1,1 in the center of the graph.

(F) Treat all of the normalized data as if they were all the same species and perform a least squares regression of all of the normalized chronic values on the corresponding normalized values of the water quality characteristic to obtain the pooled chronic slope, L, and its ninety-five percent (95%) confidence limits. If all normalized data are actually plotted, the line of best fit will go through the point 1,1 in the center of the graph.

(G) For each species, calculate the geometric mean, M, of the toxicity values and the geometric mean, P, of the values of the water quality characteristic. (These are calculated in clauses (C) and (D).)

(H) For each species, calculate the logarithm, Q, of the SMCV at a selected value, Z, of the water quality characteristic using the equation:

$$Q = \ln M - L(\ln P - \ln Z)$$

(Although it is not necessary, it is recommended that the same value of the water quality characteristic be used here as was used in subsection (f).)

(I) For each species, calculate an SMCV at Z using the equation:

$$SMCV = e^{Q}$$

(Alternatively, the SMCV at Z can be obtained by skipping clause (G), using the equations in clause (H) and this clause to adjust each chronic value individually to Z, and then calculating the geometric means of the adjusted values for each species individually. This alternative procedure allows an examination of the range of the adjusted chronic values for each species.)

(J) Obtain the FCV at Z by using the procedure described in subsection (e)(10) through (e)(15).

(3) If the SMCV at Z of a commercially or recreationally important species of the Great Lakes system is lower than the calculated FCV at Z, then that SMCV shall be used as the FCV at Z instead of the calculated FCV.

(4) The final chronic equation is written as:

$$FCV = e^{(L[\ln(\text{water quality characteristic})] + \ln S - L[\ln Z])}$$

Where: L = pooled chronic slope.
S = FCV at Z.

Because L, S, and Z are known, the FCV can be calculated for any selected value of the water quality characteristic.

(i) An FPV is the lowest plant value that was obtained with an important aquatic plant species in an acceptable toxicity test for which the concentrations of the test material were measured and the adverse effect was biologically important. Appropriate measures of the toxicity of the material to aquatic plants are used to compare the relative sensitivities of aquatic plants and animals. Although procedures for conducting and interpreting the results of toxicity tests with plants are not well developed, results of tests with plants usually indicate that criteria that adequately protect aquatic animals and their uses will, in most cases, also protect aquatic plants and their uses. When developing an FPV, the following apply:

(1) A plant value is the result of a ninety-six (96) hour test conducted with an alga or a chronic test conducted with an aquatic vascular plant. (A test of the toxicity of a metal to a plant shall not be used if the medium contained an excessive amount of a complexing agent, such as EDTA, that might affect the toxicity of the metal. Concentrations of EDTA above two hundred (200) µg/L should be considered excessive.)

(2) The FPV shall be obtained by selecting the lowest result from a test with an important aquatic plant species in which the concentrations of test material are measured and the endpoint is biologically important.

(j) Pertinent information that could not be used in earlier subsections may be available concerning adverse effects on aquatic organisms. The following are data that may affect a criterion if the data were obtained with an important species, the test concentrations were measured, and the endpoint was biologically important:

(1) Cumulative and delayed toxicity, reduction in survival, growth, or reproduction, or any other adverse effect that has been shown to be biologically important. Delayed toxicity is an adverse effect to an organism that results from, and occurs after the end of, its exposure to one (1) or more test materials.

(2) Species for which no other data are available.

(3) Behavioral, biochemical, physiological, microcosm, and field studies.

(4) Tests conducted in unusual dilution water (see subsections (e)(4) and (g)(4)).

(5) Chronic tests in which the concentrations were not measured (see subsection (g)(2)).

(6) Tests with previously exposed organisms (see subsection (c)(6)(C)).

(7) Tests on formulated mixtures or emulsifiable concentrates (see subsection (c)(4)).

(k) A criterion consists of two (2) concentrations, the CMC and the CCC, determined as follows:

(1) The CMC is equal to one-half (½) the FAV. The CMC is an estimate of the highest concentration of a material in the water column to which an aquatic community can be exposed briefly without resulting in an unacceptable effect.

(2) The CCC is equal to the lowest of the FCV or the FPV (if available) unless other data (see subsection (j)) show that a lower value should be used. The CCC is an estimate of the highest concentration of a material in the water column to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect. If toxicity is related to a water quality characteristic, the CCC is obtained from the final chronic equation or FPV (if available) that results in the lowest concentrations in the usual range of the water quality characteristic, unless other data (see subsection (j)) show that a lower value should be used.

(3) Round both the CMC and the CCC to two (2) significant digits.

(4) The criterion is stated as follows:

(A) The procedures described in the Tier I methodology indicate that, except possibly where a commercially or recreationally important species is very sensitive, aquatic organisms should not be affected unacceptably if the four (4) day average concentration of (insert name of substance) does not exceed (insert the CCC for the substance) µg/L more than once every three (3) years on the average and if the one (1) hour average concentration does not exceed (insert the CMC for the substance) µg/L more than once every three (3) years on the average.

(B) If the CMC averaging period of one (1) hour or the CCC averaging period of four (4) days is inappropriate for the pollutant, or if the once-in-three-year allowable excursion frequency is inappropriate for the pollutant or for the sites to which a criterion is applied, then the commissioner may specify alternative averaging periods or frequencies. The choice of an alternative averaging period or frequency shall be justified by a scientifically defensible analysis demonstrating that the alternative values will protect the aquatic life uses of the water. Appropriate laboratory data or well-designed field biological surveys shall be submitted to the U.S. EPA as justification for differing averaging periods or frequencies of exceedance.

(Water Pollution Control Board; 327 IAC 2-1.5-11; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1381; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3377; filed Feb 14, 2005, 10:05 a.m.: 28 IR 2084)

327 IAC 2-1.5-12 Determination of Tier II aquatic life values

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4

Sec. 12. (a) If all eight (8) minimum data requirements for calculating an FAV using Tier I under section 11 of this rule are not met, a secondary acute value (SAV) for the waters of the Great Lakes system shall be calculated for a chemical as follows:

(1) To calculate a SAV, the lowest GMAV in the database is divided by the secondary acute factor (SAF) (Table 12-1 in this section) corresponding to the number of satisfied minimum data requirements listed in the Tier I methodology (section 11(d)(2)(A) of this rule). (Requirements for definitions, data collection, and data review, contained in section 11(b), 11(c), and 11(e) of this rule, shall be applied to calculation of a SAV.) If all eight (8) minimum data requirements are satisfied, a Tier I criterion calculation may be possible. In order to calculate a SAV, the database must contain, at a minimum, a genus mean acute value (GMAV) for one (1) of the following three (3) genera in the family Daphnidae:

(A) Ceriodaphnia sp.
(B) Daphnia sp.
(C) Simocephalus sp.

(2) If appropriate, the SAV shall be made a function of a water quality characteristic in a manner similar to that described in the Tier I calculation procedure under section 11(f) of this rule.

(b) If three (3) or more experimentally determined ACRs, meeting the data collection and review requirements of section 11(g) of this rule, are available for the chemical, determine the FACR using the procedure described in section 11(g) of this rule. If fewer than three (3) acceptable experimentally determined ACRs are available, use enough assumed ACRs of eighteen (18) so that the total number of ACRs equals three (3). Calculate the secondary acute-chronic ratio (SACR) as the geometric mean of the three (3) ACRs. Thus, if no experimentally determined ACRs are available, the SACR is eighteen (18).

(c) Calculate the secondary chronic value (SCV) using one (1) of the following (if appropriate, the SCV will be made a function of a water quality characteristic in a manner similar to that described in the Tier I calculation procedure under section 11 of this rule):

(1) $\mathbf{SCV} = \frac{\mathbf{FAV}}{\mathbf{SACR}}$ (use FAV from Tier I)

(2) $\mathbf{SCV} = \frac{\mathbf{SAV}}{\mathbf{FACR}}$

(3) $\mathbf{SCV} = \frac{\mathbf{SAV}}{\mathbf{SACR}}$

(d) If for a commercially or recreationally important species of the Great Lakes system the geometric mean of the acute values or chronic values from flow-through tests in which the concentrations of the test materials were measured is lower than the calculated SAV or SCV, then that geometric mean must be used as the SAV or SCV instead of the calculated SAV or SCV.

(e) A Tier II value shall consist of two (2) concentrations; the secondary maximum concentration (SMC) and the secondary continuous concentration (SCC) determined as follows:

(1) The SMC is equal to one-half (½) of the SAV.

(2) The SCC is equal to the lowest of the SCV or the final plant value, if available, unless other data (see section 11(j) of this rule) show that a lower value should be used. If toxicity is related to a water quality characteristic, the SCC is obtained from the secondary chronic equation or FPV, if available, that results in the lowest concentrations in the usual range of the water quality characteristic, unless other data (see section 11(j) of this rule) show that a lower value should be used.

(3) Round both the SMC and the SCC to two (2) significant digits.

(4) The Tier II value is stated as follows:

(A) The procedures described in the Tier II methodology indicate that, except possibly where a locally important species is very sensitive, aquatic organisms should not be affected unacceptably if the four (4) day average concentration of (insert name of material) does not exceed (insert the SCC) µg/L more than once every three (3) years on the average and if the one (1) hour average concentration does not exceed (insert the SMC) µg/L more than once every three (3) years on the average.

(B) As provided under section 11(k)(4)(B) of this rule, the commissioner has the discretion to specify alternative averaging periods or frequencies.

(f) On the basis of all available pertinent laboratory and field information, determine if the Tier II value is consistent with sound scientific evidence. If it is not, another value, either higher or lower, shall be derived consistent with the procedures in this section.

(g) The following table shall be used to determine secondary acute factors (SAFs):

Table 12-1
Secondary Acute Factors

Number of Minimum Data Requirements Satisfied	Adjustment Factor
1	21.9
2	13.0
3	8.0
4	7.0
5	6.1
6	5.2
7	4.3

(Water Pollution Control Board; 327 IAC 2-1.5-12; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1391)

327 IAC 2-1.5-13 Determination of bioaccumulation factors (BAFs)

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4

Sec. 13. (a) This section describes procedures for deriving bioaccumulation factors (BAFs) to be used in the calculation of human health Tier I criteria and Tier II values and wildlife Tier I criteria. A subset of the human health BAFs is also used to identify the chemicals that are considered bioaccumulative chemicals of concern (BCCs). BAFs are derived as follows:

(1) Bioaccumulation reflects uptake of a substance by aquatic organisms exposed to the substance through all routes, such as ambient water and food, as would occur in nature. Bioconcentration reflects uptake of a substance by aquatic organisms exposed to the substance only through the ambient water. Both BAFs and bioconcentration factors (BCFs) are proportionality constants that describe the relationship between the concentration of a substance in aquatic organisms and its concentration in the ambient water. In this section, BAFs, rather than BCFs, are used to calculate Tier I criteria for human health and wildlife and Tier II values for human health because they better account for the total exposure of aquatic organisms to chemicals.

(2) For organic chemicals, the lipid content of the aquatic organisms is used to account for partitioning of organic chemicals within organisms so that data from different tissues and species can be integrated. The baseline BAF is based on the concentration of freely dissolved organic chemicals in the ambient water to facilitate extrapolation from one (1) water to another. Baseline BAFs shall be derived using one (1) of the following four (4) methods:

(A) Measured baseline BAFs are derived from field-measured BAFs.

(B) Predicted baseline BAFs are derived using biota-sediment accumulation factors (BSAFs).

(C) Predicted baseline BAFs are derived by multiplying a laboratory-measured BCF by a food-chain multiplier (FCM).

(D) Predicted baseline BAFs are derived by multiplying a predicted BCF by a FCM.

(3) For inorganic chemicals, BAFs are assumed to equal BCFs (that is, the FCM is one (1.0)) unless chemical-specific biomagnification data support using a FCM other than one (1.0). The baseline BAFs are derived using either of the following two (2) methods:

(A) Field-measured BAFs.

(B) By multiplying laboratory-measured BCFs by a FCM.

(4) Because both humans and wildlife consume fish from both trophic levels three (3) and four (4), two (2) baseline BAFs are needed to calculate either a human health criterion or value or a wildlife criterion for a chemical. When appropriate, ingestion through consumption of invertebrates, plants, mammals, and birds in the diet of wildlife species to be protected may be taken into account.

(b) The following procedures shall be used to review and select the data necessary to determine BAFs, BSAFs, and BCFs:

(1) Measured BAFs, BSAFs, and BCFs are assembled from available sources, including the following:

(A) U.S. EPA Ambient Water Quality Criteria documents issued after January 1, 1980.

(B) Published scientific literature.

(C) Reports issued by U.S. EPA or other reliable sources.

(D) Unpublished data.

(E) Sources referenced in the Aquatic Toxicity Information Retrieval (AQUIRE) database.

(2) The following procedural and quality assurance requirements shall be met for field-measured BAFs:

(A) The field studies used shall be limited to those conducted in the Great Lakes system with fish at or near the top of the aquatic food chain, for example, in trophic levels three (3) or four (4).

(B) The trophic level of the fish species shall be determined.

(C) The site of the field study should not be so unique that the BAF cannot be extrapolated to other locations where the criteria and values will apply.

(D) For organic chemicals, the percent lipid shall be either measured or reliably estimated for the tissue used in the determination of the BAF.

(E) The concentration of the chemical in the water shall be measured in a way that can be related to particulate organic carbon (POC) or dissolved organic carbon (DOC) and should be relatively constant during the steady-state time period.

(F) For organic chemicals with log K_{OW} greater than four (4), the concentrations of POC and DOC in the ambient water shall be either measured or reliably estimated.

(G) For inorganic and organic chemicals, BAFs shall be used only if they are expressed on a wet weight basis; BAFs reported on a dry weight basis cannot be converted to wet weight unless a conversion factor is measured or reliably estimated for the tissue used in the determination of the BAF.

(3) The following procedural and quality assurance requirements shall be met for field-measured BSAFs:

(A) The field studies used shall be limited to those conducted in the Great Lakes system with fish at or near the top of the aquatic food chain, for example, in trophic levels three (3) or four (4).

(B) Samples of surface sediments (zero (0) to one (1) centimeter is ideal) shall be from locations in which there is net deposition of fine sediment and is representative of average surface sediment in the vicinity of the organism.

(C) The K_{OW}s used shall be of acceptable quality as described in subdivision (6).

(D) The site of the field study should not be so unique that the resulting BAF cannot be extrapolated to other locations where the criteria and values will apply.

(E) The trophic level of the fish species shall be determined.

(F) The percent lipid shall be either measured or reliably estimated for the tissue used in the determination of the BAF.

(4) The following procedural and quality assurance requirements shall be met for laboratory-measured BCFs:

(A) The test organism shall not be diseased, unhealthy, or adversely affected by the concentration of the chemical.

(B) The total concentration of the chemical in the water shall be measured and should be relatively constant during the steady-state time period.

(C) The organisms shall be exposed to the chemical using a flow-through or renewal procedure.

(D) For organic chemicals, the percent lipid shall be either measured or reliably estimated for the tissue used in the determination of the BCF.

(E) For organic chemicals with log K_{OW} greater than four (4), the concentrations of POC and DOC in the test solution shall be either measured or reliably estimated.

(F) Laboratory-measured BCFs should be determined using fish species, but BCFs determined with molluscs and other invertebrates may be used with caution. For example, because invertebrates metabolize some chemicals less efficiently than vertebrates, a baseline BCF determined for such a chemical using invertebrates is expected to be higher than a comparable baseline BCF determined using fish.

(G) If laboratory-measured BCFs increase or decrease as the concentration of the chemical increases in the test solutions in a bioconcentration test, the BCF measured at the lowest test concentration that is above concentrations existing in the control water shall be used, for example, a BCF should not be calculated from a control treatment. The concentrations of an inorganic chemical in a bioconcentration test should be greater than normal background levels and greater than levels required for normal nutrition of the test species if the chemical is a micronutrient, but below levels that adversely affect the species. Bioaccumulation of an inorganic chemical might be overestimated if concentrations are at or below normal background levels due to, for example, nutritional requirements of the test organisms.

(H) For inorganic and organic chemicals, BCFs shall be used only if they are expressed on a wet weight basis. BCFs reported on a dry weight basis cannot be converted to wet weight unless a conversion factor is measured or reliably estimated for the tissue used in the determination of the BAF.

(I) BCFs for organic chemicals may be based on measurement of radioactivity only when the BCF is intended to include

metabolites or when there is confidence that there is no interference due to metabolites.

(J) The calculation of the BCF must appropriately address growth dilution.

(K) Other aspects of the methodology used shall be similar to those described by ASTM, 1990, Standard Practice for Conducting Bioconcentration Tests with Fishes and Saltwater Bivalve Molluscs, Standard E 1022.

(5) The following procedural and quality assurance requirements shall be met for predicted BCFs:

(A) The K_{OW} used shall be of acceptable quality as described in subdivision (6).

(B) The predicted baseline BCF shall be calculated using the equation:

$$\text{predicted baseline BCF} = K_{OW}$$

Where: K_{OW} = octanol-water partition coefficient.

(6) The value of K_{OW} shall be determined as follows:

(A) The value of K_{OW} used for an organic chemical shall be determined by giving priority to the experimental and computational techniques used as follows:

(i) Where the Log K_{OW} is less than four (4) (Log $K_{OW} < 4$):

Priority	Technique
1	Slow-stir
1	Generator-column
1	Shake-flask
2	Reverse-phase liquid chromatography on C18 chromatography packing with extrapolation to zero percent solvent
3	Reverse-phase liquid chromatography on C18 chromatography packing without extrapolation to zero percent solvent
4	Calculated by the CLOGP program

(ii) Where the Log K_{OW} is greater than four (4) (Log $K_{OW} > 4$):

Priority	Technique
1	Slow-stir
1	Generator-column
2	Reverse-phase liquid chromatography on C18 chromatography packing with extrapolation to zero percent solvent
3	Reverse-phase liquid chromatography on C18 chromatography packing without extrapolation to zero percent solvent
4	Shake-flask
5	Calculated by the CLOGP program

(B) The CLOGP program is a computer program available from Pomona College. A value of K_{OW} that seems to be different from the others should be considered an outlier and not used. The value of K_{OW} used for an organic chemical shall be the geometric mean of the available K_{OW}s with highest priority or can be calculated from the arithmetic mean of the available log K_{OW}s with the highest priority. Because it is an intermediate value in the derivation of a BAF, the value used for the K_{OW} of a chemical should not be rounded to fewer than three (3) significant digits and a value for log K_{OW} should not be rounded to fewer than three (3) significant digits after the decimal point.

(7) This section provides overall guidance for the derivation of BAFs, but it cannot cover all the decisions that must be made in the review and selection of acceptable data. Professional judgment is required throughout the process. A degree of uncertainty is associated with the determination of any BAF, BSAF, BCF, or K_{OW}. The amount of uncertainty in a baseline BAF depends on both the quality of data available and the method used to derive the BAF.

(8) Hereinafter in this section, "BAF", "BSAF", "BCF", and "K_{OW}" refer to the "BAF", "BSAF", "BCF", and "K_{OW}" that are consistent with the procedural and quality assurance requirements given in this subsection.

(c) For comparative purposes, baseline BAFs should be derived for each chemical by as many of the four (4) methods as available data allow. Baseline BAFs shall be derived using the following four (4) methods, which are listed from most preferred to least preferred:

(1) A measured baseline BAF for an organic or inorganic chemical derived from a field study of acceptable quality.
(2) A predicted baseline BAF for an organic chemical derived using field-measured BSAFs of acceptable quality.
(3) A predicted baseline BAF for an organic or inorganic chemical derived from a BCF measured in a laboratory study of acceptable quality and an FCM.
(4) A predicted baseline BAF for an organic chemical derived from a K_{OW} of acceptable quality and an FCM.
(d) The following procedures shall be used to calculate baseline BAFs for organic chemicals:
(1) The following procedures shall be used to determine the lipid-normalized concentration:

(A) It is assumed that BAFs and BCFs for organic chemicals can be extrapolated on the basis of percent lipid from one (1) tissue to another and from one (1) aquatic species to another in most cases.

(B) Because BAFs and BCFs for organic chemicals are related to the percent lipid, it does not make any difference whether the tissue sample is whole body or edible portion, but both the BAF (or BCF) and the percent lipid must be determined for the same tissue. The percent lipid of the tissue should be measured during the BAF or BCF study, but in some cases it can be reliably estimated from measurements on tissue from other organisms. If percent lipid is not reported for the test organisms in the original study, it may be obtained from the author; or, in the case of a laboratory study, lipid data for the same or a comparable laboratory population of test organisms that were used in the original study may be used.

(C) The lipid-normalized concentration, C_ℓ, of a chemical in tissue is defined using the following equation:

$$C_\ell = \frac{C_B}{f_\ell}$$

Where: C_B = concentration of the organic chemical in the tissue of aquatic biota (either whole organism or specified tissue) (micrograms per gram).
f_ℓ = fraction of the tissue that is lipid.

(2) By definition, baseline BAFs and BCFs for organic chemicals, whether measured or predicted are based on the concentration of the chemical that is freely dissolved in the ambient water in order to account for bioavailability. The following procedures shall be used to determine this freely dissolved concentration:

(A) For the purposes of this subsection, the relationship between the total concentration of the chemical in the water (that which is freely dissolved plus that which is sorbed to particulate organic carbon or to dissolved organic carbon) to the freely dissolved concentration of the chemical in the ambient water shall be calculated using the following equation:

$$C_w^{fd} = (f_{fd})(C_w^t)$$

Where: C_w^{fd} = freely dissolved concentration of the organic chemical in the ambient water.
C_w^t = total concentration of the organic chemical in the ambient water.
f_{fd} = fraction of the total chemical in the ambient water that is freely dissolved.

(B) The fraction of the total chemical in the ambient water that is freely dissolved, f_{fd}, shall be calculated using the following equation:

$$f_{fd} = \frac{1}{1 + \frac{(DOC)(K_{OW})}{10} + (POC)(K_{OW})}$$

Where: DOC = concentration of dissolved organic carbon in kilograms of dissolved organic carbon per liter of water.
K_{OW} = octanol-water partition coefficient of the chemical.
POC = concentration of particulate organic carbon in kilograms of particulate organic carbon per liter of water.

(3) In the absence of a field-measured BAF or a predicted BAF derived from a BSAF, a food chain multiplier (FCM) shall be used to calculate the baseline BAF for trophic levels three (3) and four (4) from a laboratory-measured or predicted BCF. For an organic chemical, the FCM used shall be derived from Table 13-1 in subsection (h), using the chemical's log K_{OW} and linear interpolation. An FCM greater than one (1.0) applies to most organic chemicals with a log K_{OW} of four (4) or more. The trophic level used shall take into account the age or size of the fish species consumed by the human, avian, or mammalian predator because, for some species of fish, the young are in trophic level three (3) whereas the adults are in trophic level four (4).
(4) A baseline BAF shall be calculated from a field-measured BAF of acceptable quality using the following equation:

$$\text{Baseline BAF} = \left[\frac{\text{Measured BAF}_T^t}{f_{fd}} - 1 \right] \left(\frac{1}{f_\ell} \right)$$

Where: BAF_T^t = BAF based on total concentration in tissue and water.

f_ℓ = fraction of the tissue that is lipid.

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

The trophic level to which the baseline BAF applies is the same as the trophic level of the organisms used in the determination of the field-measured BAF. For each trophic level, a species mean measured baseline BAF shall be calculated as the geometric mean if more than one (1) measured baseline BAF is available for a given species. For each trophic level, the geometric mean of the species mean measured baseline BAFs shall be calculated. If a baseline BAF based on a measured BAF is available for either trophic level three (3) or four (4), but not both, a measured baseline BAF for the other trophic level shall be calculated using the ratio of the FCMs that are obtained by linear interpolation from Table 13-1 in subsection (h) for the chemical.

(5) A baseline BAF shall be calculated from a field-measured BAF in accordance with the following:

(A) A baseline BAF for organic chemical "i" shall be calculated from a field-measured BSAF of acceptable quality using the following equation:

$$(\text{Baseline BAF})_i = (\text{Baseline BAF})_r \cdot \frac{(\text{BSAF})_i \cdot (K_{OW})_i}{(\text{BSAF})_r \cdot (K_{OW})_r}$$

Where: $(BSAF)_i$ = BSAF for chemical "i".

$(BSAF)_r$ = BSAF for the reference chemical "r".

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

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

(B) A BSAF shall be calculated using the following equation:

$$\text{BSAF} = \frac{C_\ell}{C_{SOC}}$$

Where: C_ℓ = the lipid-normalized concentration of the chemical in tissue.

C_{SOC} = the organic carbon-normalized concentration of the chemical in sediment.

(C) The organic carbon-normalized concentration of a chemical in sediment, C_{SOC}, shall be calculated using the following equation:

$$C_{SOC} = \frac{C_S}{f_{OC}}$$

Where: C_S = concentration of chemical in sediment (micrograms per gram of sediment).

f_{OC} = fraction of the sediment that is organic carbon.

(D) Predicting BAFs from BSAFs requires data from a steady-state (or near steady-state) condition between sediment and ambient water for both a reference chemical "r" with a field-measured BAF_ℓ^{fd} and other chemicals "n = i" for which BSAFs are to be determined.

(E) The trophic level to which the baseline BAF applies is the same as the trophic level of the organisms used in the determination of the BSAF. For each trophic level, a species mean baseline BAF shall be calculated as the geometric mean if more than one (1) baseline BAF is predicted from BSAFs for a given species. For each trophic level, the geometric mean of the species mean baseline BAFs derived using BSAFs shall be calculated.

(F) If a baseline BAF based on a measured BSAF is available for either trophic level three (3) or four (4), but not both, a baseline BAF for the other trophic level shall be calculated using the ratio of the FCMs that are obtained by linear interpolation from Table 13-1 in subsection (h) for the chemical.

(6) A baseline BAF for trophic level three (3) and a baseline BAF for trophic level four (4) shall be calculated from a laboratory-measured BCF of acceptable quality and a FCM using the following equation:

$$\text{Baseline BAF} = (\text{FCM}) \left[\frac{\text{Measured BCF}_T^t}{f_{fd}} - 1 \right] \left(\frac{1}{f_\ell} \right)$$

Where: BCF_T^t = BCF based on total concentration in tissue and water.
f_ℓ = fraction of the tissue that is lipid.
f_{fd} = fraction of the total chemical in the test water that is freely dissolved.
FCM = the food-chain multiplier obtained from Table 13-1 in subsection (h) by linear interpolation for trophic level three (3) or four (4) as necessary.

For each trophic level, a species mean baseline BAF shall be calculated as the geometric mean if more than one (1) baseline BAF is predicted from laboratory-measured BCFs for a given species. For each trophic level, the geometric mean of the species mean baseline BAFs based on laboratory-measured BCFs shall be calculated.

(7) A baseline BAF for trophic level three (3) and a baseline BAF for trophic level four (4) shall be calculated from a K_{OW} of acceptable quality and a FCM using the following equation:

$$\text{Baseline BAF} = (\text{FCM})(\text{predicted baseline BCF}) = (\text{FCM})(K_{OW})$$

Where: FCM = the food-chain multiplier obtained from Table 13-1 in subsection (h) by linear interpolation for trophic level three (3) or four (4) as necessary.
K_{OW} = octanol-water partition coefficient.

(e) The following procedures shall be used to calculate human health and wildlife BAFs for organic chemicals:

(1) To calculate human health and wildlife BAFs for an organic chemical, the K_{OW} of the chemical shall be used with a POC concentration of 0.00000004 kilograms per liter and a DOC concentration of 0.000002 kilograms per liter to yield the fraction freely dissolved:

$$f_{fd} = \frac{1}{1 + \frac{(DOC)(K_{OW})}{10} + (POC)(K_{OW})}$$

$$= \frac{1}{1 + \frac{(0.000002\ kg/L)(K_{OW})}{10} + (0.00000004\ kg/L)(K_{OW})}$$

$$= \frac{1}{1 + (0.00000024\ kg/L)(K_{OW})}$$

(2) The human health BAFs for an organic chemical shall be calculated using the following equations:

(A) For trophic level three (3):

$$\text{Human Health } BAF_{TL3}^{HH} = [(\text{baseline BAF})(0.0182) + 1](f_{fd})$$

Where: 0.0182 is the standardized fraction lipid values for trophic level three (3) that is used to derive human health criteria and values.

(B) For trophic level four (4):

$$\text{Human Health } BAF_{TL4}^{HH} = [(\text{baseline BAF})(0.0310) + 1](f_{fd})$$

Where: 0.0310 is the standardized fraction lipid values for trophic level four (4) that is used to derive human health criteria and values.

(3) The wildlife BAFs for an organic chemical shall be calculated using the following equations:

(A) For trophic level three (3):

$$\text{Wildlife } BAF_{TL3}^{WL} = [(\text{baseline BAF})(0.0646) + 1](f_{fd})$$

Where: 0.0646 is the standardized fraction lipid value for trophic level three (3) that is used to derive wildlife criteria.

(B) For trophic level four (4):

$$\text{Wildlife } BAF_{TL4}^{WL} = [(\text{baseline BAF})(0.1031) + 1](f_{fd})$$

Where: 0.1031 is the standardized fraction lipid values for trophic level four (4) that is used to derive wildlife criteria.

(f) The following procedures shall be used to calculate human health and wildlife BAFs for inorganic chemicals:

(1) For inorganic chemicals, the baseline BAFs for trophic levels three (3) and four (4) are both assumed to equal the BCF determined for the chemical with fish, for example, the FCM is assumed to be one (1) for both trophic levels three (3) and four (4). However, an FCM greater than one (1) might be applicable to some metals, such as mercury, if, for example, an

organometallic form of the metal biomagnifies.

(2) The following procedures shall be used to calculate human health BAFs for inorganic chemicals:

(A) Measured BAFs and BCFs used to determine human health BAFs for inorganic chemicals shall be based on edible tissue, such as muscle, of freshwater fish unless it is demonstrated that whole body BAFs or BCFs are similar to edible tissue BAFs or BCFs. BCFs and BAFs based on measurements of aquatic plants and invertebrates should not be used in the derivation of human health criteria and values.

(B) If one (1) or more field-measured baseline BAFs for an inorganic chemical are available from studies conducted in the Great Lakes system with the muscle of fish:

(i) for each trophic level, a species mean measured baseline BAF shall be calculated as the geometric mean if more than one (1) measured BAF is available for a given species; and

(ii) for each trophic level, the geometric mean of the species mean measured baseline BAFs shall be used as the human health BAF for that chemical.

(C) If an acceptable measured baseline BAF is not available for an inorganic chemical and one (1) or more acceptable edible portion laboratory measured BCFs are available for the chemical, a predicted baseline BAF shall be calculated by multiplying the geometric mean of the BCFs times a FCM. The FCM will be one (1.0) unless chemical-specific biomagnification data support using a multiplier other than one (1.0). The predicted baseline BAF shall be used as the human health BAF for that chemical.

(3) The following procedures shall be used to calculate wildlife BAFs for inorganic chemicals:

(A) Measured BAFs and BCFs used to determine wildlife BAFs for inorganic chemicals shall be based on whole body freshwater fish and invertebrate data unless it is demonstrated that edible tissue BAFs or BCFs are similar to whole body BAFs or BCFs.

(B) If one (1) or more field-measured baseline BAFs for an inorganic chemical are available from studies conducted in the Great Lakes system with whole body of fish or invertebrates:

(i) for each trophic level, a species mean measured baseline BAF shall be calculated as the geometric mean if more than one (1) measured BAF is available for a given species; and

(ii) for each trophic level, the geometric mean of the species mean measured baseline BAFs shall be used as the wildlife BAF for that chemical.

(C) If an acceptable measured baseline BAF is not available for an inorganic chemical and one (1) or more acceptable whole body laboratory measured BCFs are available for the chemical, a predicted baseline BAF shall be calculated by multiplying the geometric mean of the BCFs times a FCM. The FCM will be one (1.0) unless chemical-specific biomagnification data support using a multiplier other than one (1.0). The predicted baseline BAF shall be used as the wildlife BAF for that chemical.

(g) For both organic and inorganic chemicals, human health and wildlife BAFs for both trophic levels shall be reviewed for consistency with all available data concerning the bioaccumulation, bioconcentration, and metabolism of the chemical. For example, information concerning octanol-water partitioning, molecular size, or other physicochemical properties that might enhance or inhibit bioaccumulation should be considered for organic chemicals. BAFs derived in accordance with this methodology should be modified if changes are justified by available data.

(h) The following shall be used to obtain food chain multipliers:

Table 13-1

Food-Chain Multipliers for Trophic Levels 2, 3, and 4

Log K_{ow}	T. L. 2	T. L. 3[a]	T. L. 4
2.0	1.000	1.005	1.000
2.5	1.000	1.010	1.002
3.0	1.000	1.028	1.007
3.1	1.000	1.034	1.007
3.2	1.000	1.042	1.009
3.3	1.000	1.053	1.012
3.4	1.000	1.067	1.014
3.5	1.000	1.083	1.019
3.6	1.000	1.103	1.023
3.7	1.000	1.128	1.033

3.8	1.000	1.161	1.042
3.9	1.000	1.202	1.054
4.0	1.000	1.253	1.072
4.1	1.000	1.315	1.096
4.2	1.000	1.380	1.13
4.3	1.000	1.491	1.178
4.4	1.000	1.614	1.242
4.5	1.000	1.766	1.334
4.6	1.000	1.950	1.459
4.7	1.000	2.175	1.633
4.8	1.000	2.452	1.871
4.9	1.000	2.780	2.193
5.0	1.000	3.181	2.612
5.1	1.000	3.643	3.162
5.2	1.000	4.188	3.873
5.3	1.000	4.803	4.742
5.4	1.000	5.502	5.821
5.5	1.000	6.266	7.079
5.6	1.000	7.096	8.551
5.7	1.000	7.962	10.209
5.8	1.000	8.841	12.050
5.9	1.000	9.716	13.964
6.0	1.000	10.556	15.996
6.1	1.000	11.337	17.783
6.2	1.000	12.064	19.907
6.3	1.000	12.691	21.677
6.4	1.000	13.228	23.281
6.5	1.000	13.662	24.604
6.6	1.000	13.980	25.645
6.7	1.000	14.223	26.363
6.8	1.000	14.355	26.669
6.9	1.000	14.388	26.669
7.0	1.000	14.305	26.242
7.1	1.000	14.142	25.468
7.2	1.000	13.852	24.322
7.3	1.000	13.474	22.856
7.4	1.000	12.987	21.038
7.5	1.000	12.517	18.967
7.6	1.000	11.708	16.749
7.7	1.000	10.914	14.388
7.8	1.000	10.069	12.050
7.9	1.000	9.162	9.840
8.0	1.000	8.222	7.798
8.1	1.000	7.278	6.012
8.2	1.000	6.361	4.519
8.3	1.000	5.489	3.311
8.4	1.000	4.683	2.371
8.5	1.000	3.949	1.663
8.6	1.000	3.296	1.146
8.7	1.000	2.732	0.778
8.8	1.000	2.246	0.521

8.9	1.000	1.837	0.345
9.0	1.000	1.493	0.226

[a]The FCMs for trophic level 3 are the geometric mean of the FCMs for sculpin and alewife.

(Water Pollution Control Board; 327 IAC 2-1.5-13; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1392; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3377)

327 IAC 2-1.5-14 Determination of human health criteria and values

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4

Sec. 14. (a) This subsection establishes a procedure required when developing Tier I criteria and Tier II values for the protection of human health as follows:

(1) The goal of the human health criteria for the Great Lakes system is the protection of humans from unacceptable exposure to toxicants via consumption of contaminated fish and drinking water and from ingesting water as a result of participation in water-oriented recreational activities.

(2) The criteria developed shall provide a level of protection likely to be without appreciable risk of carcinogenic or noncarcinogenic effects. Criteria are a function of the level of designated risk or no adverse effect estimation, selection of data, and exposure assumptions. Ambient criteria for single carcinogens shall not be set at a level representing a lifetime upper-bound incremental risk greater than one (1) in one hundred thousand (100,000) of developing cancer using the hazard assessment techniques and exposure assumptions described in this subsection. Criteria affording protection from noncarcinogenic effects shall be established at levels that, taking into account uncertainties, are considered likely to be without an appreciable risk of adverse human health effects (such as acute, subchronic, and chronic toxicity, including reproductive and developmental effects) during a lifetime of exposure, using the risk assessment techniques and exposure assumptions described in this subsection.

(3) Chemical concentration levels in surface water protective of human health shall be derived based on either a Tier I or Tier II classification. The two (2) Tiers are primarily distinguished by the amount of toxicity data available for deriving the concentration levels and the quantity and quality of data on bioaccumulation.

(b) The best available toxicity data on the adverse health effects of a chemical and the best data on bioaccumulation factors shall be used when developing human health Tier I criteria or Tier II values. The best available toxicity data shall include data from well-conducted epidemiologic or animal studies that provide, in the case of carcinogens, an adequate weight of evidence of potential human carcinogenicity and, in the case of noncarcinogens, a dose-response relationship involving critical effects biologically relevant to humans. Such information can be obtained from the U.S. EPA Integrated Risk Information System (IRIS) database, the scientific literature, and other informational databases, studies, or reports containing adverse health effects data of adequate quality for use in this procedure. Strong consideration shall be given to the most currently available guidance provided by IRIS in deriving criteria or values, supplemented with any recent data not incorporated into IRIS. When deviations from IRIS are anticipated or considered necessary, such actions shall be communicated to the U.S. EPA Reference Dose (RfD) or the Cancer Risk Assessment Verification Endeavor (CRAVE) workgroup. The best available bioaccumulation data shall include data from field studies and well-conducted laboratory studies.

(1) Tier I criteria and Tier II values shall be derived using the methodologies described in subsection (c)(1) when there is adequate evidence of potential human carcinogenic effects for a chemical. The U.S. EPA classification system for chemical carcinogens, which is described in the 1986 U.S. EPA Guidelines for Carcinogenic Risk Assessment (U.S. EPA, 1986) shall be used in determining whether adequate evidence of potential carcinogenic effects exists.

(A) Carcinogens are classified, depending on the weight of evidence, as either human carcinogens, probable human carcinogens, or possible human carcinogens. The human evidence is considered inadequate and therefore the chemical cannot be classified as a human carcinogen if one (1) of the two (2) following conditions exists:

(i) There are few pertinent data.

(ii) The available studies, while showing evidence of association, do not exclude chance, bias, or confounding and therefore a causal interpretation is not credible. The animal evidence is considered inadequate, and therefore the chemical cannot be classified as a probable or possible human carcinogen, when, because of major qualitative or quantitative limitations, the evidence cannot be interpreted as showing either the presence or absence of a

carcinogenic effect.

(B) Chemicals are described as human carcinogens when there is sufficient evidence from epidemiological studies to support a causal association between exposure to the chemicals and cancer.

(C) Chemicals described as probable human carcinogens include chemicals for which the weight of evidence of human carcinogenicity based on epidemiological studies is limited. Limited human evidence is that which indicates that a causal interpretation is credible, but that alternative explanations, such as chance, bias, or confounding, cannot adequately be excluded. Probable human carcinogens are also agents for which there is sufficient evidence from animal studies and for which there is inadequate evidence or no data from epidemiologic studies.

(i) Sufficient animal evidence is provided by data that indicate that there is an increased incidence of malignant tumors or combined malignant and benign tumors:

(AA) in multiple species or strains;

(BB) in multiple experiments, for example, with different routes of administration or using different dose levels; or

(CC) to an unusual degree in a single experiment with regard to high incidence, unusual site or type of tumor, or early age at onset.

(ii) Additional evidence may be provided by data on dose-response effects, as well as information from short term tests (such as mutagenicity and genotoxicity tests that help determine whether the chemical interacts directly with DNA) or on chemical structure, metabolism, or mode of action.

(D) Possible human carcinogens are chemicals with limited evidence of carcinogenicity in animals in the absence of human data.

(i) Limited animal evidence is defined as data that suggest a carcinogenic effect but are limited because:

(AA) the studies involve a single species, strain, or experiment and do not meet criteria for sufficient evidence (see clause (C));

(BB) the experiments are restricted by inadequate dosage levels, inadequate duration of exposure to the agent, inadequate period of follow-up, poor survival, too few animals, or inadequate reporting; or

(CC) the studies indicate an increase in the incidence of benign tumors only.

(ii) More specifically, this group may include a wide variety of evidence, for example:

(AA) a malignant tumor response in a single, well-conducted experiment that does not meet conditions for sufficient evidence;

(BB) tumor response of marginal statistical significance in studies having inadequate design or reporting;

(CC) benign but not malignant tumors with an agent showing no response in a variety of short term tests for mutagenicity; and

(DD) response of marginal statistical significance in a tissue known to have a high or variable background rate.

(E) Weight of evidence of potential human carcinogenic effects sufficient to derive a Tier I human cancer criterion (HCC) shall generally include human carcinogens, and probable human carcinogens and may include, on a case-by-case basis, possible human carcinogens if studies have been well-conducted albeit based on limited evidence, when compared to studies used in classifying human and probable human carcinogens. The decision to use data on a possible human carcinogen for deriving Tier I criteria shall be a case-by-case determination. In determining whether to derive a Tier I HCC, additional evidence that shall be considered includes, but is not limited to, the following:

(i) Available information on mode of action, such as mutagenicity and genotoxicity (determinations of whether the chemical interacts directly with DNA).

(ii) Structure activity.

(iii) Metabolism.

(F) Weight of evidence of possible human carcinogenic effects sufficient to derive a Tier II human cancer value shall include those possible human carcinogens for which there are, at a minimum, data sufficient for quantitative risk assessment, but for which data are inadequate for Tier I criterion development due to a tumor response of marginal statistical significance or inability to derive a strong dose-response relationship. As with the use of data on possible human carcinogens in developing Tier I criteria, the decision to use data on possible human carcinogens to derive Tier II values shall be made on a case-by-case basis. In determining whether to derive Tier II human cancer values, additional evidence that shall be considered includes, but is not limited to, the following:

(i) Available information on mode of action such as mutagenicity and genotoxicity (determinations of whether the chemical interacts directly with DNA).

(ii) Structure activity.

(iii) Metabolism.

(2) All available toxicity data shall be evaluated considering the full range of possible health effects of a chemical, for example, acute/subacute, chronic/subchronic, and reproductive/developmental effects, in order to best describe the dose-response relationship of the chemical, and to calculate human noncancer criteria and values that will protect against the most sensitive endpoint of toxicity. Although it is desirable to have an extensive database that considers a wide range of possible adverse effects, this type of data exists for a very limited number of chemicals. For many others, there is a range in quality and quantity of data available. To assure reliability of criteria and values, it is necessary to establish a minimum database with which to develop Tier I criteria or Tier II values. The following represent the minimum data sets necessary for this procedure:

(A) The minimum data set sufficient to derive a Tier I human noncancer criterion (HNC) shall include at least one (1) well-conducted epidemiologic study or animal study. A well-conducted epidemiologic study for a Tier I HNC must quantify the exposure level and demonstrate positive association between exposure to a chemical and an adverse effect in humans. A well-conducted study in animals must demonstrate a dose-response relationship involving one (1) or more critical effects biologically relevant to humans. For example, study results from an animal whose pharmacokinetics and toxicokinetics match those of a human would be considered most biologically relevant. Ideally, the duration of a study should span multiple generations of exposed test species or at least a major portion of the life span of one (1) generation. This type of data is currently very limited. By the use of uncertainty adjustments, shorter term studies such as ninety (90) day subchronic studies with evaluation of more limited effect may be used to extrapolate to longer exposures or to account for a variety of adverse effects. For Tier I criteria developed pursuant to this procedure, such a limited study must be conducted for at least ninety (90) days in rodents or ten percent (10%) of the life span of other appropriate test species and demonstrate a no observable adverse effect level (NOAEL). Chronic studies of one (1) year or longer in rodents or fifty percent (50%) of the life span or greater in other appropriate test species that demonstrate a lowest observable adverse effect level (LOAEL) may be sufficient for use in Tier I criterion derivation if the effects observed at the LOAEL were relatively mild and reversible as compared to effects at higher doses. This does not preclude the use of a LOAEL from a study of chronic duration with only one (1) or two (2) doses if the effects observed appear minimal when compared to effect levels observed at higher doses in other studies.

(B) When the minimum data for deriving Tier I criteria are not available to meet the Tier I data requirements, a more limited database may be considered for deriving Tier II values. As with Tier I criteria, all available data shall be considered and ideally should address a range of adverse health effects with exposure over a substantial portion of the life span, or multiple generations, of the test species. When such data are lacking, it may be necessary to rely on less extensive data in order to establish a Tier II value. With the use of appropriate uncertainty factors to account for a less extensive database, the minimum data sufficient to derive a Tier II value shall include a NOAEL from at least one (1) well-conducted short term repeated dose study. This study shall be of at least twenty-eight (28) days duration, in animals demonstrating a dose-response, and involving effects biologically relevant to humans. Data from studies of longer duration, greater than twenty-eight (28) days, and LOAELs from these studies may be more appropriate in some cases for derivation of Tier II values. Use of a LOAEL should be based on consideration of the following information:

(i) Severity of effect.

(ii) Quality of the study.

(iii) Duration of the study.

(3) The following procedures shall be used to determine minimum bioaccumulation data requirements:

(A) To be considered a Tier I cancer or noncancer human health criterion, along with satisfying the minimum toxicity data requirements of subdivisions (1)(E) and (2)(A), a chemical must have the following minimum bioaccumulation data:

(i) For all organic chemicals either:

(AA) a field-measured BAF;

(BB) a BAF derived using the BSAF methodology; or

(CC) a chemical with a BAF less than one hundred twenty-five (125) regardless of how the BAF was derived.

(ii) For all inorganic chemicals, including organometals such as mercury, either:

(AA) a field-measured BAF; or

(BB) a laboratory-measured BCF.

(B) A chemical is considered a Tier II cancer or noncancer human health value if it does not meet either the minimum toxicity data requirements of subdivisions (1)(E) and (2)(A) or the minimum bioaccumulation data requirements of clause (A).

(c) The fundamental components of the procedure to calculate Tier I criteria or Tier II values are the same. However, certain of the aspects of the procedure designed to account for short duration studies or other limitations in data are more likely to be relevant in deriving Tier II values than Tier I criteria. The following procedures shall be used to develop Tier I criteria and Tier II values:

(1) The following procedures apply for carcinogens:

(A) A nonthreshold mechanism of carcinogenesis shall be assumed unless biological data adequately demonstrate the existence of a threshold on a chemical specific basis.

(B) All appropriate human epidemiologic data and animal cancer bioassay data shall be considered. Data specific to an environmentally appropriate route of exposure shall be used. Oral exposure should be used preferentially over dermal and inhalation since, in most cases, the exposure routes of greatest concern are fish consumption and drinking water/incidental ingestion. The risk associated dose shall be set at a level corresponding to an incremental cancer risk of one (1) in one hundred thousand (100,000). If acceptable human epidemiologic data are available for a chemical, it shall be used to derive the risk associated dose. If acceptable human epidemiologic data are not available, the risk associated dose shall be derived from available animal bioassay data. Data from a species that is considered most biologically relevant to humans, that is, responds most like humans, is preferred where all other considerations regarding quality of data are equal. In the absence of data to distinguish the most relevant species, data from the most sensitive species tested, that is, the species showing a carcinogenic effect at the lowest administered dose, shall generally be used.

(C) When animal bioassay data are used and a nonthreshold mechanism of carcinogenicity is assumed, the data are fitted to a linearized multistage computer model. The upper bound ninety-five percent (95%) confidence limit on risk (or the lower ninety-five percent (95%) confidence limit on dose) at the one (1) in one hundred thousand (100,000) risk level shall be used to calculate a risk associated dose (RAD). Other models, including modifications or variations of the linear multistage model that are more appropriate to the available data may be used where scientifically justified.

(D) If the duration of the study is significantly less than the natural life span of the test animal, the slope may be adjusted on a case-by-case basis to compensate for latent tumors that were not expressed. In the absence of alternative approaches that compensate for study durations significantly less than lifetime, the commissioner may use the process described in the 1980 National Guidelines (see 45 FR 79352).

(E) A species scaling factor shall be used to account for differences between test species and humans. It shall be assumed that milligrams per surface area per day is an equivalent dose between species (1986 U.S. EPA Guidelines for Carcinogenic Risk Assessment). All doses presented in milligram per kilogram body weight will be converted to an equivalent surface area dose by raising the milligram per kilogram dose to the two-thirds (⅔) power. However, if adequate pharmacokinetic and metabolism studies are available, these data may be factored into the adjustment for species differences on a case-by-case basis.

(F) Additional data selection and adjustment decisions must also be made in the process of quantifying risk. Consideration must be given to tumor selection for modeling, for example, pooling estimates for multiple tumor types and identifying and combining benign and malignant tumors. All doses shall be adjusted to give an average daily dose over the study duration. Adjustments in the rate of tumor response must be made for early mortality in test species. The goodness-of-fit of the model to the data must also be assessed.

(G) When a linear, nonthreshold dose response relationship is assumed, the RAD shall be calculated using the following equation:

$$RAD = \frac{0.00001}{q_1^*}$$

Where:

RAD = risk associated dose in milligrams of toxicant per kilogram body weight per day (mg/kg/day).

$0.00001\ (1 \times 10^{-5})$ = incremental risk of developing cancer equal to one (1) in one hundred thousand (100,000).

q_1^* = slope factor $(mg/kg/day)^{-1}$.

(H) If human epidemiologic data or other biological data (animal) indicate that a chemical causes cancer via a threshold mechanism, the risk associated dose may, on a case-by-case basis, be calculated using a method that assumes a threshold

mechanism is operative.

(2) The following procedures apply for noncarcinogens:

(A) Noncarcinogens shall generally be assumed to have a threshold dose or concentration below which no adverse effects should be observed. Therefore, the Tier I criterion or Tier II value is the maximum water concentration of a substance at or below which a lifetime exposure from drinking the water, consuming fish caught in the water, and ingesting water as a result of participating in water related recreation activities is likely to be without appreciable risk of deleterious effects. For some noncarcinogens, there may not be a threshold dose below which no adverse effects should be observed. Chemicals acting as genotoxic teratogens and germline mutagens are thought to possibly produce reproductive or developmental effects via a genetically linked mechanism which may have no threshold. Other chemicals also may not demonstrate a threshold. Criteria for these types of chemicals will be established on a case-by-case basis using appropriate assumptions reflecting the likelihood that no threshold exists.

(B) All appropriate human and animal toxicologic data shall be reviewed and evaluated. To the maximum extent possible, data most specific to the environmentally relevant route of exposure shall be used. Oral exposure data should be used preferentially over dermal and inhalation since, in most cases, the exposure routes of greatest concern are fish consumption and drinking water/incidental ingestion. When acceptable human data are not available, for example, well-conducted epidemiologic studies, animal data from species most biologically relevant to humans shall be used. In the absence of data to distinguish the most relevant species, data from the most sensitive animal species tested, such as the species showing a toxic effect at the lowest administered dose (given a relevant route of exposure), should generally be used.

(C) Minimum data requirements are specified in subsection (b)(2). The experimental exposure level representing the highest level tested at which no adverse effects were demonstrated (NOAEL) from studies satisfying the provisions of subsection (b)(2) shall be used for criteria calculations. In the absence of a NOAEL, the LOAEL from studies satisfying the provisions of subsection (b)(2) may be used if it is based on relatively mild and reversible effects.

(D) Uncertainty factors (UFs) shall be used to account for the uncertainties in predicting acceptable dose levels for the general human population based upon experimental animal data or limited human data as follows:

(i) A UF of ten (10) shall generally be used when extrapolating from valid experimental results from studies on prolonged exposure to average healthy humans. This ten (10) fold factor is used to protect sensitive members of the human population.

(ii) A UF of one hundred (100) shall generally be used when extrapolating from valid results of long term studies on experimental animals when results of studies of human exposure are not available or are inadequate. In comparison to item (i), this represents an additional ten (10) fold UF in extrapolating data from the average animal to the average human.

(iii) A UF of up to one thousand (1,000) shall generally be used when extrapolating from animal studies for which the exposure duration is less than chronic, but greater than subchronic, for example, ninety (90) days or more in length, or when other significant deficiencies in study quality are present, and when useful long term human data are not available. In comparison to item (ii), this represents an additional UF of up to ten (10) fold for less than chronic, but greater than subchronic, studies.

(iv) A UF of up to three thousand (3,000) shall generally be used when extrapolating from animal studies for which the exposure duration is less than subchronic, for example, twenty-eight (28) days. In comparison to item (ii), this represents an additional UF of up to thirty (30) fold for less than subchronic studies. The level of additional uncertainty applied for less than chronic exposures depends on the duration of the study used relative to the lifetime of the experimental animal.

(v) An additional UF of between one (1) and ten (10) may be used when deriving a criterion from a LOAEL. This UF accounts for the lack of an identifiable NOAEL. The level of additional uncertainty applied may depend upon the severity and the incidence of the observed adverse effect.

(vi) An additional UF of between one (1) and ten (10) may be applied when there are limited effects data or incomplete subacute or chronic toxicity data, for example, reproductive or developmental data. The level of quality and quantity of the experimental data available as well as structure activity relationships may be used to determine the factor selected.

(vii) When deriving a UF in developing a Tier I criterion or Tier II value, the total uncertainty, as calculated following the procedures in items (i) through (vi) shall not exceed ten thousand (10,000) for Tier I criteria and

thirty thousand (30,000) for Tier II values.

(E) All study results shall be converted, as necessary, to the standard unit for acceptable daily exposure of milligrams of toxicant per kilogram of body weight per day (mg/kg/day). Doses shall be adjusted for continuous exposure, that is, seven (7) days per week, twenty-four (24) hours per day.

(F) The acceptable daily exposure (ADE) shall be calculated using the following equation:

$$ADE = \frac{NOAEL\ (or\ LOAEL)}{UF}$$

Where:

ADE = Acceptable daily exposure in milligrams of toxicant per kilogram body weight per day (mg/kg/day).

NOAEL (or LOAEL) = The no observed adverse effect level or lowest observed adverse effect level as determined in accordance with clause (C).

UF = The product of the uncertainty factors as determined in accordance with clause (D).

(3) The following procedures shall be used to derive criteria and values:

(A) The following represent the standard exposure assumptions used to calculate Tier I criteria and Tier II values for carcinogens and noncarcinogens. Different levels of exposure may be used where appropriate in deriving site-specific criteria pursuant to section 16 of this rule:

(i) BW = Body weight of an average human (BW = 70 kilograms).

(ii) WC_d = Per capita water consumption, both drinking and incidental exposure, for surface waters classified as public water supplies = two (2) liters per day; or

(iii) WC_r = Per capita incidental daily water ingestion for surface waters not used as human drinking water sources = 0.01 liters per day.

(iv) FC = Per capita daily consumption of regionally caught freshwater fish = 0.015 kg/day (0.0036 kilograms per day for trophic level three (3) and 0.0114 kilograms per day for trophic level four (4)).

(v) BAF = Bioaccumulation factor for trophic level three (3) and trophic level four (4) as derived using the BAF methodology in section 13 of this rule.

(B) The Tier I human cancer criteria or Tier II values shall be calculated as follows:

$$HCV = \frac{RAD \times BW}{WC + [(FC_{TL3} \times BAF^{HH}_{TL3}) + (FC_{TL4} \times BAF^{HH}_{TL4})]}$$

Where:

HCV = Human cancer value in milligrams per liter (mg/L).

RAD = Risk associated dose in milligrams toxicant per kilogram body weight per day (mg/kg/day) that is associated with a lifetime incremental cancer risk equal to one (1) in one hundred thousand (100,000).

BW = Weight of an average human (BW = 70 kilograms).

WC_d = Per capita water consumption, both drinking and incidental exposure, for surface waters classified as public water supplies = two (2) liters per day; or

WC_r = Per capita incidental daily water ingestion for surface waters not used as human drinking water sources = 0.01 liters per day.

FC_{TL3} = Mean consumption of trophic level three (3) of regionally caught freshwater fish = 0.0036 kilograms per day.

FC_{TL4} = Mean consumption of trophic level four (4) of regionally caught freshwater fish = 0.0114 kilograms per day.

BAF^{HH}_{TL3} = Bioaccumulation factor for trophic level three (3) fish as derived using the BAF methodology in section 13 of this rule.

BAF^{HH}_{TL4} = Bioaccumulation factor for trophic level four (4) fish as derived using the BAF methodology in section 13 of this rule.

(C) The Tier I human noncancer criteria or Tier II values shall be calculated as follows:

$$HNV = \frac{ADE \times BW \times RSC}{WC + [(FC_{TL3} \times BAF^{HH}_{TL3}) + (FC_{TL4} \times BAF^{HH}_{TL4})]}$$

Where: HNV = Human noncancer value in milligrams per liter (mg/L).
ADE = Acceptable daily exposure in milligrams toxicant per kilogram body weight per day (mg/kg/day).
RSC = Relative source contribution factor of eight-tenths (0.8). An RSC derived from actual exposure data may be developed using the methodology outlined by the 1980 National Guidelines (see 45 FR 79354).
BW = Weight of an average human (BW = 70 kilograms).
WC_d = Per capita water consumption, both drinking and incidental exposure, for surface waters classified as public water supplies = two (2) liters per day; or
WC_r = Per capita incidental daily water ingestion for surface waters not used as human drinking water sources = 0.01 liters/day.
FC_{TL3} = Mean consumption of trophic level three (3) fish by regional sport fishers of regionally caught freshwater fish = 0.0036 kilograms per day.
FC_{TL4} = Mean consumption of trophic level four (4) fish by regional sport fishers of regionally caught freshwater fish = 0.0114 kilograms per day.
BAF^{HH}_{TL3} = Human health bioaccumulation factor for edible portion of trophic level three (3) fish as derived using the BAF methodology in section 13 of this rule.
BAF^{HH}_{TL4} = Human health bioaccumulation factor for edible portion of trophic level four (4) fish as derived using the BAF methodology in section 13 of this rule.

(Water Pollution Control Board; 327 IAC 2-1.5-14; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1398; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3377)

327 IAC 2-1.5-15 Determination of wildlife criteria

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4

Sec. 15. (a) This section establishes a procedure that is required when developing Tier I wildlife criteria for bioaccumulative chemicals of concern (BCCs) as follows:

(1) This method may be used for the development of Tier I criteria or Tier II values for pollutants other than BCCs for which the commissioner determines:

(A) Tier I criteria or Tier II values are necessary for the protection of wildlife in the Great Lakes basin; and

(B) that this method is applicable to the pollutant.

(2) In the event that this procedure is used to develop criteria for pollutants other than BCCs, the procedure for deriving bioaccumulation factors under section 13 of this rule must be used. For chemicals that do not biomagnify to the extent of BCCs, it may be appropriate to select different representative species that are better examples of species with the highest exposures for the given chemical. In addition, section 16 of this rule describes the procedures for calculating site-specific wildlife criteria.

(b) The following procedures shall be used to calculate wildlife values for Tier I criteria:

(1) Tier I wildlife values are to be calculated using the following equation:

$$WV = \frac{\frac{TD}{UF_A \times UF_S \times UF_L} \times Wt}{W + \sum (F_{TLi} \times BAF^{WL}_{TLi})}$$

Where: WV = Wildlife value in milligrams of substance per liter (mg/L).
TD = Test dose (TD) in milligrams of substance per kilograms per day (mg/kg-d) for the test species. This shall be either a NOAEL or a LOAEL.
UF_A = Uncertainty factor (UF) for extrapolating toxicity data across species (unitless). A species-specific UF shall be selected and applied to each representative species, consistent with the equation.
UF_S = UF for extrapolating from subchronic to chronic exposures (unitless).
UF_L = UF for LOAEL to NOAEL extrapolations (unitless).
Wt = Average weight in kilograms (kg) for the representative species.

W = Average daily volume of water consumed in liters per day (l/d) by the representative species.

F_{TLi} = Average daily amount of food consumed from trophic level i in kilograms per day (kg/d) by the representative species.

BAF^{WL}_{TLi} = Bioaccumulation factor (BAF) for wildlife food in trophic level i in liters per kilogram (l/kg), developed using the BAF methodology in section 13 of this rule. For consumption of piscivorous birds by other birds, for example, herring gull by eagles, the BAF is derived by multiplying the trophic level three (3) BAF for fish by a biomagnification factor to account for the biomagnification from fish to the consumed birds.

(2) For bioaccumulative chemicals, piscivorous species are identified as the focus of concern for wildlife criteria development in the Great Lakes. This methodology identifies three (3) avian species (eagle, kingfisher, and herring gull) and two (2) mammalian species (mink and otter) as representative species for protection. The TD obtained from toxicity data for each taxonomic class is used to calculate WVs for each of the five (5) representative species.

(3) The avian WV is the geometric mean of the WVs calculated for the three (3) representative avian species. The mammalian WV is the geometric mean of the WVs calculated for the two (2) representative mammalian species. The lower of the mammalian and avian WVs must be selected as the Great Lakes wildlife criteria (GLWC).

(c) The following procedures shall be used to obtain the parameters of the effect component of the wildlife criteria procedure:

(1) A Test Dose (TD) value is required for criterion calculation. To derive a Tier I criterion for wildlife, the data set shall provide enough data to generate a subchronic or chronic dose response curve for any given substance for both mammalian and avian species.

(A) In reviewing the toxicity data available that meet the minimum data requirements for each taxonomic class, the following order of preference shall be applied to select the appropriate TD to be used for calculation of individual WVs:

(i) Data from peer-reviewed field studies of wildlife species take precedence over other types of studies, where such studies are of adequate quality. An acceptable field study must be of subchronic or chronic duration, provide a defensible, chemical specific dose response curve in which cause and effect are clearly established, and assess acceptable endpoints as defined in this rule.

(ii) When acceptable wildlife field studies are not available, or determined to be of inadequate quality, the needed toxicity information may come from peer reviewed laboratory studies. When laboratory studies are used, preference shall be given to laboratory studies with wildlife species over traditional laboratory animals to reduce uncertainties in making interspecies extrapolations.

(B) All available laboratory data and field studies shall be reviewed to corroborate the final GLWC, to assess the reasonableness of the toxicity value used, and to assess the appropriateness of any UFs that are applied. When evaluating the studies from which a test dose is derived in general, the following requirements must be met:

(i) The mammalian data must come from at least one (1) well-conducted study of ninety (90) days or greater designed to observe subchronic or chronic effects as defined in this rule.

(ii) The avian data must come from at least one well-conducted study of twenty-eight (28) days or greater designed to observe subchronic or chronic effects as defined in this rule.

(iii) In reviewing the studies from which a TD is derived for use in calculating a WV, studies involving exposure routes other than oral may be considered only when an equivalent oral daily dose can be estimated and technically justified because the criteria calculations are based on an oral route of exposure.

(iv) In assessing the studies that meet the minimum data requirements, preference should be given to studies that assess effects on developmental or reproductive endpoints because, in general, these are more important endpoints in ensuring that a population's productivity is maintained.

(2) In selecting data to be used in the derivation of WVs, the evaluation of acceptable endpoints, as defined in this rule, will be the primary selection criterion. All data not part of the selected subset may be used to assess the reasonableness of the toxicity value and the appropriateness of the UFs that are applied.

(A) If more than one (1) TD value is available within a taxonomic class, based on different endpoints of toxicity, that TD, which is likely to reflect best potential impacts to wildlife populations through resultant changes in mortality or fecundity rates, shall be used for the calculation of WVs.

(B) If more than one (1) TD is available within a taxonomic class, based on the same endpoint of toxicity, the TD from the most sensitive species shall be used.

(C) If more than one (1) TD based on the same endpoint of toxicity is available for a given species, the TD for that species shall be calculated using the geometric mean of those TDs.

(3) The following exposure assumptions are made in the determination of the TD:

(A) In those cases in which a TD is available in units other than milligrams of substance per kilograms per day (mg/kg/d), clauses (B) and (C) shall be used to convert the TD to the appropriate units prior to calculating a WV.

(B) If the TD is given in milligrams of toxicant per liter of water consumed by the test animals (mg/L), the TD shall be multiplied by the daily average volume of water consumed by the test animals in liters per day (L/d) and divided by the average weight of the test animals in kilograms (kg).

(C) If the TD is given in milligrams of toxicant per kilogram of food consumed by the test animals (mg/kg), the TD shall be multiplied by the average amount of food in kilograms consumed daily by the test animals (kg/d) and divided by the average weight of the test animals in kilograms (kg).

(4) Drinking and feeding rates shall be determined as follows:

(A) When drinking and feeding rates and body weight are needed to express the TD in milligrams of substance per kilograms per day (mg/kg/d), they are obtained from the study from which the TD was derived. If not already determined, body weight and drinking and feeding rates are to be converted to a wet weight basis.

(B) If the study does not provide the needed values, the values shall be determined from appropriate scientific literature. When scientific literature does not contain exposure information for the species used in a given study, either the allometric equations which are presented in clauses (C) and (D), or the exposure estimation methods presented in Chapter 4 of the Wildlife Exposure Factors Handbook (U.S. EPA, 1993), shall be applied to approximate the needed feeding or drinking rates. The choice of the methods described in this clause is at the discretion of the commissioner.

(C) For mammalian species, the general allometric equations are:

(i) $F = (0.0687)(Wt)^{0.82}$

Where: F = Feeding rate of mammalian species in kilograms per day (kg/d) dry weight.

Wt = Average weight in kilograms (kg) of the test animals.

(ii) $W = (0.099)(Wt)^{0.90}$

Where: W = Drinking rate of mammalian species in liters per day (L/d).

Wt = Average weight in kilograms (kg) of the test animals.

(D) For avian species, the general allometric equations are:

(i) $F = (0.0582)(Wt)^{0.65}$

Where: F = Feeding rate of avian species in kilograms per day (kg/d) dry weight.

Wt = Average weight in kilograms (kg) of the test animals.

(ii) $W = (0.059)(Wt)^{0.67}$

Where: W = Drinking rate of avian species in liters per day (L/d).

Wt = Average weight in kilograms (kg) of the test animals.

(5) In those cases in which a NOAEL is unavailable as the TD and a LOAEL is available, the LOAEL may be used to estimate the NOAEL. If used, the LOAEL shall be divided by an UF to estimate a NOAEL for use in deriving WVs. The value of the UF shall not be less than one (1) and should not exceed ten (10), depending on the dose-response curve and any other available data, and is represented by UF_L in the equation expressed in subsection (b)(1).

(6) In instances where only subchronic data are available, the TD may be derived from subchronic data. In such cases, the TD shall be divided by an UF to extrapolate from subchronic to chronic levels. The value of the UF shall not be less than one (1) and should not exceed ten (10), and is represented by UF_S in the equation expressed in subsection (b)(1). This factor is to be used when assessing highly bioaccumulative substances where toxicokinetic considerations suggest that a bioassay of limited length underestimates chronic effects.

(7) The following procedure shall be used to determine an uncertainty factor for interspecies extrapolations (UF_A):

(A) The selection of the UF_A shall be based on the available toxicological data and on available data concerning the physicochemical, toxicokinetic, and toxicodynamic properties of the substance in question and the amount and quality of available data. This value is an UF that is intended to account for differences in toxicological sensitivity among species.

(B) For the derivation of Tier I criteria, a UF_A shall not be less than one (1) and should not exceed one hundred (100), and shall be applied to each of the five (5) representative species, based on existing data and best professional judgement. The value of UF_A may differ for each of the representative species.

(C) For Tier I wildlife criteria, the UF_A shall be used only for extrapolating toxicity data across species within a

taxonomic class, except as provided in this clause. The Tier I UF_A is not intended for interclass extrapolations because of the poorly defined comparative toxicokinetic and toxicodynamic parameters between mammals and birds. However, an interclass extrapolation employing a UF_A may be used for a given chemical if it can be supported by a validated biologically based dose response model or by an analysis of interclass toxicological data, considering acceptable endpoints, for a chemical analog that acts under the same mode of toxic action.

(d) The following procedures shall be used to determine the parameters of the exposure component of the wildlife criteria procedure:

(1) The body weights (Wt), feeding rates (F_{Tli}), drinking rates (W), and trophic level dietary composition, as food ingestion rate and percent in diet, for each of the five (5) representative species are presented in Table 15-1 in subsection (e).

(2) The procedure for the determination of bioaccumulation factors is contained under section 13 of this rule. Trophic levels three (3) and four (4) BAFs are used to derive WVs because these are the trophic levels at which the representative species feed.

(e) The following exposure parameters for the five (5) representative species identified for protection shall be used:

Table 15-1

Exposure Parameters for the Five Representative Species Identified for Protection

Species	Adult Body Weight (kg)	Water Ingestion Rate (L/day)	Food Ingestion Rate of Prey in Each Trophic Level (kg/day)	Trophic Level of Prey (Percent of Diet)
Mink	0.80	0.081	TL3: 0.159	TL3: 90%
			Other: 0.0177	Other: 10%
Otter	7.4	0.600	TL3: 0.977	TL3: 80%
			TL4: 0.244	TL4: 20%
Kingfisher	0.15	0.017	TL3: 0.0672	TL3: 100%
Herring gull	1.1	0.063	TL3: 0.192	Fish: 90%
			TL4: 0.0480	TL3: 80%
			Other: 0.0267	TL4: 20%
				Other: 10%
Bald eagle	4.6	0.160	TL3: 0.371	Fish: 92%
			TL4: 0.0929	TL3: 80%
			PB: 0.0283	TL4: 20%
			Other: 0.0121	Birds: 8%
				PB: 70%
				nonaquatic: 30%

TL3 = trophic level three fish
TL4 = trophic level four fish
PB = piscivorous birds
Other = nonaquatic birds and mammals

(Water Pollution Control Board; 327 IAC 2-1.5-15; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1404; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3378)

327 IAC 2-1.5-16 Site-specific modifications to Tier I criteria and Tier II values

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-15-4-1; IC 13-18-4

Sec. 16. (a) Site-specific modifications to Tier I criteria and Tier II values must be protective of designated uses and aquatic life, wildlife, or human health. In addition, any site-specific modifications that result in less stringent criteria must be based on a sound scientific rationale and shall not be likely to jeopardize the continued existence of endangered or threatened species listed or proposed under Section 4 of the Endangered Species Act (ESA) or result in the destruction or adverse modification of such species' critical habitats. More stringent modifications shall be developed to protect endangered or threatened species listed or proposed under Section 4 of the ESA, where such modifications are necessary to ensure that water quality is not likely to jeopardize the continued existence of such species or result in the destruction or adverse modification of such species' critical habitats. More stringent

modifications may also be developed to protect candidate (C1) species being considered by the U.S. Fish and Wildlife Service (FWS) for listing under Section 4 of the ESA, where such modifications are necessary to protect such species. Criteria and values may be modified on a site-specific basis to reflect local environmental conditions as restricted by the following provisions:

(1) Aquatic life criteria or values may be modified on a site-specific basis as follows:

(A) Aquatic life criteria or values may be modified on a site-specific basis to provide an additional level of protection.

(B) Less stringent site-specific modifications to chronic or acute aquatic life criteria or values may be developed when either of the following conditions applies:

(i) The local water quality characteristics such as pH, hardness, temperature, or color alter the biological availability or toxicity of a pollutant.

(ii) The sensitivity of the aquatic organisms species that occur at the site differs from the species actually tested in developing the criteria.

(C) Less stringent modifications also may be developed to acute and chronic aquatic life criteria or values to reflect local physical and hydrological conditions.

(D) Any modifications to protect threatened or endangered aquatic species required by this subsection may be accomplished using either of the two (2) following procedures:

(i) If the SMAV for a listed or proposed species or for a surrogate of such species is lower than the calculated FAV, such lower SMAV may be used instead of the calculated FAV in developing site-specific modified criteria.

(ii) The site-specific criteria may be calculated using the recalculation procedure for site-specific modifications under 327 IAC 2-1-13.

(2) Wildlife criteria or values may be modified on a site-specific basis as follows:

(A) Wildlife water quality criteria may be modified on a site-specific basis to provide an additional level of protection.

(B) Less stringent site-specific modifications to wildlife water quality criteria may be developed when a site-specific bioaccumulation factor (BAF) is derived that is lower than the system-wide BAF derived under section 13 of this rule. The modification must consider both the mobility of prey organisms and wildlife populations in defining the site for which criteria are developed. In addition, there must be a showing that the following conditions are met:

(i) Any increased uptake of the toxicant by prey species utilizing the site will not cause adverse effects in wildlife populations.

(ii) Wildlife populations utilizing the site or downstream waters will continue to be fully protected.

(C) Any modification to protect endangered or threatened wildlife species required by this subsection must consider both the mobility of prey organisms and wildlife populations in defining the site for which criteria are developed and may be accomplished by using the following recommended method:

(i) The procedure presented in section 15 of this rule is used, substituting appropriate species-specific toxicological, epidemiological, or exposure information, including changes to the BAF.

(ii) An interspecies uncertainty factor of one (1) shall be used where epidemiological data are available for the species in question. If necessary, species-specific exposure parameters may be derived as presented in section 15 of this rule.

(iii) An intraspecies uncertainty factor, to account for protection of individuals within a wildlife population, shall be applied in the denominator of the effect part of the wildlife equation in section 15 of this rule in a manner consistent with the other uncertainty factors described in section 15 of this rule.

(iv) The resulting wildlife value for the species in question should be compared to the two (2) class specific wildlife values that were previously calculated, and the lowest of the three (3) shall be selected as the site-specific modification.

(3) BAFs may be modified on a site-specific basis as follows:

(A) BAFs may be modified on a site-specific basis to larger values where reliable data show that local bioaccumulation is greater than the system-wide value.

(B) BAFs may be modified on a site-specific basis to lower values, where scientifically defensible, if:

(i) the fraction of the total chemical that is freely dissolved in the ambient water is different than that used to derive the system-wide BAFs, that is, the concentrations of particulate organic carbon and the dissolved organic carbon are different than those used to derive the system-wide BAFs;

(ii) input parameters of the model, such as the structure of the aquatic food web and the disequilibrium constant, are different at the site than those used to derive the system-wide BAFs;

(iii) the percent lipid of aquatic organisms that are consumed and occur at the site is different than that used to derive the system-wide BAFs; or

(iv) site-specific field-measured BAFs or biota-sediment accumulation factor (BSAFs) are determined.

(C) If site-specific BAFs are derived, they shall be derived using section 13 of this rule.

(D) Any more stringent modifications to protect threatened or endangered species required by this subsection shall be derived using procedures set forth in the methodology in section 13 of this rule.

(4) Human health criteria or values may be modified on a site-specific basis as follows:

(A) Human health criteria or values may be modified on a site-specific basis to provide an additional level of protection in accordance with the following:

(i) Human health criteria or values shall be modified on a site-specific basis to provide additional protection appropriate for highly exposed subpopulations.

(ii) Any person may request the commissioner to develop a site-specific modification of a human health criterion or value to make it more stringent.

(iii) The commissioner shall develop the site-specific modification of the human health criterion or value to make it more stringent when either of the following conditions applies:

(AA) Local fish consumption rates are higher than the rate used to derive a human health criterion or value applicable under section 14 of this rule.

(BB) A site-specific BAF is derived that is higher than that used in deriving a human health criterion of value under section 14 of this rule.

(B) Less stringent site-specific modifications to human health criteria or values may be developed when either of the following conditions applies:

(i) Local fish consumption rates are lower than the rate used in deriving human health criteria or values under section 14 of this rule.

(ii) A site-specific BAF is derived that is lower than that used in deriving human health criteria or values under section 14 of this rule.

(C) Local fish consumption rates referenced in clauses (A)(iii)(AA) and (B)(i) shall be determined by a fish consumption survey applicable to the site.

(b) The application requirements for site-specific modifications to criteria or values allowed under subsection (a) are as follows:

(1) Except as provided in subdivision (2), the application requirements for site-specific modifications to criteria or values shall be determined by the commissioner on a case-by-case basis.

(2) Applications for site-specific modifications to criteria or values allowed under subsection (a)(1)(B)(ii) and determined using the recalculation procedure under 327 IAC 2-1-13 shall include the following:

(A) A list of all species of aquatic invertebrates, amphibians, and fishes that are known to occur at the site, along with the source of the information.

(B) A list of all aquatic plant, invertebrate, amphibian, and fish species that are critical species at the site, including all species that occur at the site and are listed as threatened or endangered under section 4 of the ESA.

(C) A site-specific version of Table 1 from a criteria document produced by the U.S. EPA after 1984.

(D) A site-specific version of Table 3 from a criteria document produced by the U.S. EPA after 1984.

(E) A list of all species that were deleted.

(F) Each new calculated criterion (FAV, CMC, SMC, CCC, or SCC).

(G) Each lowered criterion or value if one (1) or more were lowered to protect a specific species.

(c) Upon receipt of an application for a site-specific modification to a criterion or value, the commissioner shall do the following:

(1) For a site-specific modification listed under subsection (d):

(A) provide notice, request comment, and, if requested, schedule and hold a public meeting on the application in accordance with 327 IAC 5-2-11.2(b); and

(B) publish all pertinent information about the proposed site-specific modification on the department's Web site.

(2) For a site-specific modification not listed under subsection (d):

(A) approve or deny the application; and

(B) if the application is approved, initiate a rulemaking to have the site-specific modification incorporated into the water quality standards.

(d) Site-specific modifications to criteria or values do not require a rulemaking if they are:
(1) allowed under subsection (a) and to a criterion not specifically listed in this rule or to a value;
(2) allowed under subsection (a)(1)(B)(i) and determined using a WER;
(3) allowed under subsection (a)(1)(B)(ii) and determined using the recalculation procedure under 327 IAC 2-1-13; or
(4) required under subsection (a) and determined under subsection (a)(1)(D).
(e) Upon approval of a site-specific modification listed in subsection (d), the commissioner shall:
(1) publish a notice in the Indiana Register;
(2) place all pertinent information about the approved site-specific modification on the department's Web site;
(3) submit the site-specific modification to U.S. EPA for approval if it is for a site-specific modification to a criterion specifically listed in this rule but not for a site-specific modification to a criterion specifically listed in this rule and expressed as a function of the WER; and
(4) incorporate the site-specific modification into the water quality standards during the next revision of the water quality standards if it is for a site-specific modification to a criterion specifically listed in this rule.
(f) Site-specific modifications to criteria specifically listed in this rule, except for site-specific modifications to criteria specifically listed in this rule and expressed as a function of the WER, shall not be incorporated into a final NPDES permit or used for other Clean Water Act purposes until approved by U.S. EPA.
(g) The following site-specific modifications to water quality criteria have been granted:

Table 16-1

Site-Specific Surface Water Quality Criteria

Waterbody	Starting Location	Ending Location	Substances	CMC (Maximum) (µg/l)	CCC (4-Day Average) (µg/l)
East Branch Grand Calumet River	U.S. Steel Outfall 005	A point one (1) mile downstream	Cyanide (Free) (adult salmonids present)	35.0	8.2
			Cyanide (Free) (salmonids absent)	45.8	10.7

(Water Pollution Control Board; 327 IAC 2-1.5-16; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1407; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3378; filed Feb 14, 2005, 10:05 a.m.: 28 IR 2093; errata filed Jul 6, 2005, 3:12 p.m.: 28 IR 3582)

327 IAC 2-1.5-17 Variances from water quality standards for point sources

Authority: IC 13-14-8; IC 13-14-9; IC 13-15-1-2; IC 13-15-2-1; IC 13-18-3
Affected: IC 4-22-2; IC 13-11-2-24; IC 13-13-5; IC 13-18-4; IC 13-18-7; IC 13-23-13; IC 13-24-1; IC 13-25-5; IC 13-30-2-1

Sec. 17. (a) A permit applicant or permittee may apply to the commissioner for a variance from the water quality standard used to derive a water quality-based effluent limitation (WQBEL) contained in a NPDES permit for a specific substance. The application for such a variance shall be submitted in accordance with 327 IAC 5-3-4.1. The following do not constitute an undue hardship or burden, therefore, a variance to a water quality standard shall not be granted:
(1) that would likely jeopardize the continued existence of any endangered or threatened species listed under Section 4 of the Endangered Species Act (ESA) or result in the destruction or adverse modification of such species' critical habitat;
(2) if standards will be attained by implementing effluent limits required under Sections 301(b) and 306 of the Clean Water Act (CWA) and by the permittee implementing cost-effective and reasonable best management practices for nonpoint source control at the facility; or
(3) to recommencing dischargers or new Great Lakes dischargers, unless the new Great Lakes discharge occurs as the result of:
(A) a response action pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended (as defined in IC 13-11-2-24);
(B) a corrective action pursuant to the Resource Conservation and Recovery Act (RCRA), as amended (as defined in IC 13-13-5); or
(C) an action pursuant to similar federal or state authorities, including, but not limited to:
(i) an underground storage tank (UST) corrective action under IC 13-23-13;

(ii) a remediation of petroleum releases under IC 13-24-1;

(iii) a voluntary remediation under IC 13-25-5; or

(iv) an abatement or correction of any polluted condition under IC 13-18-7.

(b) The commissioner may approve all or part of a requested variance, or modify and approve a requested variance, if the permit applicant demonstrates that implementing a proposed methodology, that includes any production processes, wastewater treatment technology, or combination thereof used to reduce pollutants discharged in the wastewater from a facility, as identified under 327 IAC 5-3-4.1(b)(2)(A), will cause an undue hardship or burden upon the applicant.

(c) In making a determination on a variance application, the commissioner shall balance the increased risk to human health and the environment if the variance is granted against the hardship or burden upon the applicant if the variance is not granted so that the commissioner is able to conclude that any increased risk is consistent with the protection of the public health, safety, and welfare. In balancing these factors, the commissioner shall consider the following to determine if the hardship or burden upon the applicant is undue:

(1) For variance applications, except those governed under subdivision (2), the following shall be considered:

(A) The cost and cost effectiveness of pollutant removal by implementing the methodologies proposed by the applicant and the methodology capable of attaining the WQBEL.

(B) The reduction in concentrations and loadings of pollutants attainable by the methodologies proposed by the applicant as compared with the reduction attainable by use of the methodology capable of attaining the WQBEL.

(C) The impact of the proposed methodologies and the methodology capable of attaining the WQBEL on the price of the goods or services provided by the applicant.

(D) Information on the relative price of goods or services in the same market as the applicant.

(E) The overall impact of attaining the WQBEL and implementing the proposed methodologies on employment at the facility.

(F) Information on the type and magnitude of adverse or beneficial environmental impacts, including the net impact on the receiving water, resulting from the proposed methodologies that could be applied to the control of the substance for which a variance is applied. This information shall include the extent of any increased risk to human health and the environment associated with each of the proposed methodologies.

(G) Other relevant information requested by the commissioner or supplied by the applicant or the public.

(2) For variance applications where the necessity for the variance is a short term, temporary discharge resulting from the dredging of contaminated sediments from a waterbody and is conducted under any of the federal or state authorities listed under subsection (a)(3), the following shall be considered:

(A) The cost and cost effectiveness of pollutant removal by implementing the methodologies proposed by the applicant and the methodology capable of attaining the WQBEL.

(B) The reduction in concentrations and loadings of pollutants attainable by the methodologies proposed by the applicant as compared with the reduction attainable by use of the methodology capable of attaining the WQBEL.

(C) Information on the type and magnitude of adverse or beneficial environmental impacts, including the net impact on the receiving water, resulting from the proposed methodologies that could be applied to the control of the substance for which a variance is applied. This information shall include the extent of any increased risk to human health and the environment associated with each of the proposed methodologies. In considering the information required by this clause, the commissioner shall also consider that the action is the following:

(i) For the protection, maintenance, or restoration of the environment.

(ii) Short term and temporary.

(D) Other relevant information requested by the commissioner or supplied by the applicant or the public.

(d) The commissioner may grant the variance when the requirements of subsections (b) and (c) are met.

(e) A determination to grant or deny a requested variance shall be made in accordance with 327 IAC 5-3-4.1. In making this determination, the commissioner may also consider other information available to the agency or supplied by the applicant or the public.

(f) A variance applies only to the permit applicant requesting the variance and only to the substance specified in the variance application. The granting of a variance does not imply or require that the water quality standard corresponding to the variance be modified through a rulemaking in accordance with IC 4-22-2 and IC 13-14-9.

(g) A variance or any renewal thereof shall not be granted for a term greater than that allowed by IC 13-14-8. Notwithstanding the time at which the application for a variance is submitted under 327 IAC 5-3-4.1, a variance shall not be granted for a term greater

than the term remaining under the permit to which the variance is attached.

(h) Neither the filing of a variance application nor the granting of a variance shall be grounds for the staying or dismissing of or a defense in a pending enforcement action. A variance shall be prospective only. *(Water Pollution Control Board; 327 IAC 2-1.5-17; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1409; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3378)*

327 IAC 2-1.5-18 Designation of a waterbody as a limited use water or an outstanding state resource water

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4

Sec. 18. (a) Except as provided in subsection (f), a person who wishes to propose that a waterbody within the Great Lakes system be considered by the commissioner for designation as a limited use or outstanding state resource water shall submit to the commissioner a written proposal:

(1) identifying the waterbody and the proposed designation stating the rationale for the proposal; and

(2) including any other supporting documentation.

(b) The commissioner shall evaluate the proposal considering the following:

(1) Waters that meet the following conditions may be considered for designation as a limited use water:

(A) Waters that have:

(i) naturally poor physical characteristics (that is, suitable habitat to support a well-balanced fish community is severely limited or absent) including lack of sufficient flow ($Q_{7,10}$ low flow upstream of any existing or proposed discharge of one-tenth (0.1) cubic foot per second or less);

(ii) naturally poor chemical quality;

(iii) irreversible man-induced conditions that came into existence before January 1, 1983; and

(iv) no unique or exceptional features.

(B) No potential or existing uses made of the waterbody by people in the immediate area would be adversely affected by a limited use designation.

(C) The waterbody has been evaluated by a use attainability analysis.

(2) Factors that relate to outstanding state resource water designations may include, but are not limited to, the following:

(A) The presence of any of the following:

(i) A unique or exceptional habitat or species in the waterbody.

(ii) A rare or endangered species in the waterbody.

(iii) Exceptional aesthetic quality in the immediate environs of the waterbody.

(B) The waterbody:

(i) is within the boundaries of or flows through a designated natural area, nature preserve, or state or national park or forest;

(ii) supports an excellent sports fishery; or

(iii) possesses exceptional quality.

(C) Intensive recreational use is made of the waterbody.

(D) Designation as a natural, scenic, or recreational waterbody by the Indiana department of natural resources.

Irrespective of these factors, the commissioner's evaluation will generally be a case-by-case determination using information obtained from an on-site evaluation. If appropriate, the commissioner shall consult with the Indiana department of natural resources concerning the designation of a waterbody as an outstanding state resource water.

(c) After completion of the evaluation under subsection (b), if the commissioner determines that reclassification of the waterbody is appropriate, the commissioner shall initiate a rulemaking to include the waterbody either as a limited use water or an outstanding state resource water under section 19 of this rule.

(d) All waters that are designated as a limited use water under section 19(a) of this rule must be evaluated for restoration and upgrading at each triennial review of this rule.

(e) The department shall initiate a special designations rulemaking in accordance with the following:

(1) The special designations rulemaking shall be initiated for the following purposes:

(A) Determining the following:

(i) Whether any other designations in addition to:

(AA) outstanding state resource waters;

(BB) high quality waters;
(CC) limited use waters; and
(DD) outstanding national resource waters;
should be established.
(ii) The appropriate factors to consider in designating a waterbody.
(B) Identifying a list of waterbodies for each special designation.
(C) Specifying antidegradation implementation procedures for the following:
(i) Outstanding state resource waters.
(ii) Outstanding national resource waters.
(iii) Any other newly established designation.
(2) Before the presentation of proposed rules on special designations to the board, the department shall consult with:
(A) other state and federal agencies; and
(B) interested persons within Indiana;
as appropriate. The department shall provide information to the public on the history, intent, and importance of the current outstanding state resource water designation and the list of outstanding state resource waters.
(3) The department shall seek comment, as part of the second notice on special designations, on the following:
(A) Adding waterbodies to the list of outstanding national resource waters.
(B) The specific interim antidegradation implementation procedures included in 327 IAC 5-2-11.7 for outstanding state resource waters.
(C) Procedures for addressing increases not included in the specific exceptions listed in 327 IAC 5-2-11.7(c)(2).
(4) The following statement shall be included in the second notice and shall be used as a guide during the special designation rulemaking, "The interim antidegradation implementation procedures for outstanding state resource waters in 327 IAC 5-2-11.7 are intended only to assure that a specific process exists to address proposed changes pending the completion of the special designation rulemaking. The board does not consider the specific procedures listed in 327 IAC 5-2-11.7 as a final policy statement or as binding on the board in the special designation rulemaking.".
(5) The department shall present rules to the board on a schedule such that final rules may be adopted and made effective before the expiration of 327 IAC 5-2-11.7.
(f) A person seeking to obtain a CSO wet weather limited use subcategory designation shall do so in accordance with 327 IAC 2-1-3.1. *(Water Pollution Control Board; 327 IAC 2-1.5-18; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1410; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3378; filed Sep 6, 2007, 12:25 p.m.: 20071003-IR-327050218FRA)*

327 IAC 2-1.5-19 Limited use waters and outstanding state resource waters

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4

Sec. 19. (a) The following waters within the Great Lakes system are designated for limited use:
(1) Hoffman Ditch in St. Joseph County upstream from its confluence with Yellow River.
(2) Berlin Court Ditch in Elkhart County from the Nappanee sewage treatment plant to two (2) miles downstream.
(3) An unnamed tributary and Werntz Ditch in Elkhart County from the Wakarusa STP to the confluence of Werntz Ditch and Baugo Creek.
(4) Hilkey Ditch in DeKalb County from the County Line Cheese Company outfall to North County Line Road one and one-half (1.5) miles downstream.
(5) Hindman Ditch in DeKalb County from the Ralph Sechler Company outfall downstream to its confluence with Bear Creek.
(b) The following waters within the Great Lakes system are designated as an outstanding state resource water:
(1) Cedar Creek in Allen and DeKalb counties, from river mile 13.7 to its confluence with the St. Joseph River.
(2) The Indiana portion of the open waters of Lake Michigan.
(3) All waters incorporated in the Indiana Dunes National Lakeshore.
(Water Pollution Control Board; 327 IAC 2-1.5-19; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1411; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3378)

327 IAC 2-1.5-20 Incorporation by reference

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4

Sec. 20. The following materials have been incorporated by reference in this rule. Each of the following items, in addition to its title, will list the name and address of where it may be located for inspection and copying:

(1) Clean Water Act (CWA), 33 U.S.C. 1251 et seq., in effect July 1, 2004, is available from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402, or from the Indiana Department of Environmental Management, Office of Water Quality, Indiana Government Center-North, 100 North Senate Avenue, Room N1255, Indianapolis, Indiana 46204.

(2) The map identifying 1995 United States Coast Guard Light List No. 19675 is available from the Indiana Department of Environmental Management, Office of Water Quality, Indiana Government Center-North, 100 North Senate Avenue, Room N1255, Indianapolis, Indiana 46204.

(3) Code of Federal Regulations (40 CFR 136) in effect July 1, 2004, are available from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402 or the Indiana Department of Environmental Management, Office of Water Quality, Indiana Government Center-North, 100 North Senate Avenue, Room N1255, Indianapolis, Indiana 46204.

(4) ASTM, 1990, Standard Practice for Conducting Bioconcentration Tests with Fishes and Saltwater Bivalve Molluscs, Standard E 1022, available from the Indiana Department of Environmental Management, Office of Water Quality, Indiana Government Center-North, 100 North Senate Avenue, Room N1255, Indianapolis, Indiana 46204.

(5) 1986 U.S. EPA Guidelines for Carcinogenic Risk Assessment (U.S. EPA, 1986), available from the U.S. Environmental Protection Agency, Office of Water Resource Center (WH-550A), 401 M Street, S.W., Washington, D.C. 20460, and the Indiana Department of Environmental Management, Office of Water Quality, Indiana Government Center-North, 100 North Senate Avenue, Room N1255, Indianapolis, Indiana 46204.

(6) U.S. EPA. 1993, Chapter 4, Wildlife Exposure Factors Handbook, Volumes I and II, available from U.S. Environmental Protection Agency, Office of Water Resource Center, 401 M Street, S.W., Washington, D.C. 20460 [EPA/600/R-93/187a and b], and the Indiana Department of Environmental Management, Office of Water Quality, Indiana Government Center-North, 100 North Senate Avenue, Room N1255, Indianapolis, Indiana 46204.

(7) 1980 National Guidelines, 45 FR 79352 and 45 FR 79354.

(Water Pollution Control Board; 327 IAC 2-1.5-20; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1412; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3378; filed Feb 14, 2005, 10:05 a.m.: 28 IR 2096; errata filed Feb 6, 2006, 11:15 a.m.: 29 IR 1936)

Rule 2. Cyanides and Cyanogen Compounds; Drainage into Sewer Systems or Watercourses Prohibited; Exception

327 IAC 2-2-1 Cyanides or cyanogen compounds; drainage prohibition

Authority: IC 13-1-3-7
Affected: IC 13-1-3-7; IC 13-7-4-1

Sec. 1. Any person, firm, or corporation engaged in manufacture or other process in which cyanides or cyanogen compounds are used shall have each and every room, where said compounds are used or stored, so constructed that none of said compounds can escape therefrom by means of building sewer, drain or otherwise directly or indirectly into any sewer system or water-course. However, on application to and prior approval by the commissioner, limited amounts, which it is determined would not be detrimental to public health or which would not pollute any lake, river, stream, drainage or roadside ditch or other water-course, shall not come under the provision of the paragraph above. *(Water Pollution Control Board; 327 IAC 2-2-1; filed Sep 24, 1987, 3:00 pm: 11 IR 587; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA)*

Rule 3. Coal Mines; Restrictions on Acid Drainage and Refuse Deposits into State Waters

327 IAC 2-3-1 Coal mines; acid mine drainage prohibitions

Authority: IC 13-1-3-7
Affected: IC 13-1-3-5; IC 13-1-3-7; IC 13-7-4-1

Sec. 1. Every person, firm, corporation or other legal entity who owns an active or abandoned coal mine or who is engaged

in the storage, transportation, use, mining or processing of coal in the state of Indiana, shall dispose of refuse, including gob and coal fines, from processing coal, so as to create minimal acid mine drainage and deposits of coal fines in waters of this state.

No gob shall be used in the construction of public or private roadways in the state of Indiana, which will cause acid mine drainage to the waters of this state under the jurisdiction of the water pollution control board. *(Water Pollution Control Board; 327 IAC 2-3-1; filed Sep 24, 1987, 3:00 pm: 11 IR 587; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA)*

Rule 4. Waste Treatment Control Facilities; Discharge into State Waters; Monthly Reports

327 IAC 2-4-1 Monthly reports to board

Authority: IC 13-1-3-7; IC 13-7-7-5
Affected: IC 13-1-5.7-1; IC 13-7-16-7

Sec. 1. Every person, firm or corporation that operates a municipal, industrial, commercial or agricultural waste treatment plant control facility or discharges wastewaters to the waters of the state of Indiana shall submit to the commissioner monthly reports of operation, which shall include flow measurements and wastewater characteristics. *(Water Pollution Control Board; 327 IAC 2-4-1; filed Sep 24, 1987, 3:00 pm: 11 IR 587; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; readopted filed Nov 21, 2007, 1:19 p.m.: 20071219-IR-327070554BFA)*

327 IAC 2-4-2 Wastewater defined

Authority: IC 13-1-3-7
Affected: IC 13-1-5.7-1; IC 13-1-6-2; IC 13-7-1-2

Sec. 2. For the purpose of this rule (327 IAC 2-4), wastewater is defined as the liquid and water-carried wastes from industrial, municipal, commercial or confined animal feeding operation. *(Water Pollution Control Board; 327 IAC 2-4-2; filed Sep 24, 1987, 3:00 pm: 11 IR 587; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; readopted filed Nov 21, 2007, 1:19 p.m.: 20071219-IR-327070554BFA)*

327 IAC 2-4-3 Sampling frequency; methods of analysis

Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4

Sec. 3. Sampling, measurements of flow, and characteristics of the effluent shall be performed at a frequency prescribed by the commissioner. All analytical work shall be in accordance with 40 CFR 136 or other methods approved by the commissioner. *(Water Pollution Control Board; 327 IAC 2-4-3; filed Sep 24, 1987, 3:00 p.m.: 11 IR 587; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; filed Feb 14, 2005, 10:05 a.m.: 28 IR 2097; readopted filed Nov 21, 2007, 1:19 p.m.: 20071219-IR-327070554BFA)*

327 IAC 2-4-4 Preparation of reports by operator; time for submission

Authority: IC 13-1-3-7
Affected: IC 13-1-6

Sec. 4. All reports shall be prepared by the certified wastewater treatment plant operator, licensed under the provisions of IC 13-1-6, when such discharge(s) originate(s) in whole or in part from a wastewater treatment plant as defined in IC 13-1-6. Such reports shall be submitted prior to the 28th day of the following month. *(Water Pollution Control Board; 327 IAC 2-4-4; filed Sep 24, 1987, 3:00 pm: 11 IR 587; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; readopted filed Nov 21, 2007, 1:19 p.m.: 20071219-IR-327070554BFA)*

Rule 5. Phosphates; Permits for Use by Manufacturers and Processors; Detergents

327 IAC 2-5-1 Use of phosphorus detergents; permits

Authority: IC 13-1-5.5-5; IC 13-7-7-5
Affected: IC 13-7-10

Sec. 1. Any manufacturer or processor required to use detergents containing phosphorus for cleaning plant or equipment shall obtain a permit therefor from the commissioner.

(a) The application for the permit shall be made on a form provided by the commissioner and shall include as a minimum the following:

(1) Phosphorus content of the detergent by weight and the maximum daily and monthly average quantities used.

(2) Description of the use and why a phosphorus detergent is required.

(3) The means of treatment that will be installed using the best practicable control technology for removal of phosphorus from the wastewater before discharge directly into the waters of Indiana or into any sewer or drain that enters the waters of the state of Indiana.

(b) The commissioner may issue a permit for a period not to exceed four (4) years, upon a determination that the use of phosphorus detergents is necessary with no adequate substitute available and that the best practicable treatment method of removal of phosphorus is accomplished prior to discharge of the treated effluent. Renewal applications must be submitted to the commissioner at least sixty (60) days in advance of the expiration date of the permit. *(Water Pollution Control Board; 327 IAC 2-5-1; filed Sep 24, 1987, 3:00 pm: 11 IR 587; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA)*

Rule 6. Spills of Oil and Other Objectionable Substances; Reporting, Containment and Cleanup (Repealed)

(Repealed by Water Pollution Control Board; filed Feb 25, 1997, 1:00 p.m.: 20 IR 1734)

Rule 6.1. Spills; Reporting, Containment, and Response

327 IAC 2-6.1-1 Applicability

Authority: IC 13-14-8-7
Affected: IC 13-11-2; IC 13-18-1; IC 13-18-3; IC 13-18-8; IC 13-18-17

Sec. 1. This rule applies to the reporting and containment of, and the response to those spills of hazardous substances, extremely hazardous substances, petroleum, and objectionable substances that are of a quantity, type, duration and in a location as to damage the waters of the state. Nothing in this rule is intended to affect reporting or clean-up requirements set forth by other federal, state, or local laws. *(Water Pollution Control Board; 327 IAC 2-6.1-1; filed Feb 25, 1997, 1:00 p.m.: 20 IR 1731; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA)*

327 IAC 2-6.1-2 Special areas

Authority: IC 13-14-8-7
Affected: IC 13-11-2; IC 13-18-1; IC 13-18-3; IC 13-18-8; IC 13-18-17

Sec. 2. Certain areas of the state are recognized as having unique geology. A large section of the mid-southern part of the state is a karst region. Portions of Saint Joseph, Elkhart, Kosciusko, and LaGrange Counties contain a sole source aquifer as referenced in 42 U.S.C. 300h-3(e). The waters of the state are particularly vulnerable to damage from spills in these areas, and care should be exercised when evaluating damage from spills. Information about these areas can be obtained by calling the Department of Environmental Management, Office of Land Quality, Emergency Response Section: Area Code 1-888-233-7745 for in-state calls (toll free), (317) 233-7745 for out-of-state calls. *(Water Pollution Control Board; 327 IAC 2-6.1-2; filed Feb 25, 1997, 1:00 p.m.: 20 IR 1731; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA; errata filed May 27, 2008, 2:06 p.m.: 20080625-IR-327080419ACA)*

327 IAC 2-6.1-3 Exclusions

Authority: IC 13-14-8-7
Affected: IC 13-11-2; IC 13-18-1; IC 13-18-3; IC 13-18-8; IC 13-18-17

Sec. 3. Notwithstanding any other section of this rule, the reporting requirement of this rule does not apply to the following occurrences:

(1) Discharges or exceedances that are under the jurisdiction of an applicable permit when the substance in question is covered by the permit and death or acute injury or illness to animals or humans does not occur.

(2) Lawful application of materials, including, but not limited to:

(A) commercial or natural fertilizers and pesticides on or to land or water; or

(B) dust suppression materials.

(3) The application of petroleum necessary for construction that does not damage waters of the state.

(4) Spills of less than one (1) pound or one (1) pint.

(5) Spills of integral operating fluids, in the use of motor vehicles or other equipment, the total volume of which is less than or equal to fifty-five (55) gallons and which do not damage waters of the state.

(6) Oil sheens produced as a result of the normal operation of properly functioning watercraft.

(7) A release of a substance integral to a spill response activity that has been approved and authorized by a state or federal on-scene coordinator.

(Water Pollution Control Board; 327 IAC 2-6.1-3; filed Feb 25, 1997, 1:00 p.m.: 20 IR 1731; errata filed Mar 7, 1997, 2:25 p.m.: 20 IR 1738; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA)

327 IAC 2-6.1-4 Definitions

Authority: IC 13-14-8-7

Affected: IC 13-11-2; IC 13-18-1; IC 13-18-3; IC 13-18-8; IC 13-18-17; IC 14-8-2-7; IC 14-25-7-13; IC 14-25-7-15

Sec. 4. In addition to the definitions contained in IC 13-11-2-17(d), IC 13-11-2-35(a), IC 13-11-2-51, IC 13-11-2-158(a), IC 13-11-2-160, IC 13-11-2-260, IC 13-11-2-265, and in 327 IAC 1, the following definitions apply throughout this rule:

(1) "Animal" means all mammals, birds, reptiles, amphibians, fish, crustaceans, and mollusks.

(2) "Aquatic life" means those plants and macroinvertebrates that are dependent upon an aquatic environment.

(3) "Contain" means to take such immediate action as necessary to dam, block, restrain, or otherwise act to most effectively prevent a spill from entering waters of the state or minimize damage to the waters of the state from a spill.

(4) "Damage" means the actual or imminent alteration of the waters of the state so as to render the waters harmful, detrimental, or injurious to:

(A) public health, safety, or welfare;

(B) domestic, commercial, industrial, agricultural, or recreational uses; or

(C) animals or aquatic life.

(5) "Downstream water user" means:

(A) a community public water supply, as identified by the department of natural resources under IC 14-25-7-13(d);

(B) a significant water withdrawal facility as registered with the department of natural resources under IC 14-25-7-15;

(C) users of recreational waters; or

(D) any other user made known to the person who has a spill.

(6) "Extremely hazardous substance" means a substance identified pursuant to 42 U.S.C. 11002 and 11004. (40 CFR 355 Appendix A.)

(7) "Facility" means all land, buildings, equipment, structures, and other stationary items that are located on a single site or on contiguous sites and that are owned or operated by the same person or by any person who controls, is controlled by, or is under common control with, such person.

(8) "Facility boundary" means the boundary of a facility or an easement or right-of-way.

(9) "Hazardous substance" has the meaning set forth in 42 U.S.C. 9601(14).

(10) "Mode of transportation" includes, but is not limited to, carriage by:

(A) rail and motor vehicles;

(B) aircraft;

(C) watercraft;

(D) pipelines; or

(E) other means of transportation;

in commerce. This definition excludes carriage within a facility by transportation equipment owned, operated, or controlled by that facility.

(11) "Objectionable substances" means substances that are:

(A) of a quantity and a type; and

(B) present for a duration and in a location;

so as to damage waters of the state. This definition excludes hazardous substances, extremely hazardous substances, petroleum, and mixtures thereof.

(12) "On-scene coordinator" means a state or federal official designated by the department, the United States Environmental Protection Agency, or the United States Coast Guard to direct and coordinate special spill response activities.

(13) "Recreational waters" means any water used for:

(A) boating, swimming, fishing, hunting, trapping, or wildlife viewing; or

(B) public access areas that are owned by the department of natural resources or the federal government;

as listed by the department.

(14) "Reportable quantity" means the amount of a hazardous substance or extremely hazardous substance that is required to be reported under federal law under 42 U.S.C. 9602(a) and (b) and 42 U.S.C. 9603(a). (40 CFR 302.4 or 40 CFR 355 Appendix A.)

(15) "Spill" means any unexpected, unintended, abnormal, or unapproved dumping, leakage, drainage, seepage, discharge or other loss of petroleum, hazardous substances, extremely hazardous substances, or objectionable substances. The term does not include releases to impermeable surfaces when the substance does not migrate off the surface or penetrate the surface and enter the soil.

(16) "Spill response", for purposes of this rule, means the following:

(A) The spill is contained; and

(B) Free material is removed or neutralized.

(17) "Spill report" means an oral report that includes the following information about a spill, to the extent that the information is known at the time of the report:

(A) The name, address, and telephone number of the person making the spill report.

(B) The name, address, and telephone number of a contact person if different from clause (A).

(C) The location of the spill.

(D) The time of the spill.

(E) The identification of the substance spilled.

(F) The approximate quantity of the substance that has been or may further be spilled.

(G) The duration of the spill.

(H) The source of the spill.

(I) Name and location of the waters damaged.

(J) The identity of any response organization responding to the spill.

(K) What measures have been or will be undertaken to perform a spill response.

(L) Any other information that may be significant to the response action.

(18) "Waters", as defined in IC 13-11-2-265, means the accumulations of water, surface and underground, natural and artificial, public and private, or parts thereof, that are wholly or partially within, flow through, or border upon this state. The term does not include any private pond or any off-stream pond, reservoir, or facility built for reduction or control of pollution or cooling of water prior to discharge unless the discharge from the pond, reservoir, or facility causes or threatens to cause water pollution.

(Water Pollution Control Board; 327 IAC 2-6.1-4; filed Feb 25, 1997, 1:00 p.m.: 20 IR 1731; errata filed Mar 7, 1997, 2:25 p.m.: 20 IR 1738; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA)

327 IAC 2-6.1-5 Reportable spills; facility

Authority: IC 13-14-8-7

Affected: IC 13-11-2; IC 13-18-1; IC 13-18-3; IC 13-18-8; IC 13-18-17

Sec. 5. The following spills from a facility must be reported:

(1) Spills that damage the waters of the state so as to cause death or acute injury or illness to humans or animals.
(2) Spills from a facility that has been notified in writing by a water utility that it is located in a delineated public water supply wellhead protection area as approved by the department under 327 IAC 8-4.1 that are:
(A) spills of hazardous substances or extremely hazardous substances when the amount spilled exceeds one hundred (100) pounds or the reportable quantity, whichever is less;
(B) spills of petroleum when the amount spilled exceeds fifty-five (55) gallons; or
(C) spills of objectionable substances as defined in section 4(11) of this rule.
(3) Spills that damage waters of the state and that:
(A) are located within fifty (50) feet of a known private drinking water well located beyond the facility property boundary; or
(B) are located within one hundred (100) yards of:
(i) any high quality water designated as an outstanding state resource pursuant to 327 IAC 2-1-2(3), excluding Lake Michigan;
(ii) any water designated as exceptional use pursuant to 327 IAC 2-13(a)(6) *[sic., 327 IAC 2-1-3(a)(6)]* and 327 IAC 2-1-11(b);
(iii) any water designated as capable of supporting a salmonid fishery pursuant to 327 IAC 2-1-6(c)(1), except Lake Michigan; or
(iv) any water that is a fish hatchery, fish and wildlife area, nature preserve, or recreational water owned by the department of natural resources or the federal government.
(4) For any spill which does not meet the criteria in subdivisions (1) through (3), the following must be reported:
(A) Spills to surface waters:
(i) spills of hazardous substances or extremely hazardous substances when the amount spilled exceeds one hundred (100) pounds or the reportable quantity, whichever is less;
(ii) spills of petroleum of such quantity as to cause a sheen upon the waters; or
(iii) spills of objectionable substances as defined in section 4(11) of this rule.
(B) Spills to soil beyond the facility boundary:
(i) spills of hazardous substances or extremely hazardous substances when the amount spilled exceeds one hundred (100) pounds or the reportable quantity, whichever is less;
(ii) spills of petroleum when the amount spilled exceeds fifty-five (55) gallons; or
(iii) spills of objectionable substances as defined in section 4(11) of this rule.
(C) Spills to soil within the facility boundary:
(i) spills of hazardous substances or extremely hazardous substances when the amount spilled exceeds the reportable quantity;
(ii) spills of petroleum when the spilled amount exceeds one thousand (1,000) gallons; or
(iii) spills of objectionable substances as defined in section 4(11) of this rule.
(5) Any spill for which a spill response has not been done.

(Water Pollution Control Board; 327 IAC 2-6.1-5; filed Feb 25, 1997, 1:00 p.m.: 20 IR 1732; errata filed Mar 7, 1997, 2:25 p.m.: 20 IR 1738; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA)

327 IAC 2-6.1-6 Reportable spills; transportation

Authority: IC 13-14-8-7
Affected: IC 13-11-2; IC 13-18-1; IC 13-18-3; IC 13-18-8; IC 13-18-17

Sec. 6. The following spills from a mode of transportation must be reported:
(1) Spills that damage the waters of the state so as to cause death or acute injury or illness to humans or animals.
(2) Spills that damage surface waters.
(3) Spills to soil:
(A) spills of hazardous substances or extremely hazardous substances when the amount spilled exceeds one hundred (100) pounds or the reportable quantity, whichever is less;
(B) spills of petroleum when the amount spilled exceeds fifty-five (55) gallons; or

(C) spills of objectionable substances as defined in section 4(11) of this rule.

(4) Any spill for which a spill response has not been done.

(Water Pollution Control Board; 327 IAC 2-6.1-6; filed Feb 25, 1997, 1:00 p.m.: 20 IR 1733; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA)

327 IAC 2-6.1-7 Reportable spills; responsibilities

Authority: IC 13-14-8-7
Affected: IC 13-11-2; IC 13-18-1; IC 13-18-3; IC 13-18-8; IC 13-18-17

Sec. 7. Any person who operates, controls, or maintains any mode of transportation or facility from which a spill occurs shall, upon discovery of a reportable spill to the soil or surface waters of the state, do the following:

(1) Contain the spill, if possible, to prevent additional spilled material from entering the waters of the state.

(2) Undertake or cause others to undertake activities needed to accomplish a spill response.

(3) As soon as possible, but within two (2) hours of discovery, communicate a spill report to the Department of Environmental Management, Office of Land Quality, Emergency Response Section: Area Code 1-888-233-7745 for in-state calls (toll free), (317) 233-7745 for out-of-state calls. If new or updated spill report information becomes known that indicates a significant increase in the likelihood of damage to the waters of the state, the responsible party shall notify the department as soon as possible but within two (2) hours of the time the new or updated information becomes known.

(4) Submit to the Indiana Department of Environmental Management, Office of Land Quality, Emergency Response Section (MC 66-30), 2525 N. Shadeland Ave., Suite 100, Indianapolis, IN 46219-1787, a written copy of the spill report if requested in writing by the department.

(5) Except from modes of transportation other than pipelines, exercise due diligence and document attempts to notify the following:

(A) For spills to surface water that cause damage, the nearest affected downstream water user located within ten (10) miles of the spill and in the state of Indiana; and

(B) For spills to soil outside the facility boundary, the affected property owner or owners, operator or operators, or occupant or occupants.

(Water Pollution Control Board; 327 IAC 2-6.1-7; filed Feb 25, 1997, 1:00 p.m.: 20 IR 1733; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; errata filed Feb 6, 2006, 11:15 a.m.: 29 IR 1936; errata filed Oct 20, 2006, 10:08 a.m.: 20061101-IR-327060497ACA; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA; errata filed May 27, 2008, 2:06 p.m.: 20080625-IR-327080419ACA)

327 IAC 2-6.1-8 Emergency spill response actions

Authority: IC 13-14-8-7
Affected: IC 13-11-2; IC 13-18-1; IC 13-18-3; IC 13-18-8; IC 13-18-17

Sec. 8. Notwithstanding any other section of this rule, emergency spill response actions take precedence over reporting requirements, and when emergency spill response activities render spill reporting inconsistent with effective response activities, communication of the spill report to the Indiana department of environmental management may be delayed. In situations where the spill report is delayed, the burden of proving the need for the delay shall be upon the responsible person. *(Water Pollution Control Board; 327 IAC 2-6.1-8; filed Feb 25, 1997, 1:00 p.m.: 20 IR 1734; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA)*

327 IAC 2-6.1-9 Compliance confirmation

Authority: IC 13-14-8-7
Affected: IC 13-11-2; IC 13-18-1; IC 13-18-3; IC 13-18-8; IC 13-18-17

Sec. 9. When spill reporting and response, as provided for in this rule, has occurred, the department shall, upon request, issue a letter confirming compliance with this rule and stating that no further action is required under this rule. *(Water Pollution Control Board; 327 IAC 2-6.1-9; filed Feb 25, 1997, 1:00 p.m.: 20 IR 1734; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA)*

Rule 7. Lake Michigan and Contiguous Harbor Areas (Repealed)
(Repealed by Water Pollution Control Board; filed Feb 1, 1990, 4:30 p.m.: 13 IR 1046)

Rule 8. Grand Calumet River and Indiana Harbor Ship Canal (Repealed)
(Repealed by Water Pollution Control Board; filed Feb 1, 1990, 4:30 p.m.: 13 IR 1046)

Rule 9. Natural Spawning, Rearing or Imprinting Areas; Migration Routes for Salmonid Fishes (Repealed)
(Repealed by Water Pollution Control Board; filed Feb 1, 1990, 4:30 p.m.: 13 IR 1046)

Rule 10. Secondary Containment of Aboveground Storage Tanks Containing Hazardous Materials

327 IAC 2-10-1 Purpose
Authority: IC 13-18-5
Affected: IC 13-11-2

Sec. 1. (a) This rule provides the requirements for secondary containment structures and spill response plans for the purpose of preventing released hazardous materials from entering surface water or ground water at facilities storing liquid hazardous materials in an aboveground storage tank or storage area, or operating a transfer area.

(b) The intent of this rule is to provide for short term containment of discharges.

(c) This rule does not reduce or replace the secondary containment requirements found in other regulations or laws. *(Water Pollution Control Board; 327 IAC 2-10-1; filed May 28, 1999, 11:42 a.m.: 22 IR 3099; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA)*

327 IAC 2-10-2 Applicability
Authority: IC 13-18-5
Affected: IC 13-11-2

Sec. 2. (a) The secondary containment requirements of this rule apply to owners or operators of a facility storing liquid hazardous materials in an aboveground storage tank or storage area, or operating a transfer area for liquid hazardous materials as defined in section 4 of this rule, if the aboveground tank, storage area, or transfer area is constructed after the effective date of this rule and includes:

(1) construction activities scheduled after the effective date of this rule; or

(2) construction activities scheduled before the effective date of this rule only when physical construction did not begin within ninety (90) days after the effective date of this rule.

(b) An existing aboveground tank, storage area, or transfer area must be brought into compliance with this rule when replaced or relocated.

(c) The spill response plan requirements of this rule apply to owners or operators of a facility storing liquid hazardous materials in an aboveground storage tank or storage area, or operating a transfer area for liquid hazardous materials as defined in section 4 of this rule. *(Water Pollution Control Board; 327 IAC 2-10-2; filed May 28, 1999, 11:42 a.m.: 22 IR 3099; errata filed Jun 8, 1999, 9:23 a.m.: 22 IR 3108; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA)*

327 IAC 2-10-3 Exclusions
Authority: IC 13-18-5
Affected: IC 13-11-2-160; IC 13-11-2-241; IC 13-23; IC 13-24

Sec. 3. (a) The requirements of this rule do not apply to:

(1) An aboveground storage tank, storage areas, or transfer areas for agricultural chemicals regulated by the office of the Indiana state chemist under 355 IAC 2 and 355 IAC 5.

(2) An aboveground storage tank, storage areas, or transfer areas regulated by the Indiana fire prevention and building safety commission pursuant to 675 IAC 22.

(3) An aboveground storage tank or storage areas containing liquids which are solids or gases above sixty (60) degrees Fahrenheit and at atmospheric pressure.
(4) An aboveground storage system or petroleum facility and other structures, equipment, and appurtenances thereto, used or capable of being used to store or transfer oil as defined in and regulated by 40 CFR 112* or petroleum as defined in IC 13-11-2-160.
(5) Underground storage tanks as defined in IC 13-11-2-241.
(6) Hazardous materials that are stored or transferred as products packaged for distribution to, and used by, the public.
(7) Aboveground storage tanks, storage areas, and transfer areas containing hazardous waste regulated under 329 IAC 3.1 and 42 U.S.C. 6991 through 6991(i)*, as amended.
(8) Machinery and equipment containing integral operating fluids, provided that these fluids are necessary for the proper operation of the equipment.
(9) Process tanks.
(10) Piping, with the exception of any segment of piping extending from an aboveground storage tank to the point of the first fitting.
(11) Aboveground storage tanks used to store materials other than oils or petroleum products that:
(A) have a capacity of not more than six hundred sixty (660) gallons and are not in a delineated wellhead protection area as approved by the department under 327 IAC 8-4.1; or
(B) are less than two hundred seventy-five (275) gallons if at a facility that has been notified in writing by a water utility that it is located in a delineated public water supply wellhead protection area as approved by the department under 327 IAC 8-4.1.
(12) Storage area in which the drums and portable containers are considered empty of liquid hazardous materials if the standards set forth in 40 CFR 261.7* are met.
(b) Aboveground storage tanks, storage areas, and transfer areas constructed on or before the effective date of this rule are not subject to the requirements of sections 5 through 7 of this rule, except as provided in section 2 of this rule.
*The Code of Federal Regulations and the United States Code (U.S.C.) citations are incorporated by reference into this rule and are available from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402 or from the Indiana Department of Environmental Management, Office of Water Quality, Indiana Government Center-North, 100 North Senate Avenue, Room N1255, Indianapolis, Indiana 46204. *(Water Pollution Control Board; 327 IAC 2-10-3; filed May 28, 1999, 11:42 a.m.: 22 IR 3099; errata filed Jun 8, 1999, 9:23 a.m.: 22 IR 3108; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; errata filed Feb 6, 2006, 11:15 a.m.: 29 IR 1936; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA)*

327 IAC 2-10-4 Definitions
Authority: IC 13-18-5
Affected: IC 13-11-2

Sec. 4. For the purposes of this rule, the following terms are defined as follows:
(1) "Aboveground storage tank" means a stationary device designed to structurally support, enclose, and contain an accumulation of liquid hazardous materials on or above the surface of the ground, and which is constructed of nonearthen materials, such as concrete, metal, or plastic.
(2) "Board" has the meaning set forth in IC 13-11-2-17(d).
(3) "Commissioner" has the meaning set forth in IC 13-11-2-35(a).
(4) "Department" has the meaning set forth in IC 13-11-2-51.
(5) "Discharge" means the leaking, leaching, escaping, or disposing from an aboveground storage tank, storage area, or transfer area into secondary containment.
(6) "Drum" means a nonstationary container that holds between ten (10) and one hundred (100) gallons of a liquid hazardous material.
(7) "Facility" has the meaning set forth in IC 13-11-2-77(c).
(8) "Hazardous material" has the meaning set forth in IC 13-11-2-96(a) or means a mixture that contains at least one (1) of the substances specified in IC 13-11-2-96(a).
(9) "Liquid" means a nongaseous state of matter that, at sixty (60) degrees Fahrenheit and atmospheric pressure, will take the shape of its container immediately upon being placed in such container.

(10) "Mixture" means a combination of materials that contains at least one (1) of the substances defined as a hazardous material under this rule in a quantity greater than or equal to ten percent (10%) by volume.
(11) "Operator" means a person who is responsible for overall operation of a facility, including a private contractor conducting operational activities at a facility.
(12) "Owner" means a person who holds title to, controls, or owns an interest in a facility with an aboveground storage tank, storage area, or transfer area. "Owner" does not include a unit of federal, state, or local government that has acquired ownership or control involuntarily through bankruptcy, tax delinquency, abandonment, or other circumstances in which the governmental unit involuntarily acquired title because of the unit's function as sovereign, except if the unit causes or contributes to the release or threatened release of a hazardous material.
(13) " Person" has the meaning set forth in IC 13-11-2-158(a).
(14) "Petroleum facility" has the meaning set forth in IC 13-11-2-161.
(15) "Portable tank" means a nonstationary container that holds one hundred (100) gallons to one thousand (1,000) gallons of a liquid hazardous material.
(16) "Process tank" means a vessel or other container used for the mixing or batching of chemicals, feeds, wastewater, or other components, or for the preparation of one (1) or more components, leading to the production of a desired product. The term includes all attached piping and other fixtures necessary for the intended operation of the vessel or container.
(17) "Secondary containment" has the meaning set forth in IC 13-11-2-197.
(18) "Spill" means any unexpected, unintended, abnormal, or unapproved dumping, leakage, drainage, seepage, discharge, or other loss of petroleum, hazardous substances, extremely hazardous substances, or objectionable substances. The term does not include releases to impermeable surfaces when the substance does not migrate off the surface or penetrate the surface and enter the soil.
(19) "Stationary" means designed and constructed to be:
(A) immobile;
(B) with fixed piping;
(C) permanently attached to a surface; or
(D) not designed to be moved when filled.
(20) "Storage area" means any discrete area at a facility in which:
(A) drums holding, in aggregate, one thousand (1,000) gallons or more; or
(B) portable tanks holding, in aggregate, two thousand (2,000) gallons or more;
of liquid hazardous materials which are stored within twenty-five (25) feet of each other for more than fifteen (15) days.
(21) "Structure", for the purposes of this rule, means part of a structure or system that prevents or impedes a spill of a hazardous material from entering waters of the state.
(22) "Transfer area" means a dedicated outside loading or unloading area used for more than fifteen (15) days in a calendar year for the transfer of liquid hazardous materials between a railcar or semitrailer tanker and an aboveground storage tank.
(23) "Water pollution control laws" has the meaning set forth in IC 13-11-2-260.
(24) "Waters" has the meaning set forth in IC 13-11-2-265.

(Water Pollution Control Board; 327 IAC 2-10-4; filed May 28, 1999, 11:42 a.m.: 22 IR 3100; errata filed Jun 8, 1999, 9:23 a.m.: 22 IR 3108; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA)

327 IAC 2-10-5 Storage inside a building

Authority: IC 13-18-5
Affected: IC 13-11-2

Sec. 5. Aboveground storage tanks or storage areas containing hazardous materials that are located inside a building must have a floor compatible with the material being stored and a system to prevent or impede a spill from entering waters of the state. *(Water Pollution Control Board; 327 IAC 2-10-5; filed May 28, 1999, 11:42 a.m.: 22 IR 3101; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA)*

327 IAC 2-10-6 Storage outside a building

Authority: IC 13-18-5
Affected: IC 13-11-2

Sec. 6. (a) Aboveground storage tanks or storage areas containing hazardous materials that are located outside a building must have secondary containment.

(b) Secondary containment must be designed and constructed consistent with current engineering standards with materials that are compatible with the hazardous materials being stored and which will prevent a release from entering waters of the state for a seventy-two (72) hour period. The design requirements of secondary containment must be met in one (1) of the following ways:

(1) A secondary containment area with dikes, berms, retaining walls, or trenches, and a floor that must cover the entire area within the dikes, berms, retaining walls, or trenches.

(2) A tank designed and built with an outer shell and an interstitial space between the tank wall and the outer shell that allows for monitoring.

(3) Diversionary systems that direct the discharges to treatment or temporary holding areas.

(4) Other methods approved by the commissioner that have been demonstrated to be equally protective of human health and the environment.

(c) A secondary containment area must have a volume, considering displacement, to contain at least one hundred ten percent (110%) of the volume of the largest aboveground tank, or portable tank in the secondary containment area, or the volume of the largest aboveground tank, or portable tank plus enough freeboard to contain precipitation generated by a twenty-five (25) year/twenty-four (24) hour rain event. A tank designed and built with an outer shell for secondary containment is an acceptable alternative. At a minimum, secondary containment for storage areas holding only drums must be capable of holding or diverting one hundred twenty (120) gallons.

(d) A secondary containment area must be properly maintained to protect the integrity and capacity of the secondary containment.

(e) Liquid that collects within the secondary containment area must be removed within seventy-two (72) hours of its discovery in order to maintain the available capacity of the secondary containment area at one hundred percent (100%) of the largest aboveground tank, or portable tank in the secondary containment area. Ice must be removed as soon as weather permits. Liquid that collects within the secondary containment area must meet all applicable requirements of this article if discharged to waters of the state. *(Water Pollution Control Board; 327 IAC 2-10-6; filed May 28, 1999, 11:42 a.m.: 22 IR 3101; errata filed Jun 8, 1999, 9:23 a.m.: 22 IR 3108; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA)*

327 IAC 2-10-7 Hazardous materials transfer area

Authority: IC 13-18-5
Affected: IC 13-11-2

Sec. 7. (a) A hazardous materials transfer area must be designed and constructed consistent with current engineering standards with materials that are compatible with the hazardous materials being stored, and that will prevent a release from entering waters of the state for a seventy-two (72) hour period during loading and unloading of a tank as follows:

(1) A hazardous materials transfer area must:

(A) contain a minimum of the volume of the hazardous material that could be pumped during one (1) minute of transfer operation; or

(B) direct the minimum volume of the hazardous material that could be pumped during one (1) minute of transfer operation to a diversionary system that treats or temporarily stores the hazardous material.

(b) The hazardous materials transfer area must be properly maintained to protect the integrity and capacity of the transfer area.

(c) Liquid that collects within the hazardous materials transfer area must be removed within seventy-two (72) hours of its discovery in order to maintain the available capacity of the secondary containment area at one hundred percent (100%). Ice must be removed as soon as weather permits. Liquid that collects within the hazardous materials transfer area must meet all applicable requirements of this article if discharged to waters of the state. *(Water Pollution Control Board; 327 IAC 2-10-7; filed May 28, 1999, 11:42 a.m.: 22 IR 3101; errata filed Jun 8, 1999, 9:23 a.m.: 22 IR 3108; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA)*

327 IAC 2-10-8 Spill response plan

Authority: IC 13-18-5
Affected: IC 13-11-2

Sec. 8. (a) The owner or operator of each facility with an aboveground storage tank, storage area, or transfer area subject to this rule must be prepared to prevent and control pollution that could result from an aboveground storage tank, storage area, or transfer area discharge or spill.

(b) Within twelve (12) months of the effective date of this rule, the owner or operator of each facility with an aboveground storage tank, storage area, or transfer area subject to this rule shall prepare a response plan for the facility. The response plan must be available for inspection at the facility and, if requested in writing by the department, submitted to the Indiana Department of Environmental Management, Office of Land Quality, 100 North Senate Avenue, Indianapolis, Indiana 46204, Attention: Emergency Response. The response plan must provide, at a minimum, the following information:

(1) The name and telephone number of the contact person responsible for the facility.

(2) A description of the procedures that will be taken to provide an immediate response to a discharge or spill, including the identification of facility response personnel who will implement a response action.

(3) The identification of facility personnel or outside contractor who are *[sic., is]* capable of cleaning up the discharge or spill.

(4) A method for determining the location of storm sewers that reasonably may be expected to be affected by a spill.

(5) The telephone numbers of the following:

(A) The facility emergency response personnel or outside contractor.

(B) The local fire department.

(C) The Indiana department of environmental management at 1-888-233-7745 (in-state, toll free) or 317-233-7745.

(D) The community emergency coordinator designated by the local emergency planning committee.

(E) The National Response Center at 1-800-424-8802.

(c) The response plan may be a part of an existing contingency, emergency response plan, or other spill plan for the facility provided that all elements in subsection (b) are included in the plan.

(d) The owner or operator shall review and update as necessary the information required in this section at least once every three (3) years or within sixty (60) days of a significant change in the information to be contained in the plan, whichever date occurs first. *(Water Pollution Control Board; 327 IAC 2-10-8; filed May 28, 1999, 11:42 a.m.: 22 IR 3101; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; errata filed Feb 6, 2006, 11:15 a.m.: 29 IR 1936; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA)*

Rule 11. Ground Water Quality Standards

327 IAC 2-11-1 Goal

Authority: IC 13-18-3-1; IC 13-18-4-1; IC 13-18-4-3; IC 13-18-4-4; IC 13-18-4-5; IC 13-18-17-5
Affected: IC 13-18-4; IC 13-18-17

Sec. 1. The goal of this rule is to maintain and protect the quality of Indiana's ground water and ensure that exposure to the ground water will not pose a threat to human health, any natural resource, or the environment. *(Water Pollution Control Board; 327 IAC 2-11-1; filed Feb 4, 2002, 11:00 a.m.: 25 IR 1876; readopted filed Jun 4, 2008, 11:07 a.m.: 20080702-IR-327080207BFA)*

327 IAC 2-11-2 Applicability

Authority: IC 13-18-3-1; IC 13-18-4-1; IC 13-18-4-3; IC 13-18-4-4; IC 13-18-4-5; IC 13-18-17-5
Affected: IC 4-22-2; IC 13-18-4; IC 13-18-17; IC 13-22; IC 13-23; IC 13-24; IC 13-25-4; IC 13-25-5-8.5; IC 13-30

Sec. 2. (a) The following agencies shall adopt rules under IC 4-22-2 to apply the standards established in this rule to the facilities, practices, and activities they regulate:

(1) The department of environmental management.

(2) The department of natural resources.

(3) The Indiana state department of health.

(4) The state chemist of the state of Indiana.

(5) The office of the state fire marshal.

(b) An agency shall use its regulatory authority when adopting rules to ensure the criteria established in sections 5, 6, 7, and 8 of this rule will not be exceeded in ground water at or beyond the boundary of a ground water management zone established according to section 9 of this rule. When adopting rules, an agency shall, to the extent consistent with its regulatory authority, ensure that facilities, practices, and activities are designed and managed to eliminate or minimize, to the extent feasible, potential adverse impacts to the existing ground water quality by applying preventative action levels, design standards, a monitoring framework, or other regulatory methods. An agency may consider technological and economic reasonableness and other appropriate factors in determining a feasible approach.

(c) The standards established in this rule shall not limit nor expand the authority of an agency.

(d) The standards established in this rule shall allow the following to be consistent with the remediation objectives set forth in IC 13-25-5-8.5:

(1) Ground water remediations conducted under:
  (A) IC 13-22;
  (B) IC 13-23; or
  (C) IC 13-25-5.

(2) Ground water remediations that:
  (A) are not emergency or nontime-critical activities; and
  (B) are conducted under:
    (i) IC 13-24; or
    (ii) IC 13-25-4.

(3) Ground water remediations conducted under any other provision of IC 13, as appropriate.

(e) No person shall cause the ground water in a drinking water supply well to have a contaminant concentration that creates one (1) or more of the following:

(1) An exceedance of the numeric criteria established for drinking water class ground water in Tables *[section]* 6(a)(1) and 6(a)(2) of this rule.

(2) A level sufficient to be acutely or chronically toxic, carcinogenic, mutagenic, teratogenic, or otherwise injurious to human health based on best scientific information.

(3) An exceedance of one (1) or more of the following indicator levels:
  (A) Chloride at two hundred fifty (250) milligrams per liter.
  (B) Sulfate at two hundred fifty (250) milligrams per liter.
  (C) Total dissolved solids at five hundred (500) milligrams per liter.
  (D) Total coliform bacteria at nondetect.

(4) Renders the well unuseable for normal domestic use.

(f) No person shall cause the ground water in a nondrinking water supply well, including an industrial, commercial, or agricultural supply well, to have a contaminant concentration that, based on best scientific information, renders the well unuseable for its current use.

(g) The criteria established in subsections (e) and (f) are immediately enforceable on the effective date of this rule under IC 13-30 to protect ground water quality in water supply wells.

(h) Except as provided in subsection (g), the criteria established in this rule shall not be enforceable under IC 13-30 until subsequent rules are adopted to apply the standards established in this rule pursuant to subsections (a) and (b). *(Water Pollution Control Board; 327 IAC 2-11-2; filed Feb 4, 2002, 11:00 a.m.: 25 IR 1876; readopted filed Jun 4, 2008, 11:07 a.m.: 20080702-IR-327080207BFA)*

327 IAC 2-11-3 Definitions

Authority: IC 13-18-3-1; IC 13-18-4-1; IC 13-18-4-3; IC 13-18-4-4; IC 13-18-4-5; IC 13-18-17-5
Affected: IC 13-11-2-71; IC 13-18-4; IC 13-18-17; IC 14-34

Sec. 3. The following definitions apply throughout this rule:

(1) "Agency" means one (1) or more of the following:
  (A) The department of environmental management.
  (B) The department of natural resources.

(C) The Indiana state department of health.
(D) The state chemist of the state of Indiana.
(E) The office of the state fire marshal.

(2) "Commissioner" means the commissioner of the department of environmental management.

(3) "Contaminant" means any solid, semisolid, liquid, or gaseous matter, or any odor, radioactive material, pollutant (as defined by the federal Water Pollution Control Act (33 U.S.C. 1362(6)), as amended on December 16, 1996)*, hazardous waste (as defined in the federal Solid Waste Disposal Act (42 U.S.C. 6903(5)), as amended on March 26, 1996)**, any constituent of a hazardous waste, or any combination of the items described in this subdivision, from whatever source, that:

(A) is injurious to human health, plant or animal life, or property;
(B) interferes unreasonably with the enjoyment of life or property; or
(C) otherwise violates:
(i) environmental management laws; or
(ii) rules adopted under environmental management laws.

(4) "Criterion" means a numeric value or a narrative statement established to maintain and protect the quality of ground water.

(5) "Drinking water well" means a bored, drilled, or driven shaft or a dug hole that meets the following:

(A) Supplies ground water for human consumption.
(B) Has a depth greater than its largest surface dimension.
(C) Is not permanently abandoned in accordance with 310 IAC 16-10-2 *[310 IAC 16 was repealed filed Nov 22, 1999, 3:34 p.m.: 23 IR 776.]*.

(6) "Environmental management laws" has the meaning set forth in IC 13-11-2-71.

(7) "Ground water" means water located below the ground surface in interconnected voids and pore spaces in the zone of saturation.

(8) "Ground water management zone" means a three (3) dimensional region of ground water around a potential or existing contaminant source where a contaminant is or was managed to prevent or mitigate deterioration of ground water quality such that the criteria established in this rule are met at and beyond the boundary of the region.

(9) "Naturally occurring concentration" means a constituent concentration in ground water that is not attributable to human activity.

(10) "Preventative action level" means a measured concentration of a chemical constituent that is:

(A) established on a site-specific or program-specific basis;
(B) used to evaluate sample analysis data from ground water monitoring systems;
(C) statistically measurable using standard laboratory analyses; and
(D) used to determine if further action is necessary to ensure the standards established in this rule are not violated.

(11) "Property boundary" means the edge of a contiguous parcel of land owned or leased by a common owner or lessee. Contiguous land shall include land separated by a public right-of-way, if that land would otherwise be contiguous.

(12) "Standards", when used without qualification, means:

(A) the numeric and narrative criteria;
(B) the classification plan; and
(C) the method of determining where the criteria must apply;

established by this rule.

(13) "Surface water quality standards" means the water quality standards established in 327 IAC 2-1 and 327 IAC 2-1.5.

*33 U.S.C. 1362(6) is incorporated by reference. Copies of this publication may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402 or from the Indiana Department of Environmental Management, Office of Water Quality, Indiana Government Center-North, 100 North Senate Avenue, Room N1255, Indianapolis, Indiana 46204.

**42 U.S.C. 6903(5) is incorporated by reference. Copies of this publication may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402 or from the Indiana Department of Environmental Management, Office of Water Quality, Indiana Government Center-North, 100 North Senate Avenue, Room N1255, Indianapolis, Indiana 46204.

(Water Pollution Control Board; 327 IAC 2-11-3; filed Feb 4, 2002, 11:00 a.m.: 25 IR 1877; errata filed Feb 5, 2002, 1:52 p.m.: 25 IR 1906; errata filed Feb 6, 2006, 11:15 a.m.: 29 IR 1936; readopted filed Jun 4, 2008, 11:07 a.m.: 20080702-IR-327080207BFA)

327 IAC 2-11-4 Ground water classification plan

Authority: IC 13-18-3-1; IC 13-18-4-1; IC 13-18-4-3; IC 13-18-4-4; IC 13-18-4-5; IC 13-18-17-5
Affected: IC 4-22-2; IC 13-11-2-82; IC 13-18-4; IC 13-18-17; IC 14-34-4-7; IC 14-34-6; IC 14-37

Sec. 4. (a) All ground water shall be classified, under rules adopted under IC 4-22-2 that apply the standards established in this rule, to determine the appropriate narrative and numeric criteria and level of protection to be applied to ground water.

(b) Ground water shall be classified as drinking water class ground water unless it is classified as:

(1) limited class ground water under subsection (c), (d), (e), or (f); or

(2) impaired drinking water class ground water under subsection (g) or (h).

(c) Ground water shall be limited if it is in accordance with one (1) of the following conditions:

(1) Contains hydrocarbons that are producible considering their quantity and location, as has been demonstrated to an agency.

(2) Located in the injection zone of or within the physical influence of a Class I, II, or III injection well operating under a valid underground injection control permit issued under the Safe Drinking Water Act (42 U.S.C. 300) and its implementing regulations.

(3) Located in a zone within the physical influence of a gas storage well operating under a valid permit issued under IC 14-37.

(d) Ground water shall be limited if it has constituent concentrations that are the result of natural processes acting on post mine hydrology and is located within one (1) of the following:

(1) A coal mine area that:

(A) has satisfied the requirements of IC 14-34 and is fully released from the performance bond required by IC 14-34-6; and

(B) is within a zone defined by the coal mine permit as it was formerly approved and regulated by the department of natural resources unless it is within a demonstrated zone of influence of a coal mine area as determined by the commissioner in consultation with the department of natural resources.

(2) The zone of influence, as determined by the commissioner in cooperation with the department of natural resources, of a coal mine area mined prior to August 4, 1977.

(e) Ground water shall be limited if it is located within an agricultural crop root zone. A limited classification under this subsection shall extend no deeper than ten (10) feet below the land surface.

(f) The commissioner may classify ground water as limited class ground water if a person requesting classification demonstrates, in a written submission, that the following conditions are met:

(1) The ground water requested to be classified is as follows:

(A) Described in three (3) dimensions.

(B) Limited in one (1) of the following ways:

(i) The potential ground water yield is less than two hundred (200) gallons per day.

(ii) The naturally occurring total dissolved solids concentration is greater than or equal to ten thousand (10,000) milligrams per liter.

(C) Not currently used nor reasonably expected to be used for drinking water in the future, including the combined use of multiple low yield water bearing zones.

(D) Not in a state-approved wellhead protection area established pursuant to 327 IAC 8-4.1.

(2) Notification, using certified mail, was given, at least forty-five (45) days prior to the submission of the request, to the following:

(A) An owner and, if one exists, a lessee of property within or adjacent to the land area above the ground water requested to be classified.

(B) Any person reasonably expected to be aggrieved or adversely affected by the classification.

(C) City and county health officers having jurisdiction within the land area above the ground water requested to be classified.

(g) Ground water is impaired drinking water when the following conditions are met:

(1) The ground water is not in a state-approved wellhead protection area established pursuant to 327 IAC 8-4.1.

(2) The ground water has one (1) or more contaminant concentrations above the numeric criteria established in section 6(a) or 6(d) of this rule.

(3) The commissioner has approved a ground water remediation, closure, cleanup, or corrective action plan that describes the nature and extent of contaminants exceeding the criteria established in section 6(a) or 6(d), and one (1) of the following

applies:

(A) A restrictive covenant has been placed on the property or properties overlying the ground water, and it prohibits the use of the untreated ground water.

(B) An alternate institutional control, such as a local ordinance, prohibits the use of the untreated ground water as a source of residential drinking water, and the commissioner has approved the alternate institutional control as an effective means of preventing exposure to the untreated ground water.

(h) The commissioner may classify ground water as impaired drinking water class ground water if it has one (1) or more contaminant concentrations above the numeric criteria established in section 6(a) or 6(d) of this rule and the person requesting classification demonstrates to the commissioner's satisfaction, in a written submission, that the following conditions are met:

(1) The ground water requested to be classified is as follows:

(A) Described, to the commissioner's satisfaction, in a hydrogeologic report that must, at a minimum, contain the following:

(i) A three (3) dimensional description of ground water flow and direction.

(ii) A description that includes the concentration of each contaminant that exceeds the criteria established in section 6(a) or 6(d) of this rule.

(iii) A map indicating the property or properties overlying the ground water requested to be classified.

(B) Not currently used nor reasonably expected to be used for drinking water in the future unless the following apply:

(i) The ground water is treated to reduce the contaminant concentration to less than the numeric criterion established in section 6(a) or 6(d) of this rule.

(ii) A mechanism is in place to prevent untreated ground water from being used as drinking water for as long as a contaminant concentration is above the numeric criterion established in section 6(a) or 6(d) of this rule.

(C) Not in a state-approved wellhead protection area established pursuant to 327 IAC 8-4.1.

(2) Notification, using certified mail, was given, at least forty-five (45) days prior to the submission of the request, to the following:

(A) An owner and, if one exists, a lessee of property within or adjacent to the land area above the ground water requested to be classified.

(B) The following city and county positions having jurisdiction within the land area above the ground water requested to be classified:

(i) Government officials.

(ii) Planners.

(iii) Health officers.

(C) Any person reasonably expected to be aggrieved or adversely affected by the classification.

(i) The commissioner may deny a request to classify ground water as impaired drinking water class ground water if the exceedance of the numeric criterion established in section 6(a) or 6(d) of this rule was caused by an unlawful action of the person seeking the classification. Notwithstanding the impaired drinking water class ground water classification, a facility, practice, or activity or a ground water contamination assessment or remediation located within the land area above the ground water classified as impaired drinking water class ground water must comply with all otherwise applicable laws, rules, and standards.

(j) The commissioner may reevaluate and change a ground water classification determination upon the receipt of new or additional information pertaining to a classification requirement. *(Water Pollution Control Board; 327 IAC 2-11-4; filed Feb 4, 2002, 11:00 a.m.: 25 IR 1877; readopted filed Jun 4, 2008, 11:07 a.m.: 20080702-IR-327080207BFA)*

327 IAC 2-11-5 Criteria for all ground water

Authority: IC 13-18-3-1; IC 13-18-4-1; IC 13-18-4-3; IC 13-18-4-4; IC 13-18-4-5; IC 13-18-17-5
Affected: IC 13-18-4; IC 13-18-17

Sec. 5. Each class of ground water described in section 4 of this rule shall meet the following protective criteria:

(1) Ground water quality shall be maintained, at a minimum, to protect the current and reasonably expected future use of the ground water.

(2) Ground water shall be maintained and protected to ensure that a contaminant concentration attributable to human activity does not increase in a drinking water well.

(3) For waters of the state, surface water quality standards shall be met in the surface water at the ground water-surface water

interface.

(Water Pollution Control Board; 327 IAC 2-11-5; filed Feb 4, 2002, 11:00 a.m.: 25 IR 1879; readopted filed Jun 4, 2008, 11:07 a.m.: 20080702-IR-327080207BFA)

327 IAC 2-11-6 Criteria for drinking water class ground water

Authority: IC 13-18
Affected: IC 4-22-2; IC 13-14-9; IC 13-18-4; IC 13-18-17

Sec. 6. (a) The following numeric criteria are health protective goals for untreated ground water used as drinking water and are the maximum permissible level of a contaminant in drinking water class ground water:

(1) The following are the numeric criteria for select inorganic contaminants:

Contaminant	Criterion (mg/l unless noted)[1]
Antimony	0.006
Arsenic	0.010
Asbestos	7 MFL[2]
Barium	2
Beryllium	0.004
Cadmium	0.005
Chromium (total)	0.1
Combined beta/photon emitters	4 mrem/yr[3]
Cyanide (free)	0.2
Fluoride	4
Gross alpha particle activity (including radium 226 but excluding radon and uranium)	15 pCi/L[4]
Lead	0.015
Mercury (inorganic)	0.002
Nitrate (as N)	10
Nitrite (as N)	1
Radium 226 and 228 (combined)	5 pCi/L
Selenium	0.05
Thallium	0.002

Notes:

[1]mg/l is milligrams per liter.

[2]MFL is million fibers per liter greater than 10 micrometers in length.

[3]mrem/yr is millirems per year.

[4]pCi/L is picocuries per liter.

(2) The following are the numeric criteria for select organic contaminants:

Table 6(a)(2)

Numeric Criteria for Organic Contaminants in Drinking Water Class Ground Water

Chemical Abstract Registry Numbers	Contaminant	Criterion (mg/l unless noted)
15972-60-8	Alachlor	0.002
1912-24-9	Atrazine	0.003
71-43-2	Benzene	0.005
50-32-8	Benzo(a)pyrene	0.0002
1563-66-2	Carbofuran	0.04
56-23-5	Carbon tetrachloride	0.005
57-74-9	Chlordane	0.002
94-75-7	2,4-D	0.07

75-99-0	Dalapon	0.2
103-23-1	Di(2-ethylhexyl)adipate	0.4
96-12-8	Dibromochloropropane (DBCP)	0.0002
95-50-1	Dichlorobenzene, 1,2-	0.6
106-46-7	Dichlorobenzene, 1,4-	0.075
107-06-2	Dichloroethane, 1,2-	0.005
75-35-4	Dichloroethylene, 1,1-	0.007
156-59-2	Dichloroethylene, cis-1,2-	0.07
156-60-5	Dichloroethylene, trans-1,2-	0.1
75-09-2	Dichloromethane or methylene chloride	0.005
78-87-5	Dichloropropane, 1,2-	0.005
117-81-7	Di(2-ethylhexyl)phthalate	0.006
88-85-7	Dinoseb	0.007
85-00-7	Diquat	0.02
145-73-3	Endothall	0.1
72-20-8	Endrin	0.002
100-41-4	Ethylbenzene	0.7
106-93-4	Ethylene dibromide (EDB)	0.00005
1071-83-6	Glyphosate	0.7
76-44-8	Heptachlor	0.0004
1024-57-3	Heptachlor epoxide	0.0002
118-74-1	Hexachlorobenzene	0.001
77-47-4	Hexachlorocyclopentadiene	0.05
58-89-9	Lindane (gamma-BHC)	0.0002
72-43-5	Methoxychlor	0.04
108-90-7	Monochlorobenzene	0.1
23135-22-0	Oxamyl (vydate)	0.2
87-89-5	Pentachlorophenol	0.001
1918-02-1	Picloram	0.5
1336-36-3	Polychlorinated biphenyls (PCBs)	0.0005
122-34-9	Simazine	0.004
100-42-5	Styrene	0.1
1746-01-6	2,3,7,8-TCDD (Dioxin)	0.00000003
127-18-4	Tetrachloroethylene	0.005
108-88-3	Toluene	1
8001-35-2	Toxaphene	0.003
93-72-1	2,4,5-TP (Silvex)	0.05
120-82-1	Trichlorobenzene, 1,2,4-	0.07
71-55-6	Trichloroethane, 1,1,1-	0.2
79-00-5	Trichloroethane, 1,1,2-	0.005
79-01-6	Trichloroethylene	0.005
75-01-4	Vinyl chloride	0.002
1330-20-7	Xylenes (total)	10

(3) A drinking water class numeric criterion may be added to the criteria established in this subsection if adopted according to IC 4-22-2 and IC 13-14-9.

(b) An agency shall determine if further action is necessary to comply with the narrative criteria established in section 5 of

this rule if the following indicator levels are exceeded in drinking water class ground water:

(1) Chloride at two hundred fifty (250) milligrams per liter.

(2) Sulfate at two hundred fifty (250) milligrams per liter.

(3) Total dissolved solids at five hundred (500) milligrams per liter.

(4) Total coliform bacteria at nondetect.

(c) If the commissioner determines that a site-specific numeric criterion for a contaminant without a drinking water class numeric criterion established in subsection (a) is necessary to protect human health, any natural resource, or the environment, a risk analysis shall be used to establish a numeric criterion for that contaminant and must:

(1) receive approval from the commissioner; and

(2) be based upon appropriate toxicological data.

(d) The naturally occurring concentration of a contaminant in drinking water class ground water shall be the numeric criterion if that contaminant occurs at a concentration greater than the drinking water numeric criterion established in subsection (a) or (c) or an indicator level established in subsection (b).

(e) If drinking water class ground water at a facility, practice, or activity is determined to have one (1) or more contaminant concentrations above the numeric criteria established in this section that are not attributable to the facility, practice, or activity under consideration, an agency shall manage the facility, practice, or activity or implement programs such that:

(1) the facility, practice, or activity causes no further increase in the concentration of the contaminant determined to be above the numeric criterion established in this section; and

(2) any design standard or management requirements that apply to the facility, practice, or activity are at least as stringent as the design standard and management requirements that would be applied to a facility, practice, or activity where ground water does not have one (1) or more contaminant concentrations above the numeric criteria established in this section.

(f) The commissioner may, for a ground water contamination assessment or remediation at a facility, practice, or activity under the jurisdiction of the department of environmental management, allow an appropriate site-specific, risk-based numeric criterion different from the numeric criterion established in subsection (a) or (d) to be applied to drinking water class ground water within the boundary of the ground water management zone established according to section 9 of this rule. *(Water Pollution Control Board; 327 IAC 2-11-6; filed Feb 4, 2002, 11:00 a.m.: 25 IR 1879; readopted filed Jun 4, 2008, 11:07 a.m.: 20080702-IR-327080207BFA; filed Nov 24, 2008, 12:30 p.m.: 20081217-IR-327060280FRA)*

327 IAC 2-11-7 Criteria for limited class ground water

Authority: IC 13-18-3-1; IC 13-18-4-1; IC 13-18-4-3; IC 13-18-4-4; IC 13-18-4-5; IC 13-18-17-5
Affected: IC 13-18-4; IC 13-18-17

Sec. 7. (a) Limited class ground water, classified according to section 4(c) of this rule, must meet the narrative criteria established in section 5 of this rule.

(b) Limited class ground water, classified according to section 4(d) of this rule, must meet the following requirements:

(1) A contaminant attributable to activities associated with coal mining, not including the disposal of coal combustion waste at a surface coal mine under IC 14-34, must meet the greater of the following:

(A) The existing contaminant concentration.

(B) The numeric criterion established in section 6(a) of this rule.

(2) A contaminant not attributable to activities associated with coal mining, including the disposal of coal combustion waste at a surface coal mine under IC 14-34, if the contaminant concentration exceeds the concentration attributable to a coal mining activity, must meet the numeric criterion established in section 6(a) or 6(d) of this rule.

(c) Limited class ground water, classified according to section 4(e) of this rule, must meet the following requirements:

(1) A contaminant attributable to pesticides, crop nutrients, or soil amendments that have been applied for agricultural purposes and used in a manner consistent with all applicable regulatory requirements shall meet the greater of the following:

(A) The existing contaminant concentration.

(B) The numeric criterion established in section 6(a) of this rule.

(2) A contaminant not attributable to pesticides, crop nutrients, or soil amendments that have been applied for agricultural purposes and used in a manner consistent with all applicable regulatory requirements must meet the numeric criterion established in section 6(a) or 6(d) of this rule.

(d) Limited class ground water, classified according to section 4(f) of this rule, must meet the following requirements:

(1) A contaminant with a drinking water class numeric criterion established in section 6(a) of this rule must have a numeric criterion of ten (10) times the drinking water class numeric criterion established in section 6(a) of this rule.

(2) If the commissioner determines that a numeric criterion for a contaminant without a drinking water class numeric criterion established in subsection 6(a) of this rule is necessary to protect human health, any natural resource, or the environment, a risk analysis shall be used to establish a numeric criterion for that contaminant and must:

(A) receive approval from the commissioner; and

(B) be based on appropriate toxicological data.

(e) The naturally occurring concentration of a contaminant in limited class ground water shall be the numeric criterion if that contaminant occurs at a concentration greater than the limited numeric criterion established in subsection (b), (c), or (d).

(f) If limited class ground water at a facility, practice, or activity is determined to have one (1) or more contaminant concentrations above the numeric criteria established in this section that are not attributable to the facility, practice, or activity under consideration, an agency shall manage the facility, practice, or activity or implement programs such that:

(1) the facility, practice, or activity causes no further increase in the concentration of the contaminant determined to be above the numeric criterion established in this section; and

(2) any design standard or management requirements that apply to the facility, practice, or activity are at least as stringent as the design standard and management requirements that would be applied to a facility, practice, or activity where ground water does not have one (1) or more contaminant concentrations above the numeric criteria established in this section.

(g) The commissioner may allow an appropriate site specific, risk based numeric criterion different from the numeric criterion established in this section to be applied to limited class ground water at and beyond the boundary of the ground water management zone established according to section 9 of this rule. *(Water Pollution Control Board; 327 IAC 2-11-7; filed Feb 4, 2002, 11:00 a.m.: 25 IR 1880; readopted filed Jun 4, 2008, 11:07 a.m.: 20080702-IR-327080207BFA)*

327 IAC 2-11-8 Criteria for impaired drinking water class ground water

Authority: IC 13-18-3-1; IC 13-18-4-1; IC 13-18-4-3; IC 13-18-4-4; IC 13-18-4-5; IC 13-18-17-5
Affected: IC 13-18-4; IC 13-18-17

Sec. 8. Impaired drinking water class ground water, classified according to section 4(g) or 4(h) of this rule, shall meet the following requirements:

(1) A contaminant not identified in the classification as being in excess of the numeric criterion of section 6(a) or 6(d) of this rule shall meet the numeric criterion established in section 6(a) or 6(d) of this rule.

(2) A contaminant identified in the classification as being in excess of the numeric criterion established in section 6(a) or 6(d) of this rule shall meet the existing contaminant concentration if it is greater than the numeric criterion established in section 6(a) or 6(d) of this rule and results from a source of contamination that:

(A) was from a previously unregulated facility, practice, or activity;

(B) was discovered after those who caused the contamination abandoned the site and those who caused the contamination cannot be found; or

(C) cannot be identified due to the nature of the specific constituent.

(3) Any design standard or management requirements that apply to a facility, practice, or activity with impaired drinking water class ground water must be at least as stringent as the design standard and management requirements that would be applied to a facility, practice, or activity with drinking water class ground water.

(4) The commissioner may allow an appropriate site specific, risk based numeric criterion different from the numeric criterion established in this section to be applied to impaired drinking water class ground water at and beyond the boundary of the ground water management zone established according to section 9 of this rule.

(Water Pollution Control Board; 327 IAC 2-11-8; filed Feb 4, 2002, 11:00 a.m.: 25 IR 1881; readopted filed Jun 4, 2008, 11:07 a.m.: 20080702-IR-327080207BFA)

327 IAC 2-11-9 Ground water management zones

Authority: IC 13-18-3-1; IC 13-18-4-1; IC 13-18-4-3; IC 13-18-4-4; IC 13-18-4-5; IC 13-18-17-5
Affected: IC 4-22-2; IC 13-18-4; IC 13-18-17

Sec. 9. (a) The criteria established in sections 5, 6, 7, and 8 of this rule must be met at and beyond the boundary of the ground

water management zone.

(b) An agency, having jurisdiction over a facility, practice, or activity that is subject to the criteria of this rule, may establish an appropriate program specific or site specific three (3) dimensional ground water management zone and shall determine its boundary location and duration considering the following factors:

(1) Regulatory program requirements.
(2) Design standards.
(3) Monitoring frameworks.
(4) Hydrogeologic conditions.
(5) Risks of human exposure.
(6) Impacts to any natural resource and the environment.
(7) Property controls.
(8) Physical and chemical properties of potential contaminants.

(c) An agency, having jurisdiction over a ground water contamination assessment or remediation that is subject to the criteria of this rule, may establish an appropriate program specific or site specific three (3) dimensional ground water management zone considering the following factors:

(1) Regulatory program requirements.
(2) Type and amount of a contaminant present.
(3) Monitoring frameworks.
(4) Hydrogeologic conditions.
(5) Risks of human exposure.
(6) Impacts to any natural resource and the environment.
(7) Property controls.
(8) Expected future use of the site.
(9) Physical and chemical properties of existing contaminants.

(d) Rules adopted by an agency under IC 4-22-2 to apply the standards in this rule must include a default three (3) dimensional ground water management zone that shall apply if an agency having jurisdiction over a facility, practice, activity, or a ground water contamination assessment or remediation does not establish a program specific or site specific ground water management zone under subsection (b) or (c). The boundary of the default ground water management zone shall be located in accordance with one (1) of the following:

(1) At each drinking water well that is:
    (A) within three hundred (300) feet from the edge of a potential or existing contaminant source when the property boundary is greater than three hundred (300) feet from the edge of a potential or existing contaminant source; or
    (B) within the property boundary when the property boundary is less than three hundred (300) feet from the edge of a potential or existing contaminant source.
(2) The property boundary, when the property boundary is less than three hundred (300) feet from the edge of a potential or existing contaminant source, and there is no drinking water well within the property boundary.
(3) Three hundred (300) feet from the edge of a potential or existing contaminant source when the property boundary is greater than three hundred (300) feet from the edge of a potential or existing contaminant source and there is no drinking water well within three hundred (300) feet from the edge of a potential or existing contaminant source.

(e) If overlapping ground water management zone boundaries are present at a facility, practice, activity, or ground water contamination assessment or remediation, then the agency or agencies with jurisdiction may combine them. *(Water Pollution Control Board; 327 IAC 2-11-9; filed Feb 4, 2002, 11:00 a.m.: 25 IR 1882; readopted filed Jun 4, 2008, 11:07 a.m.: 20080702-IR-327080207BFA)*

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