

State	Mixing zones allowed for lakes, reservoirs and wetlands?	If yes, are non-flowing waters defined?	If yes, what are the limitations on mixing zone size?	Are these limitations in rule or guidance, and how long have they been in place?	Link to rules/guidance document	Do you have a support that provides the rationale or basis for these mixing zone limitations?
Alaska	Yes, specifically for lakes. Reservoirs and wetlands not specifically addressed.	"Lake" means an inland waterbody of substantial size that occupies a basin or hollow in the earth's surface and that might or might not have a current or a single direction of flow;	For lakes, the total horizontal area allocated to all mixing zones at any depth may not exceed 10 percent of the lake's surface area	Language pertaining to the 10% allowable surface area has been in Alaska's mixing zone regulations since 1979	http://dec.alaska.gov/water/wqsar/wqs/mixingzones.html	Alaska uses mixing zone modeling methods in the CORMIX manual for designing a mixing zone in reservoirs and lakes
Iowa	No mixing zone or zone of initial dilution will be allowed for waters <u>designated</u> as lakes or wetlands. Yes for reservoirs on rivers.	Lakes and Wetlands are generally treated as non-flowing waters. Reservoirs on a river is treated flowing water	may not exceed 10 percent of the lake's surface area	Restriction on mixing in lakes and wetlands is in Iowa's rule and it has been in the rules a long time.	https://www.legis.iowa.gov/docs/ACO/chapter/567.61.pdf	No

<p>Kansas</p>	<p>Yes</p>	<p>Flowing or non-flowing waters are not specifically defined or used in the regulations. So we don't have a flow velocity threshold for non-flowing waters.</p>	<p>K.A.R. 28-16-28c(b)(11) ... <i>"Mixing zones in lakes designated as expected aquatic life use water or restricted aquatic life use waters may be allowed by the department if the mixing zones do not extend farther than 50 meters from the point of effluent discharge or do not comprise more than one percent of the total volume of the receiving lake as measured at the conservation pool."</i></p>	<p>They are regulations that have been in place for a long time (more than 10 years at least).</p>	<p>http://www.kdheks.gov/water/download/kwqs_plus_supporting.pdf</p>	<p>No. To be more accurate, I haven't seen such document.</p>
<p>Louisiana</p>	<p>Yes</p>	<p>Defined primarily by water body type (e.g. lake -vs- river)</p>	<p>Some distances are defined in regulations (100' MZ and 25' ZID for freshwater ponds and lakes); others are determined on a case-by-case basis.</p>	<p>Yes, in rule. Initial regulations were promulgated in 1984.</p>	<p>http://www.deq.louisiana.gov/portal/DIVISIONS/LegalAffairs/RulesandRegulations/Title33.aspx</p>	<p>See pages 10 and 11 of Implementation Guidance document at following link: http://www.deq.louisiana.gov/portal/Portals/0/permits/Ipdes/pdf/IMPV35_final_110210%20version%208.pdf</p>

Michigan	Yes. Mixing zones are allowed for lakes and reservoirs but not wetlands.	Michigan has a definition of “lotic”- surface waters of the state that exhibit flow. But no minimum flow is designated in rule.	Physical mixing zone boundaries may be established on a case by case basis. The dilution volume for inland lakes is 1 part effluent to 10 parts receiving water.	Yes. Rule R323.1082 of the Part 4 rules includes dilution volumes for receiving water and effluent and have been in place since July 29, 1997.	http://www.michigan.gov/documents/deq/wb-sw-as-rules-part4_254149_7.pdf?20140421160456	40 CFR Part 132, Water Quality Guidance for the Great Lakes System: Supplementary Information Document (SID) and the Guidance itself provide the background and rationale for the mixing zone limitations. See http://www.epa.gov/gliclear/docs/usepa_sid.pdf
Minnesota	No. A permittee that has a discharge going into a lake, a Wetland or directly into a reservoir must meet chronic stds at end of pipe.	Everything is based on low flow 7Q10 flows.	We treat lakes, wetlands and direct discharge into reservoirs (non-run of the river reservoirs) as 0.00 cfs for 7Q10 flows. As such, they get no dilution	Rules for mixing zones outside of the Lake Superior basin have been in place since the early 1980’s. The GLI rule (ch.7052) was adopted in March 1998.	http://www.pca.state.mn.us/index.php/water/water-permits-and-rules/water-rulemaking/minnesota-state-water-rules.html	See rule chapters 7050, 7052 and 7053 at link in question no. 5
Nebraska	NO	Defininitions for Wetland, Lakes and Reservoirs in WQS	NA	NA	http://www.deq.state.ne.us/RuleAndR.nsf/pages/117-TOC	NA
New Jersey	No for new discharges Yes, for existing discharges into lakes, ponds, and reservoirs	no flow velocity threshold for non-flowing waters	See rule at 2.iii on NJ tab	Policies are in rule and have been in place since 2002.	http://www.nj.gov/dep/rules/	“Technical Support Document for Water Quality Based Toxics Control”.

North Dakota	Lakes and Reservoirs: Yes with many conditions. Wetlands: No	Lakes and reservoirs not non-flowing	Mixing zone for lakes and reservoirs is no more than 5% of surface area or 200 feet radius whichever is most limiting.	Not sure how long- first record I can find is 1985.	http://www.legis.nd.gov/information/acdata/pdf/33-16-02.1.pdf?20140409105102	No reply
Oregon	No. A partial exception is we do allow discharges to rivers that have dams impoundments.	We don't have a threshold.	n/a	n/a	Regulatory Mixing Zone IMD - May 2012 o Part 1: Allocating Regulatory Mixing Zones o Part 2: Reviewing Mixing Zone Studies o Transmittal Memo	n/a
Utah	Yes for lakes and reservoirs, no for wetlands per EPA Region 8 Guidance.	No definitions or flow velocity thresholds. Utah's mixing zone policy simply states lakes and reservoirs or rivers and streams.	See rule referenced in number 5	Rule and have been in place for over 10 years	http://www.rules.utah.gov/publicat/code/r317/r317-002.htm#T7	No
Wyoming	Yes	No velocity, just identifies mixing zone allowance for lakes	Mixing zones for lakes shall not exceed 5% of the lake surface area or 200 feet in radius, whichever is more limiting	Allowance for mixing zones are in rule and have been since 1990. The details and limitations are in guidance and have been in place since approximately 2001	http://deq.state.wy.us/wqd/WQDRules/Chapter_01.pdf http://deq.state.wy.us/wqd/watershed/surfacestandards/Downloads/Standards/Chapter_1_Implementation_Policies_Effective_09242013.pdf	Not to my knowledge

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Alaska: Existing Rule , Eff. 11/1/97, Register 143. EPA approved in 2003. Note: Alaska has newer 2006 rule:

18 AAC 70.990. Definitions. Unless the context indicates otherwise, in this chapter

(33) "lake" means an inland waterbody of substantial size that occupies a basin or hollow in the earth's surface and has no natural surface flow;

18 AAC 70.240. Mixing zones: department authorization. (a) The water quality criteria and limits set by or under this chapter the department will authorize a mixing zone only if the department

(1) the applicable requirements of this chapter will be met;

(2) the mixing zone will be as small as practicable; and

(3) an effluent or substance will be treated to remove, reduce, and disperse pollutants, using the most advanced technology available, consistent with the highest statutory and regulatory requirements;

(b) Ongoing compliance with 18 AAC 70.240 - 18 AAC 70.270 is a condition of any permit, certification, or order (Register 143)

18 AAC 70.245. Mixing zones: appropriateness and size determination. (a) In determining the appropriateness of a mixing zone, the department will ensure that existing uses of the waterbody outside the mixing zone are maintained and fully protected so that any discharge

(1) neither partially nor completely eliminate an existing use of the waterbody outside the mixing zone;

(2) not impair the overall biological integrity of the waterbody.

(b) In making a determination under this section, the department will consider

(1) the physical, biological, and chemical characteristics of the receiving water, including volume and flow rate;

(2) the effects that the discharge might have on the uses of the receiving water;

(3) the flushing and mixing characteristics of the receiving water;

(4) effluent treatment technology requirements under federal or state law;

(5) the characteristics of the effluent, including volume, flow rate, dispersion, and quality after treatment;

(6) methods to analyze and model near-field and far-field mixing; and

(7) the cumulative effects of multiple mixing zones and diffuse, nonpoint source inputs located within the waterbody.

18 AAC 70.250. Mixing zones: general conditions. (a) The department will not authorize a mixing zone if the department determines that

(1) the pollutants discharged could

(A) bioaccumulate, bioconcentrate, or persist above natural levels in sediments, water, or soil; or bioaccumulation and bioconcentration factors, toxicity, and exposure;

(B) be expected to cause carcinogenic, mutagenic, or teratogenic effects on, or otherwise harm, humans or wildlife; or (C) be expected to cause other adverse effects on humans or wildlife. If the department determines under this paragraph, the department will, in its discretion, require the applicant to perform a site-specific analysis of exposure pathways, including exposure duration of affected aquatic organisms in the proposed mixing zone or shellfish in the area; in the absence of a site-specific analysis, the evaluation of a discharge will be based on the following assumptions as determined by the department regarding exposure pathways, including

assumptions, as determined by the department, regarding exposure pathways, including mixing zone and patterns of fisheries use and consumption of water, fish, or shellfish in the area;

(C) otherwise create a public health hazard through encroachment on water supply or cor

(2) there could be

(A) an adverse impact on anadromous or resident fish or shellfish spawning or rearing;

(B) a barrier formed to migratory species;

(C) failure to provide a zone of passage; or

(D) an adverse effect on threatened or endangered species;

(3) flushing or mixing of the waterbody is not adequate to ensure full protection of uses of the wa

(4) there could be an environmental effect, or damage to the ecosystem that the department con

(b) The department will reduce in size or deny a mixing zone if the department finds that available evidenc

(1) result in undesirable or nuisance aquatic life;

(2) produce objectionable color, taste, or odor in aquatic resources harvested for human consump

(3) preclude or limit established processing activities or commercial, sport, personal-use, or subsis

(c) For purposes of this section, the department will find that something could happen if the department c

18 AAC 70.255. Mixing zones: in-zone quality and size specifications. (a) The size, location, or other limits discharge permit, certification, or order issued by the department under the appropriate chapter in this tit

(b) Water quality criteria must be met at the boundary of the mixing zone. A discharge may not cause or ri

(1) lethality to passing organisms in the mixing zone; or

(2) a toxic effect in the water column, sediments, or biota outside the boundaries of the mixing zo

(c) Human health and chronic aquatic life criteria apply at and beyond the boundaries of the mixing zone.

(d) Acute aquatic life criteria apply at and beyond the boundaries of a smaller initial mixing zone surround criteria must be sized to prevent lethality to passing organisms. Methods for calculating the boundaries of otherwise specified by the department, must follow procedures under Alternatives 2, 3, or 4 in Section 5.1 Quality Standards Handbook, Second Edition, August 1994, EPA-823-B-94-005a.

(e) Unless the department finds that evidence is sufficient to reasonably demonstrate, in accordance with increased, a mixing zone must comply with the following size restrictions:

(1) for estuarine and marine waters, measured at mean lower low water,

(A) the cumulative linear length of all mixing zones intersected on any given cross section exceed 10 percent of the total length of that cross section; and

(B) the total horizontal area allocated to mixing zones may not exceed 10 percent of the si

(2) for lakes, the total horizontal area allocated to all mixing zones may not exceed 10 percent of t

(3) for streams, rivers, or other flowing fresh waters, subject to (f), (g), and (h) of this section, the l described in (A) or (B) of this paragraph, whichever is closer to the point of discharge, as follows:

(A) beyond the computed point where the variation in the concentration of a water qualit predicted to be less than five percent, as determined using a standard river flow mixing m

(B) beyond the location where the department determines that a public health hazard rea

(f) For streams, rivers, or other flowing fresh waters subject to (e)(3) of this section, in calculating the maximum dilution must be determined using

(1) the actual flow as determined by gauging data collected concurrent with the discharge; or

(2) for conventional or nontoxic substances, the default 2-year, 3-day low flow (3Q2) appropriate to the discharge as the chronic criteria design flow and the 10-year, 1-day (1Q10) as the acute criteria design flow; the 7Q10 mean flow as the design flow for the protection of human health; these low flows must be calculated in accordance with *Frequency and Durational Aspects of Streamflow with Regard to Fish Passage Through Roadway Ditches* and *Aspects of Streamflow in Southeast and Coastal Alaska* (1987), or another appropriate regional regulatory document. Regional quality criteria apply at all design flows that are equal to or greater than these critical low flows.

(g) For streams, rivers, or other flowing fresh waters subject to (e)(3) of this section, a mixing zone may not be established if it results in

(1) permanent or irreparable displacement of indigenous organisms; or

(2) a reduction in fish or shellfish population levels.

(h) For streams, rivers, or other flowing fresh waters subject to (e)(3) of this section, a mixing zone will not be established if it results in

(1) anadromous fish spawning; or

(2) resident fish spawning redds for Arctic grayling, northern pike, rainbow trout, lake trout, brook trout, burbot, and landlocked coho, king, and sockeye salmon.

18 AAC 70.260. Mixing zones: application requirements. An applicant requesting a mixing zone shall provide information and demonstrations required by 18 AAC 70.240 - 18 AAC 70.270 and other applicable requirements of 18 AAC 70.240 - 18 AAC 70.270. The burden of proof for justifying a mixing zone through 18 AAC 70.270 rests with the applicant. The department will, in a timely manner, request and review for compliance.

18 AAC 70.270. Mixing zones: termination, modification, or denial of renewal. If the department finds that a mixing zone authorized by the department has a significant unforeseen adverse environmental effect, the department may terminate, modify, or deny renewal of the order authorizing the mixing zone.

s submitted to EPA in 2009 still waiting EPA action as of April 2014.

urface and that might or might not have a current or a single direction of

r under this chapter may be exceeded within a mixing zone authorized
tment will, in its discretion, upon application, authorize a mixing zone in
nent finds that available evidence reasonably demonstrates that

hods found by the department to be the most effective and
reatment requirements.

order of the department authorizing a mixing zone. (Eff. 11/1/97,

eness and size of a mixing zone, the department will ensure that e
charge will

zone; and

ind flow rate;

atment;

thin, or affecting, the receiving water.

he department finds that available evidence reasonably demonstrates

biota to significantly adverse levels, based on consideration of

present a risk to, human health; when evaluating a discharge under
epartment-approved, site-specific analysis based on exposure
ing zone and patterns of fisheries use and consumption of water, fish,
urge under this paragraph will be based on the most protective
exposure duration of affected aquatic organisms in the proposed mixing

imum pollutant discharge limitations, the volume of flow available for

to the period of discharge; for toxic substances, the 10-year, 7-day low design flow for protection of aquatic life; for carcinogens, the harmonic method using methods of Ashton and Carlson, *Determination of Seasonal, Drainage Structures* (1984), Carlson, *Seasonal, Frequency and Durational* regression flow model approved by the department; numeric water

it result in

t be authorized in an area of

ct trout, cutthroat trout, whitefish, sheefish, Arctic char (Dolly Varden),

vide to the department all available evidence reasonably necessary for a further information the department determines is necessary to meet the demonstrating compliance with the requirements of 18 AAC 70.240 - completeness, information submitted under this section.

at available evidence reasonably demonstrates that a mixing zone : will terminate, modify, or deny renewal of a permit, certification, or

61.2(4) Regulatory mixing zones. Mixing zones are recognized as being necessary for the initial assimilation treatment or control. Mixing zones shall not be used for, or considered as, a substitute for minimum treatment. The purpose of mixing zones is to provide a means of control over the placement and emission of point source discharges. Mixing zones shall meet the general water quality criteria of subrule 61.3(2). Waters at and beyond mixing zone boundaries shall meet the criteria of subrule 61.3(3), Tables 1 and 3, for that particular water body or segment. A zone of initial dilution shall meet applicable standards and the acute criteria of subrule 61.3(3) will be met. For waters designated under subrule 61.3(3), the chronic and human health criteria, and the acute criterion calculated following subrule 61.2(1) respectively.

a. Due to extreme variations in wastewater and receiving water characteristics, **spatial dimensions of mixing zones** intended to define each individual mixing zone, but will set maximum limits which will satisfy most biological criteria for each particular mixing zone. Additional details are noted in the "Supporting Document for Iowa Water Quality Management Plans, 2009, for considering unusual site-specific features such as side channels and sand bars which may influence mixing zone characteristics. 64.3(1) may be required to provide specific information related to the mixing zone characteristics below table 1.

b. For parameters included in Table 1 only (which does not include ammonia nitrogen), the dimensions of the mixing zone shall be determined by a mathematical model presented in the "Supporting Document for Iowa Water Quality Management Plans, 2009, or by in-stream studies of the mixing characteristics during low flow. In addition, the most restrictive of the following shall apply:

(1) The stream flow in the mixing zone may not exceed the most restrictive of the following:

1. Twenty-five percent of the design low stream flows noted in subrule 61.2(5) for interior streams and rivers, and the Big Sioux and Des Moines Rivers.
2. Ten percent of the design low stream flows noted in subrule 61.2(5) for the Mississippi and Missouri Rivers.
3. The stream flow contained in the mixing zone at the most restrictive of the applicable mixing zone boundaries.

(2) The length of the mixing zone below the point of discharge shall be set by the most restrictive of the following:

1. The distance to the juncture of two perennial streams.
2. The distance to a public water supply intake.
3. The distance to the upstream limits of an established recreational area, such as public beach.
4. The distance to the middle of a crossover point in a stream where the main current flows from one bank to the other.
5. The distance to another mixing zone.
6. Not to exceed a distance of 2000 feet.
7. The location where the mixing zone contained the percentages of stream flow noted in 61.2(5).

(3) The width of the mixing zone is calculated as the portion of the stream containing the allowed wastewater load, perpendicular to the basic direction of stream flow at the downstream boundary of the mixing zone.

(4) The width and length of the zone of initial dilution may not exceed 10 percent of the width and length of the mixing zone.

c. The stream flow used in determining wasteload allocations to ensure compliance with the maximum wastewater load shall be the stream flow at the boundary of the allowed mixing zone. This stream flow may not exceed the flow at the point of discharge:

- (1) Twenty-five percent for interior streams and rivers, and the Big Sioux and Des Moines Rivers.
- (2) Ten percent for the Mississippi and Missouri Rivers.

The stream flow in the zone of initial dilution used in determining effluent limits to ensure compliance shall be the calculated flow associated with the mixing zone.

d. For toxic parameters noted in Table 1, the following exceptions apply to the mixing zone requirements:

- (1) No mixing zone or zone of initial dilution will be allowed for waters designated as lakes or wetlands.
- (2) **No zone of initial dilution will be allowed in waters designated as cold water.**
- (3) The use of a diffuser device to promote rapid mixing of an effluent in a receiving stream will be allowed for dischargers to comply with an acute numerical criterion.
- (4) A discharger to interior streams and rivers, the Big Sioux and Des Moines Rivers, and the Mississippi River, may use in-stream data which technically supports the allowance of an increased percentage of the stream flow in the mixing zone. The allowed increase in mixing zone flow would still be governed by the mixing zone length restriction. See the "Supporting Document for Iowa Water Quality Management Plans," Chapter IV, July 1976, as revised on November 11, 2008.

e. For ammonia criteria noted in Table 3, the dimensions of the mixing zone and the zone of initial dilution shall be determined during low flow. In addition, the most restrictive of the following factors will be met:

- (1) The stream flow in the mixing zone may not exceed the most restrictive of the following:
 1. One hundred percent of the design low stream flows noted in subrule 61.2(5) for locations where the stream is the only source of water for the community.
 2. Fifty percent of the design low stream flows noted in subrule 61.2(5) for locations where the stream is one of two sources of water for the community.
 3. Twenty-five percent of the design low stream flows noted in subrule 61.2(5) for locations where the stream is one of three sources of water for the community.
 4. The stream flow contained in the mixing zone at the most restrictive of the applicable mixing zone length restrictions.
- (2) The length of the mixing zone below the point of discharge shall be set by the most restrictive of the following:
 1. The distance to the juncture of two perennial streams.
 2. The distance to a public water supply intake.
 3. The distance to the upstream limits of an established recreational area, such as public beach, swimming area, or fishing area.
 4. The distance to the middle of a crossover point in a stream where the main current flows from the discharge point to the crossover point.
 5. The distance to another mixing zone.
 6. Not to exceed a distance of 2000 feet.
 7. The location where the mixing zone contained the percentages of stream flow noted in 61.2(5).
- (3) The width of the mixing zone is calculated as the portion of the stream containing the allowed percentage of stream flow perpendicular to the basic direction of stream flow at the downstream boundary of the mixing zone.
- (4) The width and length of the zone of initial dilution may not exceed 10 percent of the width and length of the mixing zone.

f. For ammonia criteria noted in Table 3, the stream flow used in determining wasteload allocations to ensure compliance shall be the stream flow contained at the boundary of the allowed mixing zone. This stream flow may not exceed the percentage of stream flow at the point of discharge. The pH and temperature values at the boundary of the mixing zone used to select the wasteload allocation shall be the most restrictive of the following sources. The source of the pH and temperature data will follow the sequence listed below, if applicable data are available:

- (1) Specific pH and temperature data provided by the applicant gathered at their mixing zone boundary. See the "Supporting Document for Iowa Water Quality Management Plans," Chapter IV, July 1976, as revised on November 11, 2008.
- (2) Regional background pH and temperature data provided by the applicant gathered along the stream reach containing the outfall. Procedures for obtaining this data are noted in the "Supporting Document for Iowa Water Quality Management Plans," Chapter IV, July 1976, as revised on November 11, 2008.

November 11, 2009.

(3) The statewide average background values presented in Table IV-2 of the "Supporting Document" revised on November 11, 2009.

The stream flow in the zone of initial dilution used in determining effluent limits to ensure compliance shall be the calculated flow associated with the mixing zone for facilities with a dilution ratio of less than or equal to 2:1, and the flow associated with the mixing zone for facilities with a dilution ratio of greater than 2:1. The pH and temperature and acute ammonia criteria of Table 3 will be from one of the following sources and follow the sequence:

1. Specific effluent pH and temperature data if the dilution ratio is less than or equal to 2:1.
2. If the dilution ratio is greater than 2:1, the logarithmic average pH of the effluent and the flow-proportioned average temperature of the effluent and the regional or statewide temperature. These data are noted in the "Supporting Document for Iowa Water Quality Management Plans."

g. For ammonia criteria noted in Table 3, the following exceptions apply to the mixing zone requirements.

- (1) No mixing zone or zone of initial dilution will be allowed for waters designated as lakes or wetlands.
- (2) No zone of initial dilution will be allowed in waters designated as cold water.
- (3) The use of a diffuser device to promote rapid mixing of an effluent in a receiving stream will be allowed for point source dischargers to comply with an acute numerical criterion.
- (4) A discharge to interior streams and rivers, the Big Sioux and Des Moines Rivers, and the Mississippi River, shall be subject to special consideration, instream data which technically supports the allowance of an increased percentage of mixing zone flow. Any allowed increase in mixing zone flow would still be governed by the mixing zone flow requirements and guidance provided in the "Supporting Document for Iowa Water Quality Management Plans," Chapter 4.

h. Temperature changes within mixing zones established for heat dissipation will not exceed the temperature change specified in Table 3.

i. The appropriateness of establishing a mixing zone where a substance discharged is bioaccumulative, persistent, or toxic shall be evaluated. In such cases, effects such as potential groundwater contamination, sediment deposition, fish and wildlife impacts, food chain, and known or predicted safe exposure levels shall be considered.

of point source discharges which have received the required degree of treatment technology required by subrule 61.2(3). The objective of establishing mixing zones is so as to minimize environmental impacts. Waters within a mixing zone shall meet all applicable standards and the chronic and human health protection may be established within the mixing zone beyond which the subrule 61.3(5), any parameter not included in Tables 1, 2 and 3 of subrule 61.2(3), will be met at the mixing zone and zone of initial dilution boundaries,

mixing zones shall be defined on a site-specific basis. These rules are not intended to address chemical, physical and radiological considerations in defining a mixing zone. Applications for operation permits under 567—subrule 61.2(3) shall include a mixing zone. Applications for operation permits under 567—subrule 61.2(3) shall include their outfall so that mixing zone boundaries can be determined.

The mixing zone and the zone of initial dilution will be calculated using a method described in "Chapter IV, July 1976, as revised on November 11, 2009, or from other factors will be met:

streams and rivers, and the Big Sioux and Des Moines Rivers.

Missouri Rivers.

Mixing zone length criteria, noted below.

of the following:

streams, and state, county and local parks.

from one bank across to the opposite bank.

2(4) "b"(1).

The mixing zone stream flow. The mixing zone width will be measured at the design low stream flow. This measurement will only consider the distance of continuous water.

and length of the mixing zone.

The maximum contaminant level (MCL), chronic and human health criteria of Table 1 will be met at the following percentages of the design low stream flow as measured at the

ance with the acute criteria of Table 1 may not exceed 10 percent of the

lands.

be considered on a case-by-case basis with its usage as a means for

Mississippi or Missouri Rivers may provide to the department, for consideration, flow contained in the mixing zone due to rapid and complete mixing. Any flow. The submission of data should follow the guidance provided in the memorandum dated November 11, 2009.

Flow will be calculated using a mathematical model presented in the memorandum dated November 11, 2009, or from instream studies of the mixing characteristics

where the dilution ratio is less than or equal to 2:1.

where the dilution ratio is greater than 2:1, but less than or equal to 5:1.

where the dilution ratio is greater than 5:1.

Flow zone length criteria, noted below.

of the following:

streams, and state, county, and local parks.

from one bank across to the opposite bank.

61.2(4)“e”(1).

design low stream flow. The mixing zone width will be measured as the distance of continuous water

length of the mixing zone.

Flow compliance with the chronic criteria of Table 3 will be that value of the design low stream flow noted in 61.2(4)“e”(1) as measured at the chronic ammonia criteria of Table 3 will be from one of the following locations that exists from the source.

boundary. Procedures for obtaining this data are noted in the “Supporting Information” memorandum dated November 11, 2009.

Flow receiving stream and representative of the background conditions at the “Quality Management Plans,” Chapter IV, July 1976, as revised on

nt for Iowa Water Quality Management Plans," Chapter IV, July 1976, as

ance with the acute criteria of Table 3 may not exceed 5 percent of the
qual to 2:1, and not exceed 10 percent of the calculated flow associated
e values at the boundary of the zone of initial dilution used to select the
nce listed below, if applicable data exists from the source.

egional or statewide pH provided in 61.2(4)"f" will be used. In addition, the
ature provided in 61.2(4)"f" will be used. The procedures for calculating
s," Chapter IV, July 1976, as revised on November 11, 2009.

lands.

è considered on a case-by-case basis with its usage as a means for

ssippi and Missouri Rivers may provide to the department, for
e of the stream flow contained in the mixing zone due to rapid and
zone length restrictions. The submission of data should follow the
apter IV, July 1976, as revised on November 11, 2009.

ture criteria in 61.3(3)"b"(5).

rsistent, carcinogenic, mutagenic, or teratogenic will be carefully
attraction, bioaccumulation in aquatic life, bioconcentration in the food

28-16-28b. Definitions. As used in these regulations, the following terms shall have these meanings:

(b) "Alternate low flow" means a low flow value, which is an alternate to the 7Q10 flow, that is based sea assurance district. Wherever used in this regulation in the context of mixing zones, the term shall refer to wastewater discharge and available, in whole or in part, for dilution and assimilation of wastewater discharge.

(d) "Artificial sources" means sources of pollution that result from human activities and that can be abated by complete restraint of activities, or any combination of these methods.

(g) "Bioaccumulation" means the accumulation of toxic substances in plant or animal tissue through either direct or indirect contact.

(i) "Bioconcentration" means the concentration and incorporation of toxic substances into body tissues from the environment.

(j) "Biomagnification" means the transport of toxic substances through the food chain through successive concentration of these substances in higher-order consumers and predators.

(r) "Critical low flow" means the minimum amount of streamflow immediately upstream of a point source discharge that may be permitted to discharge without exceeding water quality criteria set out by these regulations defined in subsection (b) of this regulation.

28-16-28c. General provisions.

(b) Mixing zones.

(1) General limitations. Mixing zones shall not extend across public drinking water intakes, stream tributaries, or locations that preclude the normal upstream or downstream movement or migration of aquatic organisms. Where a department-approved demonstration indicates that the overlapping will not result in a violation of the general water quality standards or the existing uses of the receiving surface water. The zone of initial dilution for a mixing zone shall comprise the area between the discharge point and the receiving stream critical low flow.

(2) Discharges into classified streams. No mixing zone within a classified stream shall extend beyond the receiving stream critical low flow from one bank to the opposite bank, or more than 300 meters downstream from the point of effluent discharge.

(3) If the ratio of the receiving stream critical low flow to the discharge design flow is less than 3:1, then the mixing zone shall be limited to the receiving stream critical low flow during critical low flow conditions, as measured immediately upstream of the discharge during the discharge.

(4) Mixing zones shall be applied in accordance with paragraphs (b)(7) and (b)(8)(A), (B), (C), and (D) of this regulation for individual pollutants. For surface waters classified as outstanding national resource waters or exceptional state waters, specific discharges may be allowed by the secretary in accordance with paragraphs (b)(6), (b)(7), and (b)(8)(E) of this regulation and life criteria for an individual pollutant.

(5) Wherever site conditions preclude the rapid dispersion and dilution of effluent within the receiving surface water, the receiving surface water would unduly jeopardize human health or any of the existing uses of the receiving surface water, the receiving surface water shall be classified as exceptional state water, and the receiving surface water shall be reserved to the receiving surface water.

(6) Outstanding national resource waters. Mixing zones may be allowed by the secretary for existing permitted discharges into outstanding national resource waters but shall be evaluated on an individual permit basis to prevent the degradation of the receiving surface water.

(7) Exceptional state waters. If the ratio of the receiving stream critical low flow to the discharge design flow is less than 3:1, then the mixing zone shall be limited to the receiving stream critical low flow during critical low flow conditions, as measured immediately upstream of the discharge during the discharge.

(8) General purpose waters.

(A) Special aquatic life use waters. If the ratio of the receiving stream critical low flow to the discharge is less than 25 percent of the cross-sectional area or volumetric flow of the receiving stream during critical low flow.

(B) Expected aquatic life use waters. If the ratio of the receiving stream critical low flow to the discharge is less than 50 percent of the cross-sectional area or volumetric flow of the receiving stream during critical low flow.

(C) Restricted aquatic life use waters. If the ratio of the receiving stream critical low flow to the discharge is less than 100 percent of the cross-sectional area or volumetric flow of the receiving stream during critical low flow.

(D) Recreational uses. Mixing zones for classified surface waters designated for recreational uses shall be in accordance with paragraph (b)(10) of this regulation.

(9) Alternate low flows, as defined in K.A.R. 28-16-28b(b), may be utilized by the department as the critical low flow for specific water quality criteria. The 30Q10 flow for ammonia or the guaranteed minimum flow provide the basis for calculation of the mixing zone cross-sectional area or volumetric flow. Other alternate low flows, with a discharge less than the critical low flow, may be used by the department if those flows will not result in excursions above aquatic life criteria more frequently than on the critical low flow shall be reserved by the department.

(10) Alternate mixing zones employing specific linear distances for mixing zones or alternate stream dilution factors. Site-specific mixing zones may be allowed if data generated from a site-specific study supports the use of such zones.

(11) Discharges into classified lakes. Mixing zones shall be prohibited by the department from extending into any classified lake, state water, or designated as a special aquatic life use water according to K.A.R. 28-16-28d(d). Mixing zones for discharges into special aquatic life use waters may be allowed by the department if the mixing zones do not extend farther than 50 meters from the discharge point to the total volume of the receiving lake as measured at the conservation pool.

(12) Discharges into classified ponds. Mixing zones extending into any classified pond shall be prohibited.

(13) Discharges into classified wetlands. Mixing zones shall be prohibited by the department from extending into any classified wetlands delineation manual," as published in January 1987.

seasonally, hydrologically, or biologically, or a low flow determined through a water quality model, or a minimum amount of streamflow occurring immediately upstream of a discharge.

achieved by construction of control structures, modification of operating practices, or other measures.

to prevent or minimize bioconcentration or biomagnification.

from ambient sources.

through the food chain, including cycles of eating and being eaten, and through the subsequent accumulation and transfer of pollutants.

The critical low flow that will be used to calculate the quantity of pollutants from point source discharges shall be the 7Q10 flow or the alternate low flow as determined by the department.

Mixing zones shall not exist in areas where swimming or boat ramp areas are located. Mixing zones associated with separate discharges shall not overlap unless a general water quality criteria set forth in K.A.R. 28-16-28e(b) or in an impairment of use, in terms of volume, not more than 10 percent of the mixing zone.

The mixing zone shall be the cross-sectional area or the volumetric flow of the discharge at the middle of the nearest downstream current crossover point, where the main current is located.

The mixing zone shall be the cross-sectional area or the volumetric flow of the discharge at the middle of the nearest downstream current crossover point, where the main current is located.

This regulation, based on the classification and designated uses of a stream segment or designated as special aquatic life use waters, mixing zones for discharges shall be as provided in 8)(A) of this regulation. Mixing zones also may be allowed if there are no aquatic life uses in the stream segment.

The department may prohibit the use of mixing zones or to place more stringent limitations on discharges in stream segments classified in the future as outstanding or exceptional.

Discharges in stream segments classified in the future as outstanding or exceptional shall be limited to the following:

If the flow is equal to or greater than 3:1, the mixing zone shall not exceed 25 percent of the streamflow measured immediately upstream of the discharge during the critical low flow.

Large design flow is equal to or greater than 3:1, the mixing zone shall not exceed low flow conditions, measured immediately upstream of the discharge during the

discharge design flow is equal to or greater than 3:1, the mixing zone shall not exceed low flow conditions, measured immediately upstream of the discharge during the

discharge design flow is equal to or greater than 3:1, the mixing zone shall not critical low flow conditions, measured immediately upstream of the discharge

may be allowed by the secretary on an individual permit basis in accordance with

normal low flow in the calculation of mixing zone cross-sectional area or volumetric flow used by a water assurance district, if applicable, shall be used by the department in the specific recurrence frequency and averaging period, shall be considered by the department every three years. The right to approve or disapprove any proposed alternate

mixing zone volumes or cross-sectional areas, or both, may be allowed by the department. If an alternate mixing zone, but still maintains a zone of passage for aquatic life.

into any lake classified as an outstanding national resource water or exceptional values in lakes designated as expected aquatic life use water or restricted aquatic life from the point of effluent discharge or do not comprise more than one percent of

the total flow of the stream.

flowing into any classified lacustrine or palustrine wetland as defined in the "corps of

dilution apply to the implementation of acute aquatic life criteria.

- a. Chronic aquatic life criteria apply outside the mixing zone, beginning at the edge. The 7Q10 is concentration exceedances to no more than once every 10 years.
- b. In perennial, flowing streams (Table 2b, Categories 1 and 2), harmonic mean flow is specified for human health protection against noncarcinogens.
- c. These specified flows will not be appropriate under some circumstances, and alternative form for equivalent protection of human health and aquatic life uses of the stream. These exceptions discharge rates, hold and release treatment systems, and effluent dominated sites. The department to be determined on a case-by-case basis.

8. For chloride, sulfate, and total dissolved solids, criteria are to be met below the point of discharge after a 7-day period, harmonic mean flow will be applied for mixing.

9. Dilution at the edge of the mixing zone and at the edge of the zone of initial dilution for water body criteria shall be based on a case-by-case basis.

10. Mixing zones shall not preclude the occurrence of continuous water routes of the volume, area, and depth of the water body and aquatic life with no significant effects on their populations.

11. In those cases, such as wetlands, where unique site-specific conditions or other considerations preclude the application of the flow requirements, the department may specify definable, geometric limits for mixing zones.

12. In those cases where unique site-specific conditions preclude the application of the flow requirements, the department may on a case-by-case basis approve an alternative flow when determining 2,3,7,8-tetrachlorodibenzo-p-dioxin. Any flow specifications shall be protective of designated uses.

13. In cases for which a diffuser has been approved or required for use with a wastewater discharge, the acute aquatic life criteria at the edge of the zone of initial dilution. The dilution allowed will be determined based on the characteristics and diffuser capabilities. No increase in dilution will be allowed at the edge of the mixing zone. The constraints of a particular water body may preclude the approval and use of a diffuser. The following conditions shall apply:

- a. the diffused discharge velocity must be sufficient to provide adequate mixing such that acute aquatic life criteria are not exceeded;
- b. the diffused discharge must not adversely impact nursery areas for aquatic life species or individuals; provided that the discharge is in accordance with the requirements of Paragraphs C.2 and 3 of this Section, propagation areas, zones of passage for aquatic life (see Paragraphs C.2 and 3 of this Section), and drinking water supply intakes;
- c. the diffused discharge must not cause erosion or scour of the water body banks or bottom;
- d. the diffused discharge must be submerged and located in areas with sufficient depth available to ensure that the design mixing capabilities of the diffuser are achieved;
- e. diffused discharges must not be located in areas where the diffuser may be damaged or impaired;
- f. diffused discharges must not be located in areas where eddies or whirlpools can cause buildup of sediment or debris.

Table 2a. Water Body Categorization for the Determination of Appropriate Dilution		
C A T E G O R Y	Description	Flow
		1
2	Streams with 7Q10 flow less than or equal to 100 cfs	7Q10
3	Tidal channels with flows greater than 100 cfs	1/3 of the average or typical flow averaged over one tidal cycle irrespective of flow direction
4	Tidal channels with flows less than or equal to 100 cfs	1/3 of the average or typical flow averaged over one tidal cycle irrespective of flow direction
5	Freshwater lakes and ponds	Not Applicable
6	Coastal bays and lakes	Not Applicable

Title 33, Part IX, Subpart 1

Section 1115

Table 2a. Water Body Categorization for the Determination of Appropriate Dilution		
C A T E G O R Y	Description	Flow
		7

^aZID = zone of initial dilution^bMZ = mixing zone^ccfs = cubic feet per second

ontrol

effluents with the receiving water so that toxic conditions and other

fied herein shall apply during all flow conditions greater than the critical
C 33:IX.1109.C.1.)

aters. These are areas where effluents and receiving waters mix
reatment process. **Mixing must be accomplished as quickly as possible to**
minimize mixing zone size. Mixing zones and fractions of flow apply
plete mixing.

: as required in Paragraph C.5 of this Section. The waters outside
requires meeting chronic aquatic life criteria beginning at the edge of

ixing zone. Numeric mixing zones and other receiving water criteria,
l dilution. Zones of initial dilution are, however, restricted to the
not exceed 10 percent of the size of the mixing zone unless conditions
t the edge of the zone of initial dilution.

for waterfowl or indigenous wildlife associated with the aquatic
ate for oyster propagation. Mixing and mixing zones shall not include an

egatively impact the aesthetics;

o aquatic life lethality or other deleterious effects caused by the
rough a mixing zone of less mobile forms such as zooplankton that drift
stances will be applied in the mixing zone to protect aquatic life from

int source discharges, surface area involvement, and volume of
another mixing zone in such a manner, or be so large, as to impair any

escribed in Table 2a, and for the application of human health riteria,
implementation of chronic aquatic life criteria, and zones of initial

specified in Table 2a with the intention of limiting 7-day average

for human health protection against carcinogens, and the 7Q10 is

ulations will be required to determine appropriate effluent limitations
may include, but are not limited to, seasonally variable effluent
ment may approve an alternative which is protective of designated uses,

er complete mixing. Because criteria are developed over a long-term

ategories 5, 6, and 7 (Table 2a) will be determined on a case-by-case

quality necessary to allow passage of free-swimming and drifting fish

ide the application of specific mixing zone requirements, the

its for Category 2 water bodies as stated in Tables 2a and 2b, the
lorodibenzo-p-dioxin (2,3,7,8-TCDD) permitted effluent concentrations.

e department may increase the dilution allowed for the application of
ied by the department after consideration of receiving water body
zone for the application of chronic aquatic life criteria. Physical
nditions must be met with the use of a diffuser:

ly toxic conditions are minimized;

genous wildlife associated with the aquatic environment except as

Paragraph C.10 of this Section), wildlife uses, recreational uses, or

e so that surface water uses of the receiving water are not impaired

ired by scouring, deposition, or periodic dredging; and

o of effluent concentrations by obstructing or trapping the discharge jet

on and Mixing Zone Application for Aquatic Life	
Aquatic Life	
Fraction of Flow or Radial Distance (feet)	
ZID ^a	MZ ^b
10 cfs or 1/30 of the flow, whichever is greater	100 cfs or 1/3 of the flow, whichever is greater
1/10	1
10 cfs or 1/30 of the flow, whichever is greater	100 cfs or 1/3 of the flow, whichever is greater
1/10	1
25 feet	100 feet
50 feet	200 feet

Environmental Regulatory Code

December 2013

on and Mixing Zone Application for Aquatic Life	
Aquatic Life	
Fraction of Flow or Radial Distance (feet)	
ZID ^a	MZ ^b
100 feet	400 feet

Michigan, PART 4. WATER QUALITY STANDARDS

R 323.1043 Definitions; A to L.

(y) "Discharge-induced mixing" means the mixing of a discharge and receiving water that occurs due to ambient turbulence.

(oo) "Inland lake" means a surface water of the state that is an inland body of standing water situated less than 1 acre, unless otherwise determined by the department. The department may designate a d resources to be protected.

(vv) "Lotic" means surface waters of the state that exhibit flow.

R 323.1044 Definitions; M to W.

(b) "Mixing zone" means the portion of a water body in which a point source discharge or venting gro

R 323.1070 Temperature of Great Lakes and connecting waters.

Rule 70. (1) The Great Lakes and connecting waters shall not receive a heat load which would warm th above the existing natural water temperature.

R 323.1082 Mixing zones.

Rule 82. (1) A mixing zone is that portion of a water body allocated by the department where a point : state. Exposure in mixing zones shall not result in deleterious effects to populations of aquatic life or v shall not be exceeded when determining a wasteload allocation (WLA) for acute aquatic life protectio can be demonstrated to the department that an acute mixing zone is acceptable consistent with subr food organisms in a manner that would result in adverse impacts on the immediate or future populati To this end, devices for rapid mixing, dilution, and dispersion are encouraged where practicable. **A wa discharges, would have no flow except during periods of surface runoff may be considered as a mixing** apply to pollutants of initial focus specified in 40 C.F.R. §132 (1995) unless a sitespecific determination existing and expected aquatic life in the watercourse will be adequately protected in the absence of c

(2) Unless otherwise stated in this rule, not more than 25% of the receiving water design flow for lotic effluent toxicity limit or a wasteload allocation for a toxic substance, in the absence of, or consistent v department that the use of a larger volume is acceptable consistent with subrule (7) of this rule.

(3) For ammonia and substances not included in subrule (2) of this rule, the design flow for lotic syste provisions in subrule (1) of this rule are met, unless the department determines that a more restrictiv

(4) For all substances, physical mixing zone boundaries may be established and shall be determined b

(5) Mixing zones in the Great Lakes and inland lakes for the purpose of determining WLAs and WET lir unless it can be demonstrated to the department that use of a larger volume is acceptable consistent granted if it exceeds the area where discharge-induced mixing occurs. Mixing zones established unde requirements of R 323.1069, R 323.1070, R 323.1072, R 323.1073, and R 323.1075 shall be determine

- (6) In addition to subrules (1), (2), (4), and (5) of this rule, the following provisions are applicable to bi
- (a) **There shall be no mixing zones available for new discharges of BCCs to the surface waters of th**
 - (b) Mixing zones for BCCs may be allowed for existing discharges to the surface waters of the state except as provided in subdivisions (c) and (d) of this subrule, permits shall not authorize mixing zo such discharges shall be set equal to the most stringent water quality value for that BCC.
 - (c) The department may grant mixing zones for any existing discharge of BCCs to the surface water grant a mixing zone would preclude water conservation measures that would lead to overall load
 - (d) Upon the request of an existing discharger of a BCC to the surface waters of the state, the dep and economic considerations, subject to all of the following provisions:
 - (i) The department must determine that all of the following provisions are satisfied:
 - (A) The discharger is in compliance with, and will continue to implement, all applicable te 1972, as amended, 33 U.S.C. §§301, 302, 304, 306, 307, 401, and 402, and is in compliance with
 - (B) The discharger has reduced, and will continue to reduce, to the maximum extent poss costeffective controls or pollution-prevention alternatives that have been adequately demonstrated ar
 - (C) The discharger has evaluated alternative means of reducing the BCC elsewhere in the
 - (ii) In making the determination in paragraph (i) of this subdivision, the department shall cons
 - (A) The availability and feasibility, including cost effectiveness, of additional controls or pc discharger, including additional controls or pollution prevention measures used by similar
 - (B) Whether the discharger or affected communities will suffer unreasonable economic et
 - (C) The extent to which the discharger will implement an ambient monitoring plan to ensi
 - (D) Other information the department deems appropriate.
 - (iii) Any exceptions to the mixing zone elimination provision for existing discharges of BCCs gr
 - (A) Not result in any less stringent limitations than the limitations that existed on July 29,
 - (B) Be limited to 1 permit term unless the department makes a new determination in acc zone for the BCC is sought.
 - (C) Not likely jeopardize the continued existence of any endangered or threatened specie destruction or adverse modification of the species' critical habitat.
 - (iv) For each draft NPDES permit that allows a mixing zone for a BCC after November 14, 2010 zone, including the mixing provisions used in calculating the permit limits and the identity of e
- (7) For purposes of establishing a mixing zone other than as specified in subrules (1), (2), and (5) of thi approval and all of the following provisions apply:
- (a) The mixing zone demonstration shall include all of the following:
 - (i) A description of the amount of dilution occurring at the boundaries of the proposed mixing which diffusion and dispersion occur.
 - (ii) For sources discharging to the Great Lakes and inland lakes, a definition of the location at v
 - (iii) Documentation of the substrate character within the mixing zone.

- (iv) Confirmation that the mixing zone does not interfere with or block the passage of fish or a
- (v) Confirmation that the mixing zone would not likely jeopardize the continued existence of a endangered species act or result in the destruction or adverse modification of the species' cri
- (vi) Confirmation that the mixing zone does not extend to a public water supply source pursua
- (vii) Confirmation that the mixing zone would not interfere with the designated or existing us
- (viii) Documentation of background water quality concentrations.
- (ix) Confirmation that the mixing zone does not promote undesirable aquatic life or result in a
- (x) Confirmation that, by allowing additional mixing/dilution, the following will not occur:
 - (A) The formation of objectionable deposits.
 - (B) The concentration of floating debris, oil, scum, and other matter in concentrations tha
 - (C) The production of objectionable color, odor, taste, or turbidity.

(b) The mixing zone demonstration shall also address all of the following items:

- (i) Whether or not adjacent mixing zones overlap.
- (ii) Whether organisms would be attracted to the area of mixing as a result of the effluent cha
- (iii) Whether the habitat supports endemic or naturally occurring species.
- (iv) Why an increased mixing zone is necessary.
- (v) Describe any pollution prevention measures that were evaluated to eliminate the need for

(c) The mixing zone demonstration shall be based on the assumption that environmental fate or c toxic substance in the water column, within the proposed mixing zone, unless both of the followin

- (i) Scientifically valid field studies or other relevant information demonstrate that degradator conditions expected to be encountered.
- (ii) Scientifically valid field studies or other relevant information address other factors that aff factors:
 - (A) Sediment release or resuspension.
 - (B) Chemical speciation.
 - (C) Biological and chemical transformation.

to accumulative chemicals of concern (BCCs) when establishing WLAs:

the state.

on or after November 14, 2010, pursuant to the provisions of this rule. After this date, no new permits for existing discharges of BCCs to the surface waters of the state, and WLAs for

any permit in the state where it can be demonstrated, on a case-by-case basis, that failure to implement reductions in BCCs.

The department may grant mixing zones beyond November 14, 2010, based upon technical

and technology-based treatment and pretreatment requirements of the clean water act of

and its existing NPDES WQBELs, including those based on a mixing zone.

When a mixing zone is requested, the loading of the BCC for which a mixing zone is requested, by the use of

and are reasonably available to the discharger. The department shall consider the watershed.

The department shall consider all of the following factors:

1. The effectiveness of pollution prevention measures for reducing and ultimately eliminating BCCs for the permit dischargers for reducing and ultimately eliminating BCCs.

2. The potential effects if the mixing zone is eliminated.

3. The ability to ensure compliance with water quality values at the edge of any authorized mixing zone.

Any permit granted pursuant to this subdivision shall comply with all of the following provisions: (a) On or after 1997.

(b) In accordance with this subrule for each successive permit application in which a mixing

zone is listed or proposed under section 4 of the endangered species act or result in the

issuance of a permit, the NPDES fact sheet shall specify relevant information used to establish the mixing zone for each BCC for which a mixing zone is proposed.

Under this rule, a mixing zone demonstration shall be submitted to the department for

approval of the mixing zone and the size, shape, and location of the area of mixing, including the manner in

which discharge-induced mixing ceases.

aquatic life.

any endangered or threatened species listed or proposed under section 4 of the
tical habitat.

ant to R 323.1100(8).

es of the receiving water or downstream waters.

a dominance of nuisance species.

at form nuisances.

aracter.

r an increased mixing zone.

other physical, chemical, or biological factors do not affect the concentration of the
ng occur:

n of the toxic substance is expected to occur during typical environmental

ffect the level of toxic substances in the water column, including all of the following

Minnesota, **7050.0210 GENERAL STANDARDS FOR WATERS OF THE STATE.**

Subp. 4. **Definitions.** For the purposes of this part, the following terms have the meanings given them.

J. "Lake" means an enclosed basin filled or partially filled with standing fresh water with a maximum depth of at least 10 feet and both an inlet and outlet.

S. "Reservoir" means a body of water in a natural or artificial basin or watercourse where the outlet or discharge is distinguished from river systems by having a hydraulic residence time of at least 14 days. For purposes of this part, a reservoir is defined for the months of June through September, a 122Q10 for the summer months.

U. "Shallow lake" means an enclosed basin filled or partially filled with standing fresh water with a maximum depth of at least 10 feet enough to support emergent and submerged rooted aquatic plants (the littoral zone). It is uncommon for shallow lakes to support a healthy indigenous aquatic community and the lakes will permit the propagation and maintenance of a healthy indigenous aquatic community and the lakes may be usable. For purposes of this chapter, shallow lakes are differentiated from wetlands and lakes as defined in subpart 1a.

7050.0186 WETLAND STANDARDS AND MITIGATION.

B. "Wetlands" are those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands designed for wastewater treatment are not waters of the state. Wetlands must have the following attributes:

- (1) a predominance of hydric soils;
- (2) inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, a prevalence of a saturated soil condition; and
- (3) under normal circumstances, support a prevalence of such vegetation.

Subp. 5. **Mixing zones.** Reasonable allowance will be made for dilution of the effluents, which are in compliance with the standards of this part into waters of the state. The agency, by allowing dilution, will consider the effect on all uses of the water. The agency, by allowing dilution, shall not violate the standards allowed regarding any specific discharge as specified in part 7053.0205, subpart 7, shall not violate the nondegradation requirements contained in those chapters. This subpart also applies in cases where a discharge is made into a water body.

Mixing zones must be established by the agency on an individual basis, with primary consideration being given to the following:

- A. mixing zones in rivers shall permit an acceptable passageway for the movement of fish;
- B. the total mixing zone or zones at any transect of the stream should contain no more than 25 percent of the stream width and should not extend over more than 50 percent of the width;
- C. mixing zone characteristics shall not be lethal to aquatic organisms;
- D. for contaminants other than heat, the FAV, as defined in part 7050.0218, subpart 3, item O, for a discharge shall not be exceeded at any point in the mixing zone;
- E. **mixing zones should be as small as possible**, and not intersect spawning or nursery areas, migratory routes, or other sensitive areas;
- F. overlapping of mixing zones should be minimized and measures taken to prevent adverse synergistic effects.

7052.0210 LAKE SUPERIOR BASIN WATER STANDARDS

7052.0210 MIXING ZONES

7052.0210 MIXING ZONES.

Subpart 1. **Applicability and standards for acute and chronic mixing zones.** General provisions pertain to mixing zones, the conditions in items A to C apply.

- A. At the edge of an acute mixing zone approved under subpart 2, acute aquatic life toxicity must not be exceeded. If a discharger does not have an approved acute mixing zone demonstration, the agency must apply the provisions of this subpart. If two or more proximate sources interact or overlap, the combined effect must be evaluated to ensure that the acute toxicity does not exceed the acute standard or criterion.
- B. At the edge of a chronic mixing zone, chronic toxicity must not exceed the chronic standard or criterion.

- (1) not more than 25 percent of the applicable stream design flows listed in part 7052.0200, subpart 2, approved under subpart 2; or
- (2) for lakes, the area of 10:1 dilution of receiving water volume to effluent volume, unless a chronic mixing zone dilution ratio in which case the chronic mixing zone must equal the area corresponding to the discharge-induced mixing.

- C. Acute and chronic mixing zones must not jeopardize the continued existence of endangered or threatened species, as defined by the Endangered Species Act, United States Code, title 16, section 1533, or result in the destruction or adverse modification of critical habitat.

Subp. 2. **Mixing zone demonstration requirements for lakes and tributaries.** The agency shall approve a mixing zone demonstration if the discharger completes a demonstration that complies with items A to N.

- A. Define the mixing zone size, shape, location of the area of mixing, manner of diffusion and dispersion, and the time of day of mixing.
- B. Determine the discharge-induced mixing area for lake discharges.
- C. **For discharge to a lake**, determine the dilution ratio of receiving water volume to effluent volume. **greater than the area of discharge-induced mixing**, the calculated ratio must be used in the WLA calculation for potential determination for lakes in part 7052.0240, subpart 5, items B, subitem (2), and C, subitem (2), and C.
- D. Document the substrate character and geomorphology of the mixing zone.
- E. Ensure that the mixing zone will maintain a zone of passage for mobile aquatic life; protect spawning habitat.
- F. Ensure the mixing zone will protect the existence of threatened or endangered species.
- G. Document that the mixing zone does not affect drinking water intakes.
- H. Document background water quality.
- I. Show that the mixing zone does not promote undesirable aquatic life or dominance of nuisance species.
- J. Ensure that the mixing zone will not result in the following:
 - (1) objectionable deposits formed by settling;
 - (2) floating debris, oil, or scums;
 - (3) objectionable taste, odor, color, or turbidity; or
 - (4) attraction of organisms to the area of discharge.
- K. Prevent or minimize overlapping mixing zones.
- L. Document the ability of the habitat to support endemic or naturally occurring species.
- M. Assume no GLI pollutant degradation unless the conditions of part 7052.0200, subpart 2, item B, subitem (2), are met.
- N. Show that the mixing zone will not interfere with the designated or existing uses of the receiving water body.

Subp. 3. **Mixing zones for BCCs.** **After March 9, 1998, acute and chronic mixing zones shall not be allowed for existing discharges of BCCs must be phased out by March 23, 2007, except for existing discharges and March 23, 2007, for existing discharges, WLAs developed under part 7052.0200, subpart 2, item B, subitem (2), and C, subitem (2), and C.** The provisions for existing discharges of BCCs are in items A to E.

- A. Mixing zones for BCCs shall be allowed for existing discharges after March 23, 2007, if the discharge does not preclude water conservation measures that would lead to overall load reductions in BCCs discharge.
- B. Mixing zones shall be allowed for existing discharges after March 23, 2007, upon the request of the discharger, if the discharge does not preclude water conservation measures that would lead to overall load reductions in BCCs discharge.

B. MIXING ZONES shall be allowed for existing discharges after March 23, 2007, upon the request of

(1) the discharger is in compliance with and will continue to implement technology-based treatment and 402 of the Clean Water Act, United States Code, title 33, sections 1311, 1312, 1314, 1316, including those based on a mixing zone; and

(2) the discharger has reduced and will continue to reduce the loading of the BCC for which a non-effective controls or pollution prevention alternatives that have been adequately demonstrated

C. In making the determination in item B, the agency must consider:

(1) the availability and feasibility, including cost effectiveness, of additional controls or pollution treatment at the discharger, including those used by similar dischargers;

(2) whether the discharger or affected communities will incur unreasonable economic effects if

(3) the extent to which the discharger will implement an ambient monitoring plan to ensure compliance with the mixing zone or to ensure consistency with any applicable TMDL or assessment and remediation

D. Any exceptions to the mixing zone phase-out provision for existing discharges of BCCs granted under

(1) not result in any less stringent effluent limitations than those existing on March 9, 1998, in

(2) not jeopardize the continued existence of any endangered or threatened species listed under section 16, section 1533, or result in the destruction or adverse modification of such species' critical

(3) be limited to one permit term unless the agency makes a new determination in accordance with which the BCCs is sought;

(4) reflect all information pertaining to the size of the mixing zone considered by the agency under

(5) protect all designated and existing uses of the receiving water;

(6) meet all applicable aquatic life, wildlife, and human health standards and criteria at the edge of the mixing zone established, be consistent with any TMDL or such other strategy consistent with part 7052.02C

(7) ensure the discharger has developed and conducted a GLI pollutant minimization program;

(8) ensure that alternative means for reducing BCCs elsewhere in the watershed are evaluated

E. For each draft permit that would allow a mixing zone for one or more BCCs after March 23, 2007, the permit shall be available through public notice under Code of Federal Regulations, title 40, section 124.6, paragraph

(1) specify the mixing provisions used in calculating the effluent limitations; and

(2) identify each BCC for which a mixing zone is proposed.

Minnesota, **7053.0205 STATE WATERS DISCHARGE RESTRICTIONS**

Subp. 5. **Mixing zones and compliance with water quality standards.**

A. Reasonable allowance must be made for dilution of the effluents that are in compliance with the water quality standards. The dilution, shall consider the effect on all uses of the waters of the state into which the effluents are specified in subpart 7 must not violate the applicable water quality standards in chapters 7050 and 7051. This subpart also applies in cases where a Class 7 water is tributary to a Class 2 water.

B. Means for expediting mixing and dispersion of sewage, industrial waste, or other waste effluent necessary by the agency to maintain the quality of the receiving waters according to chapters 7050 and 7051.

C. Mixing zones must be established by the agency on an individual basis, with primary consideration

(1) mixing zones in rivers shall permit an acceptable passageway for the movement of fish;

(2) the total mixing zone or zones at any transect of the stream should contain no more than 2 mixing zones and should not extend over more than 50 percent of the width;

(3) mixing zone characteristics shall not be lethal to aquatic organisms;

(4) for contaminants other than heat, the final concentration, as defined in part 7050.0210, subpart

- (4) for contaminants other than heat, the final acute value, as defined in part 7050.0218, subpart 1, concentration at any point in the mixing zone;
 - (5) mixing zones should be as small as possible and not intersect spawning or nursery areas, m
-

depth greater than 15 feet. Lakes may have no inlet or outlet, an inlet or outlet, or

flow is artificially controlled by a structure such as a dam. Reservoirs are
of this item, residence time is determined using a flow equal to the 122Q10 for the

maximum depth of 15 feet or less or with 80 percent or more of the lake area shallow
for shallow lakes to thermally stratify during the summer. The quality of shallow
lakes will be suitable for boating and other forms of aquatic recreation for which they
are used on a case-by-case basis. Wetlands are defined in part 7050.0186,

frequency and duration sufficient to support, and that under normal circumstances
generally include swamps, marshes, bogs, and similar areas. Constructed wetlands
contribute:

sufficient to support a prevalence of hydrophytic vegetation typically adapted for life in

compliance with this chapter and chapter 7053, as applicable, following discharge
into waters of the state into which the effluents are discharged. The extent of dilution
shall be applicable water quality standards in this chapter and chapter 7052, including the
Class 7 water is tributary to a Class 2 water.

shall be given to the following guidelines:

percent of the cross sectional area and/or volume of flow of the stream, and should

toxic pollutants should not be exceeded as a one-day mean concentration at any

tributary routes, water intakes, nor mouths of rivers; and
ecological effects.

ing to mixing zones are located in part 7050.0210, subpart 5. For acute and chronic

not exceed the maximum standard or criterion, or 0.3 TUa for WET. If the
the FAV, or 1.0 TUa for WET, directly to the discharge. If acute mixing zones from
ure that applicable standards and criteria will be met in the area of overlap.
riterion, or 1.0 TUC for WET. A chronic mixing zone must equal:

subpart 3, item A, unless an alternate chronic mixing zone demonstration is

chronic mixing zone demonstration approved under subpart 2 identifies an alternate
alternate dilution ratio. The mixing zone in lakes must not exceed the area of

threatened species listed or proposed under chapter 6134 or section 4 of the
adverse modification of such species' critical habitat.

an acute or chronic mixing zone demonstration if the discharger proposing a
ersion, and amount of dilution at the boundaries.

re. **If this dilution ratio is other than 10 to 1 and results in a mixing zone that is no**
alculation for lakes in part 7052.0200, subpart 3, item B; in the WET reasonable
n (2); and in the WET WQBEL calculation in part 7052.0240, subpart 6, items A,

ving, nursery areas, and migratory routes; and not intersect river mouths.

species.

4, are met.

g water or downstream surface waters of the state.

ved for new and expanded discharges of BCCs to the Lake Superior Basin. Acute and
ider the provisions in items A to E. After March 9, 1998, for new and expanded
rts 2 and 3, for discharges of BCCs must be set equal to the most stringent
ceptions to the acute and chronic mixing zone phase-out for existing

arger demonstrates that the failure to maintain an existing mixing zone would
ed.

the discharger if the agency determines that:

the discharger if the agency determines that:

tment and pretreatment requirements under sections 301, 302, 304, 306, 307, 401, 1317, 1341, and 1342, and is in compliance with its existing permit WQBELs,

mixing zone is requested to the maximum extent possible by the use of cost-
ed and are reasonably available to the discharger.

on prevention measures for reducing and ultimately eliminating BCCs for that

if the mixing zone is eliminated; and
ompliance with water quality standards and criteria at the edge of any authorized
n plan consistent with part 7052.0200.

nder this subpart must:

the previous permit;
ler chapter 6134 or section 4 of the Endangered Species Act, United States Code,
cal habitat;
: with this subpart for each successive permit application in which a mixing zone for

nder subpart 2;

ze of the mixing zone for a WLA in the absence of a TMDL, or, if a TMDL has been
00;
for the BCCs if required to do so under part 7052.0250, subpart 4; and
l.

7, the fact sheet or statement of basis for the draft permit, required to be made
ch (e), must:

is chapter, following discharge into waters of the state. The agency, by allowing
discharged. The extent of dilution allowed regarding any specific discharge as
l 7052, including the nondegradation requirements contained in those

s in the receiving waters must be provided so far as practicable when deemed
0) and 7052.

ion being given to the following guidelines:

.5 percent of the cross sectional area or volume of flow of the stream and should

art 2, item 9, for toxic pollutants should not be exceeded on a one day mean

art 3, item 0, for toxic pollutants should not be exceeded as a one-day mean

igratory routes, water intakes, or mouths of rivers; and

Chapter 1 - DEFINITION OF TERMS

002 "Acute Mixing Zone" shall mean the limited area or volume of a waterbody, as designated by t be exceeded while wastewaters which have received the applicable level of treatment or control a

010 "Chronic Mixing Zone" shall mean the limited area or volume of a waterbody, as designated by may be exceeded while wastewaters which have received the applicable level of treatment or cont transformation

031 "High-Rate Diffusers" shall mean devices attached to, or part of, a discharge outfall structure v wastewaters with the receiving water.

037 "Lake or Impounded Water" shall mean any waterbody with all of the following characteristics percent or less areal coverage of trees, shrubs, persistent emergent aquatic plants, or emergent m acres are also included if an active waveformed or bedrock shoreline feature makes up all or part c feet. Impounded waters in this definition do not include areas designated by the Department as w

041 "Mixing Zone" shall mean the limited area or volume of a water body, as designated by the De which have received the applicable level of treatment or control are allowed to assimilate, dispers

082 "Wetland" shall mean those areas that are inundated or saturated by surface or groundwater circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil cor

083 "Zone of Passage" shall mean the area or volume of a water body outside of any mixing zone c and drifting aquatic organisms such that there are no adverse effects to their populations.

Chapter 2, Certification by the Department of Activities Requiring a Federal License or Permit wh

010 These standards, except water quality criteria associated with aesthetics (Chapter 4, 005) and below.

Mixing zones for the initial assimilation of effluents or wastewaters may be necessary where disch adequately protect the water quality of a receiving stream. **Mixing zones shall be limited to as sma with or impairment of any beneficial uses.** The requirements of mixing zones for heat shall be defir Water Act.

010.01 The Department shall determine the applicability of a mixing zone, and if applicable requirements shall be used in defining all mixing zones. These requirements are not intend satisfy most biological, chemical, physical, and radiological considerations. A smaller mixing these requirements.

010.02 The appropriateness, if any, of establishing a mixing zone for a pollutant which may carefully evaluated by the Department. In such cases, effects such as potential ground wat bioaccumulation in aquatic life, fish attraction, sediment deposition, and protection of dov

010.03 Mixing zones established for dissolved oxygen shall take into account the delayed e the mixing zone. One-day minimum dissolved oxygen criteria shall apply at the boundary o

the chronic mixing zone boundary.

010.06C2 Where more than one wastewater discharge is located in a specific area, pollutant levels or concentrations in water from a receiving stream outside the chronic mixing zone shall not exceed the No Observed Effect Level (NOEL) based on chronic toxicity to aquatic life.

010.06C3 Where a mixing zone is not allowed by the Department, the pollutant levels or concentrations in water from a receiving stream shall not exceed the No Observed Effect Level (NOEL) based on chronic toxicity to aquatic life.

010.07 Acute Mixing Zones.

Acute toxicity to aquatic life shall not be allowed at any time outside of an acute mixing zone.

010.07A Acute mixing zones shall allow at all times for a continuous zone of passage. Where a zone of passage, the width of an acute mixing zone at any transect of the receiving stream where one wastewater discharge is located in a specific area, acute mixing zones shall be 1/2 the stream width.

010.07B The length of an acute mixing zone shall not exceed the following distance:

010.07B1 Acute mixing zones in Coldwater Class A, Coldwater Class B, and Coldwater Class C streams shall be the length of the chronic mixing zone whichever is more restrictive.

010.07B2 Acute mixing zones in Warmwater Class A streams shall be designed to be the length of the chronic mixing zone whichever is more restrictive.

010.07C Acute mixing zones shall be located in a receiving stream in such a manner as to not adversely affect the stream. Acute mixing zones shall not at any time:

010.07C1 Extend across public drinking water supply intakes.

010.07C2 Extend across heavily-used or state designated recreation bathing areas.

010.07C3 Extend into publicly owned lakes and reservoirs listed in Chapter 100, 005.

010.07C4 Significantly impact federally designated threatened or endangered species.

010.07C5 Extend across the mouth of a classified tributary stream segment.

010.07D Water quality of acute mixing zones.

The Department may suspend the applicability of all or part of the water quality criteria (Chapter 100, 005). In streams designated a recreational use, criteria relating to recreation shall be met at and beyond acute mixing zone boundaries shall meet all acute water quality criteria equal to or greater than 0.1 cfs or its 1-day 10-year low flow.

010.07D1 The pollutant levels or concentrations of wastewaters which contribute to acute toxicity shall not exceed 0.3 acute toxic units (TU_a) based on acute bioassays.

010.07D2 Where more than one wastewater discharge is located in a specific area, pollutant levels or concentrations in water from a receiving stream outside any acute mixing zone shall not exceed the No Observed Effect Level (NOEL) based on acute toxicity to aquatic life.

010.07D3 Where a mixing zone is not allowed by the Department, the pollutant concentration shall not exceed 0.3 TU_a based on acute bioassays of the undiluted effluent.

010.08 Mixing Zones for Public Drinking Water Supply Criteria

In waters designated as Water Supplies for Public Drinking Water, the criteria for protection of a mixing zone for public drinking water supply criteria.

010.08A Mixing zones for public drinking water supply criteria shall be designed to protect public drinking water supply intake.

010.08B Mixing zones for public drinking water supply criteria shall be located in a way that minimizes the area affected.

010.08C Water quality of mixing zones for public drinking water supply criteria. The water quality criteria for the protection of public drinking water supplies within a mixing zone for public drinking water supply criteria shall meet all public drinking water supply criteria at the day 10-year low flow.

010.09 Outfall Design.

Prior to designating a mixing zone, the Department shall first approve pursuant to Title 12:00 Treatment Works that the best practical engineering design for the outfall structure and its location shall be designed to meet all mixing zone requirements for size, location, and water quality.

010.09A The following are acceptable circumstances for modifying the existing design, location, or depth of an outfall structure:

010.09A1 Where high-rate diffusers or similar devices are required to: (1) minimize the size of the mixing zone, (2) minimize or prevent exposure of aquatic biota to possible irreversible pollutants, or (3) otherwise expedite mixing and dispersion of wastewaters in order to meet mixing zone requirements.

010.09A2 Where changes are required in the location of an outfall structure (e.g., location, water depth, direction in relation to the stream current) in order to meet mixing zone requirements.

010.09B Water turbulence created by high-rate diffusers or similar devices shall not be of such a nature that the passage of water through the mixing zone is interfered with or prevented.

MENTAL QUALITY

the Department, which adjoins a point source discharge, where acute criteria may be allowed to assimilate, disperse, dissipate, or undergo chemical transformation.

y the Department, which adjoins a point source discharge, where chronic criteria control are allowed to assimilate, disperse, dissipate, or undergo chemical

which provide discharge velocities that promote turbulent initial mixing of

is: (1) situated in a topographic depression or a dammed stream channel; (2) 30 acres; and (3) total area exceeds 20 acres. Similar waterbodies totaling less than 20 acres of the boundary, or if the water depth in the deepest part of the basin exceeds 6.6 feet, shall be subject to wastewater treatment or wastewater retention facilities or irrigation reuse pits.

Department, which adjoins a point source discharge, and into which wastewaters are allowed to assimilate, disperse, dissipate, or undergo chemical transformation.

at a frequency and duration sufficient to support, and that under normal conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

or zones which provides a continuous water route for the free passage of swimming

which May Result in a Discharge.

recreation (Chapter 4, 002) will not apply within mixing zones unless specified

larges that have received the applicable level of treatment or control still do not meet the requirements of this section. All an area and volume of a receiving stream as is practical to prevent interference with the beneficial uses of the stream, based on a sitespecific basis, in a manner consistent with Section 316 of the Clean

is, the allowable size, location, water quality, and outfall design. The following criteria shall be used to define each individual mixing zone, but represent maximum limits which will be required for each zone. A mixing zone may be required or no zone at all allowed, as necessary, in order to meet

shall be bioaccumulative, persistent, carcinogenic, mutagenic, or teratogenic shall be subject to the same standards as other discharges. The known or predicted safe exposure levels for human health, and the known or predicted safe exposure levels for downstream beneficial uses shall be considered.

effects caused by oxidation of organic matter and ammonia inside and outside of and beyond acute mixing zones but not within acute mixing zones. All

ifric area and the potential exists for additive or synergistic effects, the
e any mixing zone shall not exceed 1.0 TU_c based on chronic bioassays.

utant levels or concentrations of the wastewater in the outfall structure
ric bioassays of the undiluted effluent.

ne.

ge in the receiving stream for the movement or drift of aquatic biota. To provide for
ng stream shall not exceed more than 1/2 of the stream width. Where more than
located in such a manner as to provide for a continuous zone of passage of at least

es based on designated aquatic life use classes.

Warmwater Class B streams shall be designed to not exceed 125 feet in length or 5
tive.

igned to not exceed 250 feet in length or 5 percent of the length of the

or that the maintenance of aquatic life and other beneficial uses will not be

ng areas.

r 6.

red aquatic species.

t.

riteria within an acute mixing zone, except those criteria relating to aesthetics
eation (Chapter 4, 002) shall also apply within the acute mixing zone. Waters
eria associated with the receiving stream any time the receiving streamflow is

rtain unknown or complex mixtures of potentially additive or synergistic toxic
ssays representing the effluent dilution received at the acute mixing zone boundary.

ifric area and the potential exists for additive or synergistic effects, the pollutant
e mixing zone shall not exceed 0.3 TU_a based on acute bioassays.

utant levels or concentration of the wastewater in the outfall structure itself shall

on of public drinking water supplies shall not be exceeded at any time outside of

not extend to within a 2 mile zone of influence from any public drinking water

receiving stream in such a manner that other beneficial uses will not be adversely

e Department may suspend the applicability of all or part of the water quality
r public drinking water supply criteria. Waters at and beyond boundaries of mixing
supply criteria any time the receiving stream is flowing equal to or greater than its 7-

3 - Rules and Regulations for Design, Operation, and Maintenance of Wastewater
s location and placement in the receiving stream have been applied, as necessary,

ation, or placement of an outfall structure in a stream:

re or prevent exposure of aquatic biota to acutely toxic conditions within an acute
ible chronic effects within a mixing zone where wastewaters tend to attract aquatic
er to meet mixing zone requirements for size, location, and water quality.

upstream, downstream, or to the opposite stream bank) or its placement (e.g.,
one requirements for size, location, and water quality.

such a magnitude that the movement or drift of aquatic biota within a zone of

New Jersey: ***NJ Surface Water Quality Standards at N.J.A.C. 7:9B-1.5(h)***

(h) A permittee may request that a regulatory mixing zone be established by the Department for applicable zones may be evaluated as part of the development of water quality-based effluent limitation(s) to provide protection near the discharge point.

1. The following are the general conditions for establishing regulatory mixing zones:

- i. Regulatory mixing zones shall be established in accordance with this subsection;
- ii. Water quality criteria may be exceeded within the regulatory mixing zone; however, surface water quality shall not be degraded;
- iii. The regulatory mixing zone shall be no larger than that portion of the receiving water where current water quality criteria are not being achieved;
- iv. Regulatory mixing zones shall not be used for, or considered as a substitute for, minimum treatment requirements under Federal or State laws or regulations;
- v. Regulatory mixing zones shall be established to assure that significant mortality does not occur
 - (1) In individual regulatory mixing zones, discharges which meet acute effluent toxicity of LC50 shall be required;
 - (2) In cases of extended regulatory mixing zones resulting from multiple, conjoined individual discharges, significant mortality shall be required, taking into account factors including, time of travel, concentration, and other factors;
- vi. The existing and designated uses outside the regulatory mixing zone shall not be adversely affected;
- vii. The total area and volume of a waterbody assigned to a regulatory mixing zone shall be limited to protect biological communities or populations of important species (for example, commercially or recreationally important species);
- viii. Regulatory mixing zones, including those for shore hugging plumes, shall not extend into recreational areas, or to the farthest point of backwatering due to the intake, whichever is more protective of habitat, and other important biological or natural resource areas;
- ix. The regulatory mixing zone shall not inhibit or impede the passage of aquatic biota; and
- x. Overlapping regulatory mixing zones shall not inhibit or impede the passage of aquatic biota.

2. Spatial limitations for regulatory mixing zones delineate the maximum area in which the initial mixing zone may be used to determine dilution in tidal water bodies and in nontidal water bodies where mixing is not shown. The following four situations:

- i. Heat dissipation areas shall be established as follows:
 - (1) For discharges to FW2-NT, FW2-TM, and SE waters, not more than one-quarter (1/4) of the surface area (2/3) of the surface from shore to shore at any time.
 - (2) For discharges to lakes, ponds, reservoirs, bays or coastal waters, the heat dissipation area shall be limited to the surface area of the receiving water body.
 - (3) A discharger may be granted a larger heat dissipation area pursuant to 33 U.S.C. 1326(a) S
- ii. For discharges to tidal water bodies:
 - (1) Regulatory mixing zones for chronic and human health criteria are limited to one fourth of the shoreline during average tidal conditions, or 100 meters, whichever is greater; and
 - (2) Regulatory mixing zones for acute criteria are limited by the distances calculated in accordance with the following:

vii. For new discharges of the following pollutants:

- (1) alpha-BHC (alpha-HCH);
- (2) beta-BHC (beta-HCH);
- (3) gamma-BHC (gamma HCH / Lindane);
- (4) Chlordane;
- (5) 4,4'-DDD (p,p'-TDE);
- (6) 4,4'-DDE;
- (7) 4,4'-DDT;
- (8) Dieldrin;
- (9) Hexachlorobenzene;
- (10) Hexachlorobutadiene;
- (11) Mercury;
- (12) Mirex;
- (13) Pentachlorobenzene;
- (14) Polychlorinated biphenyls (PCBs);
- (15) 1,2,4,5-Tetrachlorobenzene;
- (16) 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD); and
- (17) Toxaphene; and

viii. For new or expanded discharges, within 1,500 feet upstream of a potable surface water intake of backwatering due to the intake, whichever is more protective.

cable criteria except as otherwise provided in this section. Regulatory mixing zone for the initial dispersion of the effluent in the receiving water body at or

water quality criteria must be met at the edge of the regulatory mixing zone;

complete mixing occurs;

treatment technology required by the Federal and State Acts or other applicable

requirements for free swimming or drifting organisms;

at least 50% shall be deemed to comply with this requirement.

In regulatory mixing zones, site-specific studies to demonstrate no significant degradation, and the toxicity of the parameters in question;

is required;

shall be limited to that which will not adversely affect beneficial uses or interfere with protection of environmentally significant species; or threatened or endangered species);

in recreational areas, potable surface water intakes (1,500 feet upstream and 500 feet protective), shellfish harvesting areas, threatened or endangered species

may occur. A site-specific study performed in accordance with (h)3 below will be deemed to be rapid and complete. A maximum area shall be applied in any one of

the cross section and/or volume of the water body at any time or more than

as shall be developed on a case-by-case basis.

Section 316(a) of the Clean Water Act.

of the distance between the discharge port closest to the shoreline and the

in accordance with the USEPA "Technical Support Document For Water Quality-

nce. In no case shall a regulatory mixing zone for acute criteria extend more
ce area of a water body based on critical ambient tidal conditions during

gn flows at (c)2 above. If rapid, complete mix is demonstrated, the entire
nstrated, only that portion of the design flow that can be demonstrated to
culations; and

rapid, complete mix is demonstrated, the entire available design flow may be
the design flow that can be demonstrated to mix with the effluent within a
t For Water Quality-Based Toxics Control" USEPA, EPA/505/2-90-001, March
ian 100 meters from the discharge point or include more than five percent of

er shall be determined by the Department. The dimensions of the site-
ne may be established using appropriate diffuser models (for example,
nce with (h)3 below.

Department. General protocols for conducting mixing zone studies are
PA/505/2-90-001, March 1991. In addition, the following principles apply:

the design flows specified at (c)2 above; and

nt tidal conditions during low slack, astronomical spring tide
a shall be based on average conditions during a normal tidal cycle.

ply with the regulatory mixing zone requirements, instream pollutant

or a mathematical model, if available; or the information generated during

cal Support Document For Water Quality-Based Toxics Control" USEPA,
instream concentrations at the boundary of the regulatory mixing zone.

ered species listed pursuant to the Federal or State Threatened and
ndangered and Non Game Species Conservation Act of 1973, N.J.S.A. 23:2A-
ould likely have an adverse effect on the species or its associated habitat;

ce (including any reservoir) and 500 feet downstream or to the farthest point

2. **Mixing zones.** North Dakota mixing zone and dilution policy is contained in appendix III.

APPENDIX III
MIXING ZONE AND DILUTION
AND
IMPLEMENTATION PROCEDURES

PURPOSE

This policy addresses how mixing and dilution of point source discharges with receiving waters will be limited for point source discharges. Depending upon site-specific mixing patterns and environmental conditions, mixing zone and dilution allowances shall be limited, as necessary, while others may not. In all cases, mixing zone and dilution allowances shall be limited, as necessary.

MIXING ZONES

Where dilution is available and the discharge does not mix at a near instantaneous and complete rate, a mixing zone may be designated. In addition, **a mixing zone may only be designated if it is not possible to achieve compliance with no allowance for dilution.** The size and shape of a mixing zone will be determined on a case-by-case basis to be one-half the cross-sectional area or a length 10 times the stream width at critical low flows, whichever is more limiting, or **percent of lake surface area or 200 feet in radius, whichever is more limiting.** Individual mixing zones shall be designated in the presence of the following concerns in the area affected by the discharge:

- 1) **There is the potential for bioaccumulation in fish tissues or wildlife.**
- 2) The area is biologically important, such as fish spawning/nursery areas.
- 3) The pollutant of concern exhibits a low acute to chronic ratio.
- 4) There is a potential for human exposure to pollutants resulting from drinking water use or recreational activities.
- 5) The effluent and resultant mixing zone results in an attraction of aquatic life to the effluent plume.
- 6) The pollutant of concern is extremely toxic and persistent in the environment.
- 7) The mixing zone would prohibit a zone of passage for migrating fish or other species (including access to tributaries).
- 8) There are cumulative effects of multiple discharges and their mixing zones.

Within the mixing zone designated for a particular pollutant, certain numeric water quality criteria and general conditions set forth in Section 33-16-02-08 of the State Water Quality Standards.

While exceedences of acute chemical specific numeric standards are not allowed within the entire mixing zone, exceedences may occur within the mixing zone. If the discharge permit includes a rationale for concluding that a zone of initial dilution poses no unacceptable risk, the discharge may exceed acute chemical-specific numeric standards established for the protection of aquatic life. The discharge permit includes a rationale for concluding that a zone of initial dilution poses no unacceptable risk if the discharge is achieved at the end-of-pipe with no allowance for a ZID.

DILUTION ALLOWANCES

An appropriate dilution allowance may be provided in calculating chemical-specific acute and chronic standards if 1) dilution is available at low-flow conditions, and 2) available information is sufficient to reasonably

dition is available at low-flow conditions, and 3) available information is sufficient to reasonably with the receiving water (complete mixing). The basis for concluding that such near instantaneous for the NDPDES permit. In the case of field studies, the dilution allowance for continuous discharge The requirements and environmental concerns identified in the paragraphs above may be considered following critical low flows shall be used for streams and effluents:

Stream Flows

Aquatic life, chronic	4-day, 3-year flow (biologically based)**
Aquatic life, acute	1-day, 3-year flow (biologically based)
Human health (carcinogens)	harmonic mean flow
Human health (non-carcinogens)	4-day, 3-year flow (biologically based) or 1-day, 3-year flow (biologically based)

Effluent Flows

Aquatic life, chronic	Mean daily flow
Aquatic life, acute	Maximum daily flow
Human health (all)	Mean daily flow

* Biologically based refers to the biologically based design flow method developed by EPA. It differs averaging periods and frequencies specified in the aquatic life water quality criteria for individual

** A 30-day, 10-year flow (biologically based) can be used for ammonia or other chronic standard

For chemical-specific and chronic WET limits, an appropriate dilution allowance may also be provided such dilution will pose insignificant environmental risks. For acute WET limits, an allowance for dilution

For controlled discharges, such as lagoon facilities that discharge during high ambient flows, the flow expected to occur during the period of discharge.

Where a discharger has installed a diffuser in the receiving water, all or a portion of the critical low flow depend on the diffuser design and on the requirements and potential environmental concerns identified in the receiving river/stream width (at critical low flow), it will generally be presumed that near instantaneous and complete dilution is appropriate.

OTHER CONSIDERATIONS

Where dilution flow is not available at critical conditions (i.e., the water body is dry), the discharge shall be limited to a maximum of 10% of the flow (numeric, chronic and acute) at the end-of-pipe; neither a mixing zone or an allowance for dilution shall be used.

All mixing zone dilution assumptions are subject to review and revision as information on the natural flow (e.g., monitoring at the mixing zone boundary). At a minimum, mixing zone and dilution decisions are subject to review upon expiration of the permit.

For certain pollutants (e.g., ammonia, dissolved oxygen, metals) that may exhibit increased toxicity, the waste load allocation shall address such effects on water quality, as necessary, to fully protect the receiving water something other than the mixing zone boundary or the point where complete mixing is achieved.

The discharge will be consistent with the Antidegradation Procedure.

IMPLEMENTATION PROCEDURE

IMPLEMENTATION PROCEDURE

This procedure describes how dilution and mixing of point source discharges with receiving water. For the purposes of this procedure, a mixing zone is defined as a designated area or volume of water progressively diluted by the receiving water and numerical water quality criteria may not apply. In the context of an individual permit decision, discharges may also be provided an allowance for dilution instantaneous and complete fashion. Such mixing zones and allowances for dilution will be granted to protect existing and designated uses.

The procedure to be followed is composed of six individual elements or steps. The relationship of Figure 1.

Step 1 - No Dilution Available During Critical Conditions

Where dilution flow is not available at critical low flow conditions, discharge limitations will be based on end-of-pipe.

Step 2 - Dilution Categorically Prohibited for Wetland Discharges

Permit limitations for discharges to a wetland shall be based on achieving all applicable water quality standards.

Step 3 - Procedure for Certain Minor POTWs

Minor POTWs that discharge to a lake or to a river/stream at a dilution greater than 50:1 qualify for this procedure (at the discretion of the permit writer) where it can be adequately demonstrated that this procedure is appropriate. River/stream dilution ratio is defined as the chronic low flow of the segment upstream of the POTW. For lagoon facilities (discharging during high flows), the river/stream dilution ratio is defined as the mean daily flow of the discharge.

For minor POTWs that qualify for this procedure and discharge to lakes, the allowance for dilution is based on a 19:1 (5 percent effluent) basis. Dilution up to 19:1 (5 percent effluent) may be provided.

For minor POTWs that qualify for this procedure and discharge to a river/stream segment, dilution allowances may be provided.

Step 4 - Site-Specific Risk Considerations

Where allowing a mixing zone or a dilution allowance would pose unacceptable environmental risks, numerical water quality criteria at the end-of-pipe. The existence of environmental risks may also be determined. Determinations will be made on a case-by-case and parameter-by-parameter basis. These decisions will be based on site-specific environmental concerns, including the following:

1. **Bioaccumulation in fish tissues or wildlife**
2. Biologically important areas such as fish spawning areas
3. Low acute to chronic ratio
4. Potential human exposure to pollutants resulting from drinking water or recreational activities
5. Attraction of aquatic life to the effluent plume
6. Toxicity/persistence of the substance discharged
7. Zone of passage for migrating fish or other species (including access to tributaries)
8. Cumulative effects of multiple discharges and mixing zones

Step 5 - Complete Mix Procedures

For point source discharges to rivers/streams where available data are adequate to support a conclusion that the receiving water (complete mix) the full critical low flow or a portion thereof may be provided. Complete mixing will be made on a case-by-case basis using best professional judgement. Presence of a mixing zone will generally be assumed to provide complete mixing. Also, where the mean daily flow of the discharge is less than or equal to the mean daily flow of the receiving water, complete mixing will generally be assumed. In addition, where the mean daily flow of the discharge is less than or equal to the mean daily flow of the receiving water, complete mixing will generally be assumed that complete mixing does not occur unless otherwise demonstrated by a study plan developed in cooperation with the states/tribes and EPA Region VIII. Near instantaneous to-bank concentrations within a longitudinal distance not greater than two river/stream widths. For complete mixing will be made using the expected rate of effluent discharge and the lowest upstream

The following critical low flows shall be applied for streams and effluents:

Stream Flows

Aquatic life, chronic	4-day, 3-year flow (biologically based)**
Aquatic life, acute	1-day, 3-year flow (biologically based)
Human health (carcinogens)	Harmonic mean flow
Human health (non-carcinogens)	4-day, 3-year flow (biologically based) or 1-day, 3-year flow (biologically based)

Effluent Flows

Aquatic life, chronic	Mean daily flow
Aquatic life, acute	Maximum daily flow
Human health (all)	Mean daily flow

* Biologically based refers to the biologically based design flow method developed by EPA. It differs from the 30-day, 10-year flow method in the averaging periods and frequencies specified in the aquatic life water quality criteria for individual

** A 30-day, 10-year flow (biologically based) can be used for ammonia or other chronic standard

Where complete mixing can be concluded and the environmental concerns identified in step 4 do not require critical low flows identified above may be provided as dilution. Such decisions will take site-specific conditions and designated and existing uses.

Step 6 - Incomplete Mix Procedures

This step addresses point source discharges that exhibit incomplete mixing. Because acute WET limits and mixing zone procedures for chronic aquatic life, human health, and WET limits, and ZID procedure size of the ZID shall be limited as follows:

Lakes: The ZID volume shall not exceed 10 percent of the volume of the chronic mixing zone.

Rivers and Streams: The ZID shall not exceed 10 percent of the chronic mixing zone volume or 100,000 cubic feet, whichever is more restrictive.

The following provides guidelines for determining the amount of dilution available for dischargers

Default Method

Default Method

This method addresses situations where information needed for modeling is not available zone. The default method provides a conservative dilution allowance.

Stream/River Dischargers: Dilution calculation which uses up to 10 percent if the critical allowance may be adjusted downward on a case-by-case basis depending upon relevant the uses of the segment portion affected by the discharge.

Lake/Reservoir Dischargers: Dilution up to 4:1 ratio (20 percent effluent) may be provided allowance may be adjusted downward on a case-by-case basis depending upon discharge uses of the lake portion affected by the discharge.

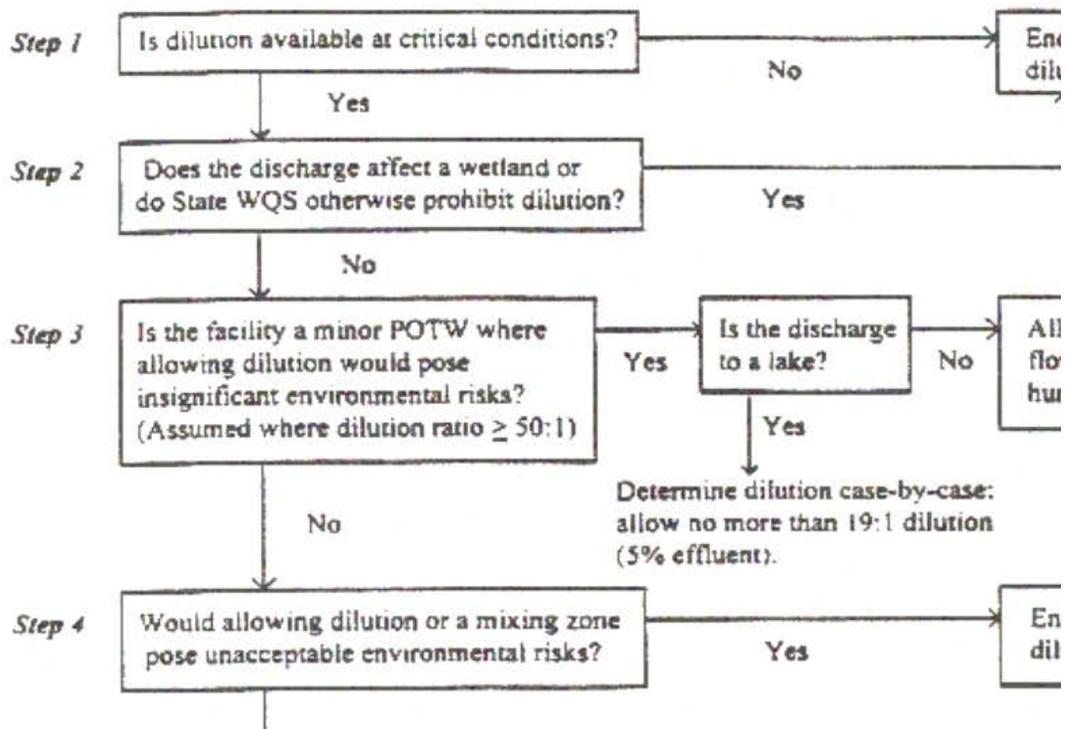
Modeling Method

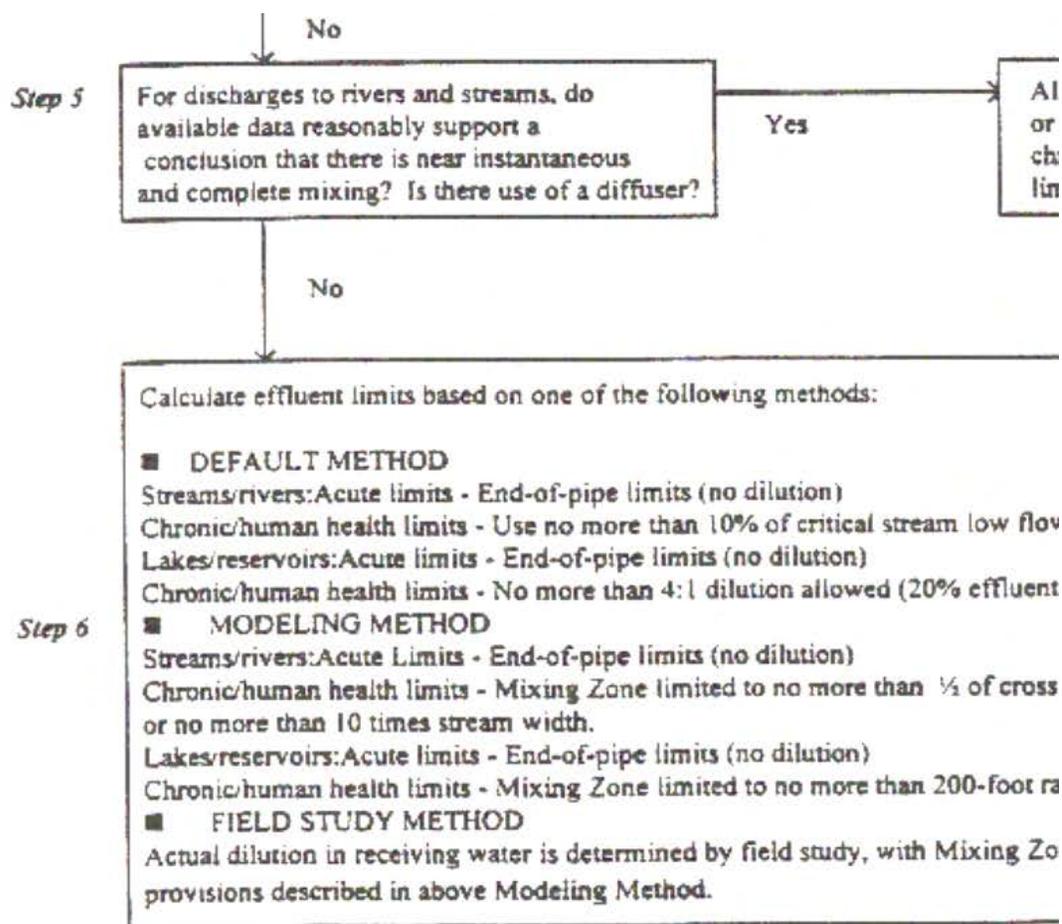
An appropriate mixing zone model is used to calculate the dilution flow that will allow mixing studies, it should be determined that compliance with criteria at the end-of-pipe is not prohibited.

Field Study Method

Field studies which document the actual mixing characteristics in the receiving water are achieved at the critical low flow. For the purposes of field studies, "near instantaneous and difference in bank-to-bank concentrations within a longitudinal distance not greater than

FIGURE 1
NORTH DAKOTA MODEL MIXING ZONE/DILUTION PROGRAM





* This procedure is applied to both chemical-specific and WET limits. In the case of comp mixing zone may vary parameter-by-parameter.

Is.

FUNCTION POLICY

PROCEDURE

It will be addressed in developing chemical-specific and whole effluent toxicity discharge permit objectives. In some circumstances, where there are special environmental concerns, some pollutants/criteria may be allowed a mixing zone or dilution factor, to protect the integrity of the receiving water's ecosystem and designated uses.

In cases where mixing is not complete (incomplete mixing), an appropriate mixing zone may be established. **Chemical-specific standards and whole effluent toxicity objectives at the end-of-pipe** shall be established on a case-by-case basis. At a maximum, mixing zones for streams and rivers shall not exceed 10% of the stream length, whichever is more limiting. **Also, at a maximum, mixing zones in lakes shall not exceed 5% of the lake length.** Mixing zones may be limited or denied in consideration of designated beneficial uses or

where a mixing zone is established for a substance, the discharge limit for that substance may not apply. However, all mixing zones shall meet the

requirements of the permit. Within the mixing zone, a portion of the mixing zone (the zone of initial dilution or ZID) may be established. The ZID shall be determined on a case-by-case basis where the statement of basis for the permit is based on acceptable risks to aquatic life. Acute whole effluent toxicity (WET) limits shall be

established in addition to chronic and WET discharge limitations where: 1) the discharge is to a river or stream, 2) the permit is based on acceptable risks to aquatic life, and 3) the permittee can conclude that there is near instantaneous and complete mixing of the discharge

... conclude that there is near instantaneous and complete mixing of the discharge
... s and complete mixing is occurring shall be documented in the statement of basis
... gers shall be based on the critical low flow (or some portion of the critical low flow).
... ered in deciding the portion of the critical low flow to provide as dilution. The

... ers from the hydrologically based design flow method in that it directly uses the
... pollutants and whole effluents for determining design flows.

... l with a 30-day averaging period.

... ided for certain minor publicly owned treatment works (POTWs) where allowing
... lution is authorized only where dilution is available and mixing is complete.

... stream flow to be used in the mixing zone analysis should be the lowest statistical

... w stream flow may be provided as a dilution allowance. The determination shall
... entified in the above paragraphs. Where a diffuser is installed across the entire
... d complete mixing is achieved and that providing the entire critical low flow as

... e limits will be based on achieving applicable water quality criteria (i.e., narrative
... ation will be provided.

... ure and impacts of the discharge becomes available (e.g., chemical or biological
... bject to review and revision, along with all other aspects of the discharge permit

... ty or other effects on water quality after dilution and complete mixing is achieved,
... t designated and existing uses. In other words, the point of compliance may be

is will be addressed in developing discharge limitations for point source discharges. Water surrounding or downstream of a point source discharge where the discharge is based on site-specific considerations, such a mixing zone may be designated in the area where it is determined that the discharge mixes with the receiving water in near accordance on a parameter-by-parameter and criterion-by-criterion basis as necessary to fully

The six steps and an overview of the mixing zone/dilution procedure is shown in

based on achieving applicable narrative and numeric water quality criteria at the end-

quality criteria (i.e., narrative and numeric, chronic and acute) at end-of-pipe.

For this procedure. Minor POTWs with dilution ratios less than 50:1 may also qualify where the discharge poses insignificant environmental risks. For the purposes of this procedure, the dilution ratio is the POTW discharge divided by the mean daily flow of the POTW. For controlled discharges, the dilution ratio is the lowest upstream flow expected during the period of discharge divided by the

The dilution ratio for chemical-specific and chronic WET limits will be determined on a case-by-case

basis up to the full chronic aquatic life, acute aquatic life, and human health critical

limits. If risks, the discharge limitations will be based on achieving applicable narrative and numeric water quality criteria as the basis for a site-specific mixing zone or dilution allowance. Such risk assessments will take into account the designated and existing uses and all relevant site-

areas

clusion that there is near instantaneous and complete mixing of the discharge with as dilution for chemical-specific and WET limitations. Such determinations of ce of an effluent diffuser that covers the entire river/stream width at critical low flow charge exceeds the chronic low stream flow of the receiving water, complete mixing equal to the chronic low flow of the receiving water, it y the permittee. Demonstrations for complete mixing should be consistent with the us and complete mixing is defined as no more than a 10 percent difference in bank- or controlled discharges (lagoon facilities), the test of near instantaneous and eam flow expected to occur during the period of discharge.

ers from the hydrologically based design flow method in that it directly uses the pollutants and whole effluents for determining design flows.

l with a 30-day averaging period.

o not justify denying dilution, but are nevertheless significant, some portion of the ic environmental concerns into account as necessary to ensure adequate protection

imits are achieved at the end-of-pipe in incomplete mix situations, this step provides es for acute chemical-specific limits. Where a ZID is allowed for chemical limits, the

w, nor shall the ZID exceed a maximum downstream length of 100 feet, whichever is

s that exhibit incomplete mixing.

or there are concerns about potential environmental impacts of allowing a mixing

low flow for chronic aquatic life limits or human health limits. However, this site-specific information, designed and existing uses of the segment, and especially

d for chronic aquatic life analyses or human health analyses. However, this flow, lake size, lake flushing potential, designated and existing uses of the lake, and

mixing zone limits to be achieved at the critical low flow. Prior to initiating modeling practicable.

used to determine the dilution flow that will allow mixing zone size limits to be achieved complete mixing" is operationally defined as no more than a 10 percent two stream/river widths.

PROCEDURE*

End-of-pipe limits (no dilution)



Low flow full critical stream flow for acute, chronic, & human health limits.

End-of-pipe limits (no dilution)

low critical stream flow
some portion for acute,
chronic & human health
risks.

W.

(1).

(2) sectional area of stream

(3) radius or 5% of lake surface.

(4) time limited by size

(5) for large discharges, the dilution or

Mixing Zones

(1) The Department may allow a designated portion of a receiving water to serve as a zone of dilution defined as a mixing zone;

(2) The Department may suspend all or part of the water quality standards, or set less restrictive standards to be met:

(a) A point source for which the mixing zone is established may not cause or significantly contribute to:

(A) Materials in concentrations that will cause acute toxicity to aquatic life as measured by a significant difference in lethal concentration between receiving water and percent effluent may be allowed due to ammonia and chlorine only when it is demonstrated that the mixing zone reduces toxicity below lethal concentrations. The Department may set standards for other parameters;

(B) Materials that will settle to form objectionable deposits;

(C) Floating debris, oil, scum, or other materials that cause nuisance conditions; and

(D) Substances in concentrations that produce deleterious amounts of fungal or bacterial growth.

(b) A point source for which the mixing zone is established may not cause or significantly contribute to a mixing zone:

(A) Materials in concentrations that will cause chronic (sublethal) toxicity. Chronic toxicity is defined as significantly impaired growth or reproduction in aquatic organisms, during the life cycle of the organisms, as specified by the Department in wastewater discharge permits;

(B) Exceedances of any other water quality standards under normal annual low flow conditions.

(c) The limits of the mixing zone must be described in the wastewater discharge permit. The Department may use appropriate mixing zone guidelines to assess the biological, physical, and chemical placement of the outfall, to protect instream water quality, public health, and other beneficial uses. The Department will define a mixing zone in the immediate area of a wastewater discharge to:

(A) Be as small as feasible;

(B) Avoid overlap with any other mixing zones to the extent possible and be less restrictive than the most restrictive of the other mixing zones to the extent possible; and

(C) Minimize adverse effects on the indigenous biological community, especially where the community has special importance, tribal significance, ecological uniqueness, or other similar reasons determined by the Department;

(D) Not threaten public health;

(E) Minimize adverse effects on other designated beneficial uses outside the mixing zone.

(d) Temperature Thermal Plume Limitations. Temperature mixing zones and effluent limit minimize the following adverse effects to salmonids inside the mixing zone:

(A) Impairment of an active salmonid spawning area where spawning redds are limited by limiting potential fish exposure to temperatures of 13 degrees Celsius (55.4 Fahrenheit) or more for bull trout;

(B) Acute impairment or instantaneous lethality is prevented or minimized by limiting exposure to temperatures of 21.0 degrees Celsius (69.8 Fahrenheit) or more to less than 2 seconds);

(C) Thermal shock caused by a sudden increase in water temperature is prevented by limiting exposure to temperatures of 21.0 degrees Celsius (69.8 Fahrenheit) or more to less than 5 percent of the cross section of the mixing zone; and develop additional exposure timing restrictions to prevent thermal shock; and

(D) Unless the ambient temperature is 21.0 degrees of greater, migration blockage is prevented by limiting exposure to temperatures of 21.0 degrees Celsius (69.8 degrees Fahrenheit) or more to less than 25 percent of the mixing zone;

(e) The Department may request the applicant of a permitted discharge for which a mixing zone, such as:

(A) Type of operation to be conducted;

(B) Characteristics of effluent flow rates and composition;

(C) Characteristics of low flows of receiving waters;

(D) Description of potential environmental effects;

(E) Proposed design for outfall structures.

(f) The Department may, as necessary, require mixing zone monitoring studies and/or bioassays inside and outside the mixing zone boundary;

(g) The Department may change mixing zone limits or require the relocation of an outfall, if necessary, to avoid any existing beneficial uses in the receiving waters.

Stat. Auth.: ORS 468.020, 468B.030, 468B.035 & 468B.048

Stats. Implemented: ORS 468B.030, 468B.035 & 468B.048

Hist.: DEQ 17-2003, f. & cert. ef. 12-9-03; DEQ 1-2007, f. & cert. ef. 3-14-07; DEQ 2-2007, f. & cert. ef. 3-14-07

NOTE: Oregon also has an extensive 'Guidance' document: **DEQ Publication Number 07-WQ-012**

ation for wastewaters and receiving waters to mix thoroughly and this zone will be

standards in the defined mixing zone, provided that the following conditions are

contribute to any of the following:

asured by a Department approved bioassay method. Acute toxicity is lethal to
en the control and 100 percent effluent in an acute bioassay test. Lethality in 100
monstrated on a case-by-case basis that immediate dilution of the effluent within
ay on a case-by-case basis establish a zone of immediate dilution if appropriate for

ind

bacterial growths.

contribute to any of the following conditions outside the boundary of the

c toxicity is measured as the concentration that causes long-term sublethal effects,
ig a testing period based on test species life cycle. Procedures and end points will be

ow conditions.

n determining the location, surface area, and volume of a mixing zone area, the
l, and chemical character of receiving waters, effluent, and the most appropriate
eficial uses. Based on receiving water and effluent characteristics, the Department

than the total stream width as necessary to allow passage of fish and other aquatic

when species are present that warrant special protection for their economic
etermined by the Department and does not block the free passage of aquatic life;

ing zone.

ts authorized under 340-041-0028(12)(b) will be established to prevent or

located or likely to be located. This adverse effect is prevented or minimized by
enheit) or more for salmon and steelhead, and 9 degrees Celsius (48 degrees

limiting potential fish exposure to temperatures of 32.0 degrees Celsius (89.6 degrees

and or minimized by limiting potential fish exposure to temperatures of 25.0 degrees
tion of 100 percent of the 7Q10 low flow of the water body; the Department may

size is prevented or minimized by limiting potential fish exposure to temperatures of
of the cross section of 100 percent of the 7Q10 low flow of the water body.

ing zone is required, to submit all information necessary to define a mixing

assays to be conducted to evaluate water quality or biological status within

, if it determines that the water quality within the mixing zone adversely affects

.. ef. 3-15-07

!, **Regulatory Mixing Zone Internal Management Directive**

[R317-2-5. Mixing Zones.](http://www.rules.utah.gov/publicat/code/r317/r317-002.htm#T7)

A mixing zone is a limited portion of a body of water, contiguous to a discharge, where dilution is in progress concentrations which will meet certain standards for all pollutants. At no time, however, shall concentration allowed which are acutely lethal as determined by bioassay or other approved procedure. Mixing zones may purpose of guiding sample collection procedures and to determine permitted effluent limits. The size of the and streams shall not to exceed 2500 feet and the size of an acute mixing zone shall not exceed 50% of strea residency time of greater than 15 minutes. Streams with a flow equal to or less than twice the flow of a poin considered to be totally mixed. **The size of the chronic mixing zone in lakes and reservoirs shall not exceed 2 acute mixing zone shall not exceed 35 feet.** Domestic wastewater effluents discharged to mixing zones shall specified in R317-1-3.

5.1 Individual Mixing Zones. Individual mixing zones may be further limited or disallowed in consideration of area affected by the discharge:

- a. **Bioaccumulation in fish tissues or wildlife,**
- b. Biologically important areas such as fish spawning/nursery areas or segments with occurrences of federal endangered species,
- c. Potential human exposure to pollutants resulting from drinking water or recreational activities,
- d. Attraction of aquatic life to the effluent plume, where toxicity to the aquatic life is occurring.
- e. Toxicity of the substance discharged,
- f. Zone of passage for migrating fish or other species (including access to tributaries), or
- g. Accumulative effects of multiple discharges and mixing zones.

[R317-2-5. Mixing Zones.](#)

s but has not yet resulted in
is within the mixing zone be
/ be delineated for the
chronic mixing zone in rivers
am width nor have a
it source discharge may be
00 feet and the size of an
meet effluent requirements

the following factors in the

ly listed threatened or

Wyoming, **WATER QUALITY RULES AND REGULATIONS Chapter 1**

Section 9. **Mixing Zones.** Except for acute whole effluent toxicity (WET) values and Sections 14, 15, 16, 17, 28 and 29(b) of the Wyoming Surface Water Quality Standards (Water Quality Rules and Regulations), standards shall be determined after allowing reasonable time for mixing. Except for the zone of initial dilution, which is the initial zone of dilution, shall not contain pollutant concentrations that exceed the aquatic life acute values (see Appendix B). In addition, there shall be a zone of passage that shall not contain pollutant concentrations that exceed the aquatic life chronic values (see Appendix B). Under no circumstance may a mixing zone be established that exceeds the health criteria (see Appendix B) to be exceeded within 500 yards of a drinking water supply intake or result in acute lethality to aquatic life. The mixing zones and dilution allowances implementation policy section are described in the *Mixing Zones and Dilution Allowances Implementation Policy*.

**Implementation Policy
for
Antidegradation
Mixing Zones and Dilution
Turbidity
Use Attainability
Effective September 1, 2010**

**MIXING ZONES AND DILUTION ALLOWANCES IMPLEMENTATION POLICY
(Chapter 1, Section 9)**

Section 1. Purpose . Section 9 of the Wyoming Surface Water Quality Standards (Water Quality Rules and Regulations) requires that standards for dilution in the vicinity of point source discharges where acute and chronic aquatic life criteria and

*Except for acute whole effluent toxicity (WET) values and Sections 14, 15, 16, 17, 28 and 29(b) of the Wyoming Surface Water Quality Standards (Water Quality Rules and Regulations), standards shall be determined after allowing reasonable time for mixing. Except for the zone of initial dilution, which is the initial zone of dilution, shall not contain pollutant concentrations that exceed the aquatic life acute values (see Appendix B). In addition, there shall be a zone of passage that shall not contain pollutant concentrations that exceed the aquatic life chronic values (see Appendix B). Under no circumstance may a mixing zone be established that exceeds the health criteria (see Appendix B) to be exceeded within 500 yards of a drinking water supply intake or result in acute lethality to aquatic life. The mixing zones and dilution allowances implementation policy section are described in the *Mixing Zones and Dilution Allowances Implementation Policy*.*

This policy addresses how mixing and dilution of point source discharges in receiving waters will be limited by the design of the discharge. In all cases, mixing zone and dilution allowances shall be limited as follows:

Section 2. Concepts. A mixing zone is a limited area within the receiving water body where initial dilution is not appropriate in all circumstances. For example, in non-perennial or low flow streams, there may be instances where background concentrations of specific pollutants in the receiving stream are such that the discharge criteria would have to be met in the discharge itself.

Where the establishment of a mixing zone is appropriate and possible, the design needs to be based on the following criteria:

- (a) The size and configuration of the mixing zone shall not impair the integrity of the water body;
- (b) There shall be no lethality to aquatic organisms through the mixing zone; and
- (c) There shall be no significant health risks to human populations associated with the mixing zone.

The size, configuration and other relevant design considerations shall be based on critical flow conditions. Critical flow conditions include effluent flow and pollutant concentrations; receiving water critical conditions include receiving water flow and pollutant concentrations.

include effluent flow and pollutant concentrations; receiving water critical conditions include receiving water quality criteria that affect pollutant concentrations (e.g. temperature, pH, reaction rates, etc.) and mixing is complete and near instantaneous at the point of discharge (Section 3) and mixing is incomplete at the point of discharge (Section 4).

Section 3. Complete Mixing.

(a) Where the discharge is to a river or stream and available information is sufficient to conclude that the receiving water at critical conditions, an appropriate dilution allowance may be provided. Complete mixing may be based on any of the following:

(i) Mean daily flow of the discharge exceeds the critical in-stream flow;

(ii) An effluent diffuser covers the entire stream width at critical flow;

(iii) Demonstration by the permittee, based on in-stream studies, that shows no recirculation distance not greater than 2 stream/river widths; or

(iv) Other defensible discharge outlet designs and configurations provided by the permittee.

(b) The basis for concluding that complete mixing occurs will be documented in the ratio of discharge to receiving water flow.

(c) The dilution allowance for continuous discharges shall be based on the critical low flow provided in Chapter 1, Section 11.

(d) For controlled discharges, such as lagoon facilities that discharge only during high and low flows, the lowest flow expected to occur during the period of discharge shall be used.

(e) Where a discharger has installed a diffuser in the receiving stream, that portion of the receiving water flow that is used for the diffuser shall be subtracted from the receiving water flow. For example, 50% of the 7Q10 low flow may be used for a diffuser extending halfway across the stream.

Section 4. Incomplete Mixing.

(a) Where dilution is available at critical conditions and the discharge does not mix at a designated location for purposes of implementing aquatic life and human health criteria in the receiving water, the size of the mixing zone shall be determined on a case-by-case basis as follows:

(i) Mixing zones for streams and rivers shall not exceed one-half of the cross-section of the receiving water body, and shall not be more limiting; and

(ii) Mixing zones in lakes shall not exceed 5% of the lake surface area or 200 feet in length.

(b) The above limits are intended to establish the maximum allowable size of mixing zone where there are concerns about designated and existing uses or the following in the area affected by the discharge:

(i) Bioaccumulation in fish tissues or wildlife;

(ii) Biologically important areas such as fish spawning or nursery areas;

(iii) Low acute to chronic ratio;

(iv) Potential human exposure to pollutants resulting from drinking water or recreational activities.

- (v) Attraction of aquatic life to the effluent plume;
- (vi) Toxicity/persistence of the substance discharged;
- (vii) Zone of passage for migrating fish or other species, including access to tributaries;
- (viii) Cumulative effects of multiple discharges and mixing zones.

(c) Within the mixing zone designated for a particular substance, the numeric water quality standards shall be free from materials that:

- (i) Settle to form objectionable deposits (Chapter 1, Sections 14 and 15);
- (ii) Float as debris, scum, oil or other matter (Chapter 1, Section 16);
- (iii) Produce objectionable color, odor or taste (Chapter 1, Section 17);
- (iv) Are acutely lethal (Chapter 1, Section 9);
- (v) Produce undesirable aquatic life (Chapter 1, Section 28); and
- (vi) Form visible sheens or deposits or damage or impair the normal growth, function or reproduction of aquatic life (Chapter 1, Section 29(b)).

(d) In incomplete mixing situations, permit limitations to implement acute whole effluent toxicity standards shall be based on the critical low flow (i.e. without an allowance for dilution). For chemical-specific acute aquatic life criteria, dilution shall be based on the zone of initial dilution (Chapter 1, Section 9).

(e) The dilution allowance for continuous discharges shall be based on the critical low flow provided in Chapter 1, Section 11.

(f) For controlled discharges, such as lagoon facilities that discharge only during high ambient flow, the dilution allowance shall be based on the lowest flow expected to occur during the period of discharge.

(g) The requirements and concerns identified in Sections 4(b) and 4(c), above, may be corrected by dilution. The environmental concerns listed in Section 4(b) are not intended to establish a prohibition on discharge. Consideration should be made in consideration of designated and existing uses and relevant site-specific factors.

- (i) Bioaccumulation in fish tissues or wildlife. Both potential and existing bioaccumulation and bioconcentration factors (BCF) greater than 300 indicate a potential risk of downstream impacts.
- (ii) Biologically important areas such as fish spawning or nursery areas. Informatic or a "shore hugging" effluent plume in an aquatic life segment could support a community of biologically important area. Presence of a threatened or endangered species downstream could result in potential exposure of the particular species;
- (iii) Low acute to chronic ratio. For substances with low acute to chronic ratios, in which it has been demonstrated to result in chronic effects, restricting or denying a mixing zone could result in concentrations outside of the zone of initial dilution;

(iv) Potential human exposure to pollutants resulting from drinking water or recreation near the proposed zone of influence would strongly suggest that an allowance criteria;

(v) Attraction of aquatic life to the effluent plume. Where available data support it may be appropriate to set discharge limitations at the end-of-pipe;

(vi) Toxicity/persistence of the substance discharged. It may be appropriate to determine a factor should be given added weight where the discharge is to an isolated aquatic

(vii) Zone of passage for migrating fish or other species, including access to tributaries. If it is likely to inhibit migration of fish or other species, it may be appropriate to set discharge limitations. If the effluent plume will block migration into tributary segments;

(viii) Cumulative effects of multiple discharges and mixing zones. In some cases, establish mixing zones for discharging facilities. Any allowances for dilution should be restricted to designated water uses.

(h) The mixing zone size limits shall be implemented by calculating allowable dilution concentrations.

(i) Default Method. In general, the default method provides a conservative level of protection. If environmental impacts suggest that a full mixing zone should not be allowed, or if other factors determine the appropriate mixing zone dimensions.

(A) Stream/River Discharges. As a general guideline, dilution calculations should be based on aquatic life chronic criteria and human health consumption criteria. For numerical calculations, a 4:1 dilution is recommended.

(B) Lake/Reservoir Discharges. As a general guideline, dilution up to 4:1 is recommended. For numerical calculations, a 4:1 dilution is recommended.

(ii) Modeling Method. Mixing zones should not exceed one-half the cross-section of the stream at critical low flow. These restrictions apply to the stream at critical low flow.

A calculation must first be performed to determine if the discharge mixes within the stream. If it does, mixing zone calculations can be performed using any number of appropriate modeling methods.

(iii) Field Study Method. Field studies which document the actual field characteristics of the stream at critical low flows.

Section 5. Other Considerations.

(a) Where dilution flow is not available at critical flow conditions, neither a mixing zone nor a dilution factor shall be used.

(b) All mixing zone and dilution assumptions are subject to review and revision as information becomes available. Mixing zone and dilution decisions are subject to review and revision along with all other aspects of the permit.

(c) For certain pollutants (e.g. ammonia, dissolved oxygen, metals) that may exhibit increased toxicity at low flows, wasteload allocation shall address such toxicity as necessary to fully protect designated uses.

5, 16, 17, 28 and 29(b) of these regulations, compliance with water quality initial dilution, which is the initial 10% of the mixing zone, the mixing zone shall not in addition, there shall be a zone of passage around the mixing zone which shall not under no circumstance may a mixing zone be established which would allow human health or result in acute lethality to aquatic life. The procedures used to implement this

olicies

on

1 Allowances

analysis

24, 2013

ules and Regulations, Chapter 1) provides for the establishment of a zone of initial dilution. If human health criteria may be exceeded. Section 9 provides:

Under these regulations, compliance with water quality standards shall be determined as follows: (1) In the initial 10% of the mixing zone, the mixing zone shall not contain pollutant concentrations that exceed the applicable water quality standards. (2) A zone of passage around the mixing zone which shall not contain pollutant concentrations that exceed the applicable water quality standards shall not be established which would allow human health criteria (see Appendix B) to be exceeded. The procedures used to implement this section are described in the Mixing Zone Regulations.

be addressed in developing chemical-specific and whole effluent toxicity discharge limits. The limits shall be based on the toxicity of the discharge and necessary to protect the integrity and designated uses of the receiving water.

initial dilution of a point source discharge of pollution takes place. The establishment of a mixing zone, there may not be any dilution available to mix with the discharge. Also, there shall be no assimilative capacity. In circumstances like these, acute and chronic

based on the following 3 concepts:

the receiving water body as a whole;

the mixing zone (e.g. proximity to recreation areas or drinking water intakes).

conditions for both the receiving water and the effluent. Effluent critical conditions shall be based on the receiving water flow, background pollutant concentrations and other characteristics of

receiving water flow, background pollutant concentrations and other characteristics of the receiving water body. This policy addresses mixing zones and dilution allowances where mixing is expected to occur at the point of discharge (Section 4).

It is assumed that there is near instantaneous and complete mixing of the discharge with the receiving water body in calculating chemical-specific discharge limitations. An assumption of

no more than a 10% difference in bank to bank concentrations within a longitudinal

mixing zone for the permittee.

The following criteria apply for the discharge permit.

1. The minimum flow of the receiving stream. Critical low flow can be determined using the methods

described in the permit. If the minimum flow is less than the minimum flow, the stream flow to be used in determining a dilution allowance shall be

the minimum flow. If the stream flow affected by the diffuser may be used to calculate a dilution allowance, the minimum flow shall be the stream flow at the stream bottom

2. Mixing zones. Where a mixing zone is allowed, its size and shape will be determined by the following criteria: near instantaneous and complete rate, an appropriate mixing zone may be allowed in the receiving stream. Where a mixing zone is allowed, its size and shape will be

determined by the following criteria: a circular area or a length 10 times the stream width at critical low flow, whichever is

more limiting, or a circular area with a radius, whichever is more limiting.

3. Mixing zones; however, individual mixing zones may be further limited or denied due to the nature of the discharge:

4. Mixing zones for recreational activities;

aries; and

ity criteria contained in Chapter1, Appendix B may not apply. However, all mixing

tion or reproduction of human, animal, plant or aquatic life (Chapter 1, Section

: toxicity (WET) criteria shall be based on meeting such criteria at the end-of-pipe
scharge limitations will be based upon meeting such criteria at the edge of the zone

w of the receiving stream. Critical low flow can be determined using the methods

ient flows, the stream flow to be used in determining a dilution allowance shall be

nsidered in deciding the portion, if any, of the critical low flow to provide as
any bright line tests in which to make risk determinations. Rather, such decisions
c conditions. Each of the concerns is further explained as follows:

ulation concerns should be evaluated. As a general guideline, pollutants with
stream bioaccumulation;

on on either the existence of spawning areas within the proposed zone of influence
onclusion that allowing dilution or a mixing zone would pose significant risk to a
vntstream should also be considered in light of the duration and magnitude of

indicating that acute affects may occur at concentrations "close" to those that have
ne or dilution allowance may be appropriate in order to avoid acutely toxic

recreational activities. Existence of a drinking water intake or a recreational area within 100 feet of dilution is not appropriate for substances with established human health

or a conclusion that fish or other aquatic life are attracted to the effluent plume, it

denies dilution or a mixing zone for particularly toxic or persistent substances. This factor applies to a receiving water system where the substance is expected to remain biologically available;

varies. Where available data suggest that allowing dilution or a mixing zone would be inconsistent with the protection of public health, safety, or the environment, dilution or mixing is not permitted at the end-of-pipe. This factor includes consideration of whether the

existence of overlapping effluent plumes may necessitate denying dilution or mixing if it is determined to be necessary to protect the integrity of the receiving water ecosystem and

is consistent with one of the following methods:

1. A dilution factor of allowable dilution and can be used where available data on potential impacts are insufficient to protect public health, safety, or the environment.

2. A dilution factor of 10% of the critical low flow may be used to develop effluent limits for aquatic life acute criteria, 1% of the critical low flow may be used.

3. A dilution factor of 20% effluent) may be provided for developing effluent limitations for aquatic life acute criteria, a 0.4:1 dilution ratio may be used.

4. A dilution factor of 10% of the critical low flow may be used to develop effluent limits for aquatic life acute criteria, 1% of the critical low flow may be used.

5. A dilution factor of 10% of the critical low flow may be used to develop effluent limits for aquatic life acute criteria, 1% of the critical low flow may be used.

6. A dilution factor of 10% of the critical low flow may be used to develop effluent limits for aquatic life acute criteria, 1% of the critical low flow may be used.

7. A dilution factor of 10% of the critical low flow may be used to develop effluent limits for aquatic life acute criteria, 1% of the critical low flow may be used.

8. A dilution factor of 10% of the critical low flow may be used to develop effluent limits for aquatic life acute criteria, 1% of the critical low flow may be used.

9. A dilution factor of 10% of the critical low flow may be used to develop effluent limits for aquatic life acute criteria, 1% of the critical low flow may be used.