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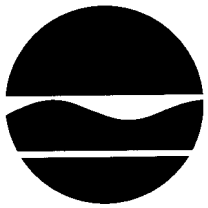

Michael D. Zagata
Commissioner

MEMORANDUM

*****NOTICE*****
This document has been developed to provide Department staff with guidance on how to ensure compliance with statutory and regulatory requirements, including case law interpretations, and to provide consistent treatment of similar situations. This document may also be used by the public to gain technical guidance and insight regarding how the department staff may analyze an issue and factors in their consideration of particular facts and circumstances. This guidance document is not a fixed rule under the State Administrative Procedure Act section 102(2)(a)(i). Furthermore, nothing set forth herein prevents staff from varying from this guidance as the specific facts and circumstances may dictate, provided staff's actions comply with applicable statutory and regulatory requirements. This document does not create any enforceable rights for the benefit of any party.

Issued Date:

TO: Regional Water Engineers, Bureau Directors, Section Chiefs

SUBJECT: Division of Water Technical & Operational Guidance Series (1.3.1.E)

TOTAL MAXIMUM DAILY LOADS AND WATER QUALITY-BASED EFFLUENT LIMITS

AMENDMENT - PERMIT LIMIT DEVELOPMENT FOR CERTAIN PARAMETERS

(Originator - Al Bromberg)

PURPOSE

TOGS 1.3.1 describes the principles and procedures for developing water quality-based effluent limits (WQBEL) using the total maximum daily load (TMDL) process. This amendment provides direction to implement certain water quality standards.

DISCUSSION

Since issuance of the water quality standards and guidance values, questions have arisen with interpretation of certain of the standards and translation to water quality-based effluent limits.

The questions have focused on the state of the substance (i.e., dissolved, ionic, free, undissociated), the accuracy of the currently accepted analytical detection level, and, within the constraints imposed by these factors, the ability to translate the standard/guidance value to an effluent limit.

This guidance contains a statement of the issue and recommended procedures for development of effluent limitations for

- aluminum
- ammonia
- bis(2-ethylhexyl)phthalate
- chlorine
- cyanide
- hydrogen sulfide
- phenol and phenolic compounds
- silver

GUIDANCE IS ATTACHED

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N.G. Kaul, Director
Division of Water

GUIDANCE

WATER QUALITY STANDARD	ISSUE	RECOMMENDED PROCEDURE FOR EFFLUENT LIMIT DEVELOPMENT
Aluminum (ionic)	There is no approved analytical procedure for this form. The solubility of Aluminum is a function of the pH of the receiving water. At pH less than 6.5, the potential for solubility exceeds 100 µg/l, which is the water quality standard.	When receiving water pH is 6.5 or greater, technology-based limits for total Aluminum are adequate to meet water quality standards. For receiving waters with pH less than 6.5, which will be the exception, a water quality-based limit will be developed and expressed as dissolved Aluminum.
Ammonia and Ammonium	Ambient chronic standards are provided for Class A, B and C waters separately for cold water (trout) and warm water fisheries. Acute criteria are provided for Class D waters. Unlike other toxics which are treated as "conservative" substances, ammonia is treated as a non-conservative substance. In the presence of oxygen, aerobic bacteria convert ammonia to nitrite and nitrate. The Great Lakes Water Quality Initiative guidance classifies ammonia as a "conventional" pollutant, not subject to the same stringent permitting procedures as other more traditional toxics.	The ammonia standard will be applied year-round. Seasonal water quality-based limits will be evaluated and applied when appropriate. Since ammonia is a "conventional, non-conservative pollutant, the MA30CD10 flow will be applied to the chronic standard for class A, B and C waters and the limit expressed as a monthly average. The MA7CD10 flow will be applied to the acute standard for Class D waters and the limit expressed as a daily maximum. Unless site specific data are available, apply 10°C and 25°C for cold and warm weather, respectively. When pH data are available, use the 75 to 80 percentile value as the critical condition. pH data from other locations within the same watershed or adjacent watersheds with similar geologic conditions may be used.

WATER QUALITY STANDARD	ISSUE	RECOMMENDED PROCEDURE FOR EFFLUENT LIMIT DEVELOPMENT
Bis(2-ethylhexyl)phthalate	The ambient standard for this parameter is below the accepted detection limit. Analytical results are suspect due to the likelihood of sample contamination during collection and/or analysis. This causes difficulty in the measurement of ambient background levels, establishing of a baseline basin discharge inventory, determination of treatment requirements and the development of water quality-based effluent limits using the watershed/basin TMDL process.	Available data does not indicate that Bis is a water quality limiting substance. Quantitative analysis is complicated by the relatively high detection level and sample contamination from plastic tubing. Where Bis is suspected of being a problem, caution should be exercised in sample collection methods and analytical procedures. Until contamination and detection level issues are more thoroughly evaluated, effluent limits based on technology or action levels will be recommended.
Chlorine	Chlorine is treated as a non-conservative substance.	See Attachment 1.
Cyanide (free) HCN+CN	There is no approved analytical procedure for this form. Free cyanide is the toxic form of the substance. The "amenable to chlorination" form measures all cyanide complexes which have the potential to dissociate when mixed with the receiving water.	A water quality-based effluent limit based on free cyanide will be developed. The permit limit will be expressed as cyanide "amenable to chlorination."
Hydrogen sulfide (undissociated)	There is no approved analytical procedure for the direct measurement of undissociated hydrogen sulfide. The amount of dissolved hydrogen sulfide in a receiving water is a function of stream pH, conductivity and temperature.	A water quality-based effluent limit for the standard will be evaluated using stream data for conductivity, pH and temperature, the relationship of dissolved sulfide and hydrogen sulfide, and expressed as an effluent limit in terms of dissolved sulfide. See Attachment 2 from the 18th Edition of Standard Methods for guidance on calculating dissolved sulfide.

WATER QUALITY STANDARD	ISSUE	RECOMMENDED PROCEDURE FOR EFFLUENT LIMIT DEVELOPMENT
Phenol Phenolic compounds (total phenols) Phenols,Total chlorinated Phenols,Total unchlorinated	Phenolic compounds or total phenols are usually measured by the 4-aminoantipyrine (4AAP) test. The 4AAP does not detect all phenolic compounds, nor does it measure those it does detect with the same precision and accuracy. Total chlorinated and unchlorinated phenols cannot be measured independently by any single test. Individual chlorinated phenolic substances are measured by GC.	Dependent on the type of discharge, the number of individual phenolic substances identified, the water body classification and designated best use, apply the most appropriate of the following: <u>Class A, GA (human health)</u> Limit all as "total phenolics" by 4 AAP (1 µg/l). <u>Class B, C, D (aquatic life)</u> 1. <u>Chlorinated</u> a. Limit individually, if standards/criteria exist, and if the individual limit is more stringent than the "total chlorinated phenols" limit of 1 µg/l, describe in (b). Analysis by GC. b. Limit sum of all species present, listing individual species that are identified. Analysis by GC. Ambient standard of 1.0 µg/l. 2. <u>Unchlorinated</u> a. Limit all as "total phenolics" by 4 AAP. Ambient standard is 5.0 µg/l.

Silver (ionic)	The chemistry of silver is complex. There is no approved analytical procedure for this form. Dependent on the type of silver compound which is present, it is possible the silver can dissolve (and be present in the ionic form) in surface waters at concentrations approximating the standard of 0.1 µg/l. However, ionic silver is very reactive and it complexes readily with other available ions. Under these circumstances, it is highly unlikely that the water quality standard would be exceeded when the discharge is at technology-based effluent limitations.	A chronic water quality-based effluent limit will not be developed. Technology-based limits will be applied and expressed as total silver. An acute water quality-based effluent limit (Class D) will be developed and applied if it is more stringent than the technology-based effluent limit. Where water quality concerns are suspected, professional judgement may be exercised and an effluent limit expressed as dissolved silver using the numeric ionic standard.

Attachment 1

Chlorine Standard
Interim Guidance for Application

The total residual chlorine standard will be applied using the mass balance principle assuming complete mixing of the effluent with the receiving water at the point of discharge. Dependent on site-specific conditions, a mixing zone using less than the entire stream flow or width may be computed.

1. FRESHWATER STREAMS

Effluent limits will be developed using the following procedure:

a. For discharge situations with less than 30:1 dilution:

1. Alternative practices or dechlorination should be required for new and/or modified facilities required to disinfect and/or facilities which apply chlorine for other purposes.

2. For existing discharges, the permit writer may allow continued chlorination if facility records demonstrate that the water quality based TRC can be regularly met. Further, if the chlorine is applied for disinfection, effective bacterial kill must also be demonstrated at the water quality based effluent limit.

If these conditions cannot be confidently verified, an alternate to chlorination (or dechlorination) should be required.

b. For discharge situations with dilution greater than 30:1 but less than 80:1, a TRC limit will be calculated using the water quality standard times the dilution times a factor of five (5).

Water Division responsible technical staff should make a judgement as to whether the water quality based TRC can be consistently met by the discharging facility and that effective disinfection or other process need will be accomplished.

If a positive finding is not possible, alternate processes or dechlorination is recommended.

c. For discharge situations with dilution greater than 80:1, water quality based effluent limits will not be specified.

Available dilution is to be determined under critical low flow (MA7CD10) conditions. The effluent limit is to be specified as a daily maximum.

Rationale

In the Spring of 1991, the Department (Water and Fish and Wildlife Divisions) completed a field study and evaluation of the fate and impact of chlorine disinfection upon aquatic life from treated wastewater discharges to freshwater streams. Coupled with literature review, key findings are:

1. A rapid decay of residual chlorine upon discharge to a waterbody takes place during warm weather periods. Based on available information, a five-fold across-the-board reduction is assumed.

2. The decay factor diminishes with temperature as does chlorine toxicity. A reasonable presumption has thus been made that these two factors will effectively offset each other, with the result that an 80:1 dilution would protect aquatic life under the proposed chlorine standard at as high as 2.0 mg/l effluent TRC.

   80 x 5 ug/l x 5 (decay factor) = 2000 ug/l = 2.0 mg/l

3. Discharges to streams with dilution ratios of 30:1 or less would be allowed no more than 0.5 mg/l considering the factors noted above. At this maximum concentration, effective disinfection becomes questionable; hence the recommended alternative disinfection or dechlorination to meet the conflicting needs of adequate disinfection and aquatic life protection.

   Note that this recommendation extends to facilities which apply chlorine for purposes other than wastewater disinfection as the same principles apply.

2. LAKES

A dilution ratio of 10:1 will be applied unless a site-specific diffusion study has been conducted which shows that actual dilution is different. Water quality based effluent limits will be developed applying the standard times an appropriate dilution factor times a factor of five (5).

Lake discharge facilities practicing chlorination will be treated the same as freshwater stream dischargers in accord with the guidance set forth above for the various dilution ratios.

Rationale

The factor of five (5) was derived from review of literature information and takes into account the rapid decrease in free and combined residual chlorine in ambient waters resulting from reaction with organic matter and other naturally occurring chemical constituents. Application of the factor is supported by the findings of the Department's recent study of chlorine in ambient waters.

3. Freshwater Notes

a. This interim guidance will be followed by normal TOGS development.

b. The interim guidance supersedes the May 11, 1984 memo by Mr. Pagano regarding chlorine standard application.

c. Since the limit for detection of chlorine is currently 0.10 mg/l, effluent limits established under SPDES permits will be set at or above this limit.

4. Freshwater Variance

Dischargers may provide site-specific information regarding the impact of chlorine disinfection upon the protection of aquatic life to demonstrate reasonable variance from the above guidance.

5. Marine Waters

The Division is currently considering guidance beyond technology limits for implementation of the proposed chlorine standard.