Water Quality Standard Guidance	**Legal and Technical Basis for Nutrient Target Values Used in TMDL Projects**	
4 **Final**	Statutory references: ORC Sections 6111.03, 6111.041 Rule references: OAC rules 3745-1-04 (E), 3745-1-07(A)(6), 3745-1-07 Table 7-10, 3745-2-12	Ohio EPA, Division of Surface Water Revision 0, November 27, 2000
This internal guidance does not affect the requirements found in the referenced rules or statutes.		

Note: The user of this guidance should be familiar with the Ohio EPA technical report *Association Between Nutrients, Habitat, and the Aquatic Biota in Ohio Rivers and Streams* (Ohio EPA 1999). Familiarity with this technical report is important when selecting nutrient targets.

Background

The establishment of instream numeric targets is a significant component of the total maximum daily load (TMDL) process. The numeric targets serve as measures of comparison between observed instream conditions and conditions that are expected to restore the designated uses of the water body. The TMDL identifies the load reductions and other actions that are necessary to meet the target, thus resulting in the attainment of applicable water quality standards. Numeric targets are derived directly or indirectly from narrative or numeric water quality standards contained in Chapter 3745-1 of the Ohio Administrative Code (OAC).

This guidance summarizes Ohio EPA's authority for regulating the discharge of nutrients and developing TMDL implementation plans for nutrients, focusing on nitrogen and phosphorus in river/stream environments. This guidance was written at this time to address the immediate need to regulate discharges of nutrients through the TMDL program.

U.S. EPA has identified state adoption of numeric water quality standards for nutrients as a priority and is in the process of developing recommendations. The recommendations under development address phosphorus, nitrogen, chlorophyll a and turbidity in rivers/streams, lakes/reservoirs, estuarine/coastal and wetlands. Adoption of specific numeric water quality standards for nutrients in Ohio rules is probably two to four years away. In the meantime, the existing water quality standards provisions can be used to regulate the discharge of nutrients. The existing rule requirements for nutrients are general in nature and, therefore, must be applied on a case-by-case basis.

The following sections summarize the existing Ohio rule provisions that should be considered when developing TMDLs for nutrients and offer guidance on the selection of nutrient targets in TMDLs.

Ohio Administrative Code (OAC) Rule Requirements

Paragraph (A) of OAC 3745-2-12 requires that TMDLs be established and implemented through TMDL implementation plans that address attainment of applicable water quality standards.

Water quality standards are contained in OAC Chapter 3745-1. The water quality standards for nutrients can be grouped into two categories: 1) prevention of nuisance conditions; and 2) prevention of biological community impairment. These categories are explained below.

Prevention of Nuisance Conditions

OAC 3745-1-04 prohibits, where practical and possible as determined by the director, discharges of nutrients in concentrations that create nuisance growths of aquatic weeds and algae. The term nuisance growth is not defined in Chapter 3745-1. Growths of aquatic weeds and algae are commonly considered nuisances when they interfere with the use of a water body. Nuisance growths that interfere with the use of a water body are those that directly inhibit recreational uses like fishing or swimming, or produce a noxious odor or taste in drinking water. The concentrations of nutrients that result in nuisance growths of aquatic weeds and algae vary from water body to water body due to physical and hydrological factors including the flow volume, the amount of direct sunlight reaching the water body, the quality of the physical stream habitat, and the mode of nutrient delivery to the water body.

Table 7-10 of rule 3745-1-07 specifically limits phosphorus "to the extent necessary to prevent nuisance growths of algae, weeds, and slimes that result in a violation of the water quality criteria set forth in paragraph (E) of rule 3745-1-04 of the Administrative Code or, for public water supplies, that result in taste or odor problems. In areas where such nuisance growths exist, phosphorus discharges from point sources determined significant by the director shall not exceed a daily average of one milligram per liter as total P, or such stricter requirements as may be imposed by the director in accordance with the international joint commission (United States-Canada agreement)." The limit for phosphorus currently established by the International Joint Commission for municipal waste treatment facilities discharging more than one million gallons per day within the Lake Erie drainage basin is 0.5 mg/l (IJC 1987, Annex 3).

Prevention of Biological Community Impairment

Nutrients can interfere with an aquatic life use by lowering the quality of the biological communities through the process commonly known as eutrophication. Determination of current use attainment is based on a comparison of biological scores to the appropriate numeric biological criteria in OAC 3745-1-07. Likewise, the success of any implementation actions resulting from the TMDLs will be evaluated by observed improvements in biological scores. OAC 3745-1-07(A)(6) states that the biological criteria in Table 7-14 of rule 3745-1-07 are used to determine attainment of the warmwater habitat, exceptional warmwater habitat and modified warmwater habitat aquatic life uses. When the biological criteria are not met in a water body, the Agency has the responsibility to identify the causes of nonattainment and implement regulatory approaches to allow the water body to come into attainment.

Selection of Nutrient Targets

Nutrient targets used in the TMDL process are determined on a case-by-case basis. The TMDL project team should consider stream survey results and other available information to determine if nuisance conditions and aquatic life use impairment exist. Options available include the following:

Option 1

The nuisance provisions of rule 3745-1-04 and Table 7-10 of rule 3745-1-07 can be applied alone or in combination with the other provisions of rule 3745-1-07 described under Option 2.

Phosphorus
For situations in which a nuisance condition has been identified (which in Table 7-10 means a nuisance growth of algae, weeds and slimes or, for public water supplies, taste or odor problems), phosphorus limits for dischargers determined to be significant must not exceed a daily average of 1.0 mg/l. For significant dischargers in the Lake Erie drainage basin, phosphorus limits of 0.5 mg/l may be imposed. Table 7-10 and rule 3745-1-04 allow the imposition of more restrictive phosphorus limits on a case-by-case basis if determined to be necessary to prevent nuisance conditions.

Nitrogen
There are no numerical nitrogen criteria in OAC 3745-1 that address the prevention of nuisance conditions. Rule 3745-1-04 limits nitrogen to the extent necessary to prevent nuisance growths of aquatic weeds and algae. Nitrogen limits necessary to prevent nuisance conditions must be determined on a case-by-case basis.

OAC 3745-1 contains several numerical water quality criteria for nitrogen based on toxicity effects. They are summarized in Table 1. These criteria, however, may not be restrictive enough to prevent nuisance conditions.

Table 1. Numeric water quality criteria for nitrogen in OAC 3745-1

Water Body	Chemical	Criterion	OAC 3745-1 Citation
Aquatic life habitats	Ammonia-nitrogen	varies with temp. and pH	Tables 7-2 to 7-8
Public water supplies	Nitrate-nitrogen	10 mg/l	Table 7-9
Agricultural water supplies	Nitrates + nitrites	100 mg/l	Table 7-11
Ohio River	Nitrate-N + nitrite-N	10 mg/l	Table 32-1
Ohio River	Nitrite-nitrogen	1.0 mg/l	Table 32-1
Ohio River	Ammonia-nitrogen	varies with temp. and pH	Table 32-2

Option 2
The use of specially developed nutrient targets may be appropriate under the biological criteria provisions in OAC 3745-1-07 in the following situation, taken from OAC 3745-1-07(A)(6)(b):

> "Where the designated use is attainable and the cause of the nonattainment has been established, the director shall, wherever necessary and appropriate, implement regulatory controls or make other recommendations regarding water resource management to restore

the designated use. Additional regulatory controls shall not be imposed on point sources that are meeting all applicable chemical-specific and whole-effluent criteria unless:

(i) The point sources are shown to be the primary contributing cause of the nonattainment;

(ii) The application of additional or alternate treatment or technology can reasonably be expected to lead to attainment of the designated use; and

(iii) The director has given due consideration to the factors specified in division (J) of section 6111.03 of the Revised Code."

Division (J) of section 6111.03 of the Revised Code requires that, when establishing water quality based permit limits, the director "shall give consideration to, and base the determination on, evidence relating to the technical feasibility and economic reasonableness of removing the polluting properties from those wastes and to evidence relating to conditions calculated to result from that action and their relation to benefits to the people of the state and to accomplishment of the purposes of this chapter."

Intermediate nutrient targets are available to complement the biological criteria and to help evaluate the impact of nutrient loadings. These target concentrations are identified in a technical report (Ohio EPA 1999). The values in the technical report represent "no affect or no impact" based concentrations that have been associated with measured biological criteria and aquatic life use attainment. In most situations, higher concentrations can reasonably be expected to carry an increasing risk of impaired biological communities and failure to attain the respective aquatic life use. However, the values in the technical report are only suggested guidelines, and a variety of factors must be considered in selecting a specific nutrient target used in the TMDL process. These factors include:

Some waters attain aquatic life criteria at higher concentrations - this fact is evident in the technical report (Ohio EPA 1999) and requires that a variety of physical and hydrological factors be evaluated on a case-by-case basis prior to setting a target level.

Location of project with respect to ecoregion - consult the technical report (Ohio EPA 1999) and assess if higher of lower targets may be appropriate.

Stream habitat conditions - unusually low or high physical habitat quality will influence nutrient impacts on aquatic life; adjust the targets accordingly.

Stream flow conditions - impairment of the aquatic life use caused by nutrients is exacerbated on wastewater effluent dominated streams (high percentage of wastewater during low flow periods).

Because the values in the technical report are initial target concentrations only and are not codified in regulations, there is a certain degree of flexibility as to how they can be used in a TMDL setting. A TMDL must be flexible in its consideration of load reduction, habitat improvements, the degree of wastewater effluent flow predominance, and other features that determine attainment of biological criteria. As provided in paragraph (E) of rule at 3745-2-12,

TMDL nutrient targets may allow for a phased reduction towards the selected target in recognition of such factors as habitat restoration efforts, technical feasibility, treatment costs, and the possibility of achieving aquatic life use attainment at concentrations in excess of the target value.

References

Ohio EPA. 1999. Association Between Nutrients, Habitat, and the Aquatic Biota in Ohio Rivers and Streams. Ohio EPA Technical Bulletin MAS/1999-1-1. January 7, 1999. 70 pp.

International Joint Commission. 1987. Revised Great Lakes Water Quality Agreement of 1978 as amended by Protocol signed November 18, 1987. 84 pp.

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