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Memo

*****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.

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Subject: Division of Water Technical and Operational Guidance Series (1.3.1)

TOTAL MAXIMUM DAILY LOADS AND WATER QUALITY-BASED EFFLUENT LIMITS

(Originators: Albert W. Bromberg and Quality Allocation & Plans Section staff)

NOTE: AMENDMENTS TO THIS TOGS WHICH SHOULD ALSO BE CONSULTED are TOGS 1.3.1.A, B, C, D and E. Also, see the Attachment A listing of additional TOGS.

PURPOSE

The purpose of this guidance is to describe the analysis used to determine if a waterbody will meet water quality standards. The analysis is called the total maximum daily load (TMDL) process which is required by Section 303(d) of the Clean Water Act and described in 40 CFR Part 130 and EPA guidance. New York State water quality standards and designated uses are contained in the water quality regulations (NYCRR, Parts 700-705). Surface water classifications for individual waterbodies are contained in NYCRR Parts 800-941.

The TMDL process is used to integrate and evaluate all potential sources of a pollutant. It is applied to an entire watershed or drainage basin whenever possible, but may also be applied to waterbody segments with individual or multiple pollutant sources. Other water quality management planning activities can satisfy the requirements of TMDLs. These activities include lakewide management plans, remedial action plans, hazardous waste site remediation activities, lake restoration projects or other state or local water quality management planning actions.

Appendix A is a list of Division of Water Technical and Operational Guidance Series (TOGS) which describe other elements of the SPDES permit development process.

GENERAL DISCUSSION

The Division of Water is implementing a Toxics Reduction Strategy which is committed to the application of the TMDL process using numeric, pollutant-specific water quality standards through the **Watershed Approach.**

The TMDL process is a water quality-based approach to implementing water quality standards. It provides for the establishment of allowable loadings of pollutants which can be allocated among pollutant sources. Appendix B describes the elements of the TMDL process.

The TMDL process is a rational method for assessing pollution problems and developing integrated water quality protection strategies. It can be applied to areas as large as an entire river basin/watershed, a sub-basin within a watershed, or a waterbody segment. The analysis is carried out separately for each pollutant. It allows for the consideration of all sources of the pollutant including point sources, nonpoint sources, atmospheric deposition and natural background. Dependent on the complexity of the issue and the amount of data available, the analysis can be relatively simple such as a desk-top, mass balance calculation or it can be exacting and detailed by using complex, multidimensional water quality models.

Analysis of water quality situations using the TMDL process can be conducted in stages or "phases". The first phase TMDL, if properly calibrated and verified, may be adequate to generate final permit limits. If calibration/verification is not satisfactory, the TMDL analysis is used to identify additional data needs for subsequent “phased” TMDL analyses.

Under the phased approach, the TMDL process provides for the calculation of point source wasteload allocations (WLA) and nonpoint source load allocations (LA) while applying appropriate margins of safety to meet water quality standards. The allocations are based on estimates which use available data and information, but the collection of additional data may be required. The phased approach provides for assigning pollutant load reductions while additional data collection and analysis are undertaken. The margin of safety applied to the TMDL under the phased approach should reflect the uncertainty in the analysis relating loadings to receiving water quality.

The TMDL process serves a dual function in the permit development process. It also provides the basis for a "reasonable potential" analysis; that is, does the proposed discharge of a pollutant have the reasonable potential to cause or contribute to a an excursion of water quality standards. If the answer is "yes", the TMDL process is then used to determine the WQBELs for all sources of that pollutant to assure compliance with water quality standards. If the analysis indicates the answer is "no", the watershed or waterbody segment is <u>not</u> water quality limited for that pollutant. Discharge loading information to support the reasonable potential analysis is generated using procedures in TOGS 1.2.1 - Industrial Permit Development and TOGS 1.3.3 - SPDES Permit Development for POTWs.

The TMDL process provides for the inclusion of background concentrations of a pollutant in the analysis. This compensates for the consideration of "intake credits" and "no net discharge" requirements for some pollutants.

The generic elements or steps of a TMDL analysis for a watershed or waterbody segment includes the following calculations and assessments.

- Calculate the loading capacity of the waterbody using the most stringent, applicable water quality standard and critical flow condition.

- Establish a baseline pollutant inventory for all known pollutant sources.

- Establish the pollutant environmental fate assumptions to be applied.

- Identify the margin of safety (MOS) to be applied taking into consideration the uncertainties and conservative assumptions incorporated into the analysis.

- Make the "reasonable potential" determination by comparing the calculated loading capacity to the baseline pollutant inventory load.

- Identify pollutant sources subject to wasteload/load allocation in the watershed/waterbody segment and conduct the allocation.

- Calculate individual discharge wasteload/load allocations based on critical point of discharge conditions.

- Calculate WQBELs based on the more stringent of the watershed or the point of discharge wasteload/load allocation.

- Establish ambient/source monitoring requirements to verify/validate the TMDL analysis or conduct subsequent "phased" TMDL analyses.

GUIDANCE FOR TOXIC SUBSTANCES - NYSDEC APPLICATION OF THE TMDL PROCESS

The Division of Water has been using the phased TMDL approach in permit limit development for the control of toxic substances. Since the early 1980's, the loading capacity for specific pollutants has been determined for each drainage basin. Water quality-limiting segments and pollutants have been identified, TMDLs, wasteload allocations and load allocations have been developed, and permits with water quality-based effluent limits have been issued.

The following **principles and conditions** should be applied when conducting a watershed/basin TMDL analysis for a specific pollutant.

a) Toxic substances should be assumed to be conservative; that is, a substance which enters a waterbody remains in downstream segments unaffected by reactive or mechanical forces (i.e., no losses due to biological or chemical degradation, adsorption, volatilization or settling).

b) The TMDL analysis should be conducted under critical low flow conditions. The 7 day, 10 year low flow (7Q10) is applied when assessing aquatic life protection, and the 30 day, 10 year low flow (30Q10) is applied for human health protection of drinking water sources.

c) Ambient water quality data representative of background pollutant concentrations are included in the TMDL analysis. This data may reflect contributions from nonpoint sources.

d) Nonpoint sources are incorporated into the TMDL analysis when measured or calculated loads are available and relevant.

e) Water quality standards, guidance values and procedures for deriving criteria are found in NYCRR Parts 700-705 and TOGS 1.1.1. In the absence of a water quality standard or guidance value for a substance that is known or believed to be present in an effluent, an ambient screening value should be estimated for the purpose of conducting the “reasonable potential” analysis as described in this guidance.

f) Stream classifications and best uses for waterbody segments are found in NYCRR Parts 800-941.

g) A WQBEL for the protection of aquatic life should be stipulated as a daily maximum. This provides protection for sensitive aquatic life stages.

h) A WQBEL for the protection of human health should be stipulated as a monthly average.

i) The **allocation method** used to develop WQBELs in water quality- limiting situations should be the reduction of each source on an equal percentage basis. Other allocation methods may be applied where appropriate. De minimus sources may be excluded from the allocation process.

j) The background concentration of a specific pollutant should be determined by evaluation of available ambient monitoring data. When no data are available, and there are no known sources of the pollutant, the background concentration should be assumed to be zero.

k) Uncertainties consistent with the concept of the margin of safety have been accounted for by:

- conducting the analysis under MA7CD10 flow (the low flow which, on a statistical basis, is exceeded 99.8% of the time).

- assuming that point sources are discharging at 100% of permitted loads.

- treating toxic pollutants as conservative substances.

If appropriate, a separate and distinct margin of safety (MOS) may be incorporated in the TMDL analysis as a percentage of the calculated loading capacity (LC).

l) When deriving a water quality-based effluent limitation from a surface water standard or guidance value, factors which include, but are not limited to, analytical detectability, treatability, natural background levels and the waste assimilative capacity of the receiving waters may be taken into account.

In situations where insufficient information is available, a phased TMDL may be developed. A phased TMDL includes water quality-based effluent limits which incorporate a schedule for additional data collection (ambient water quality, point and nonpoint loads), and additional modeling. The effluent limitations developed under these conditions may be considered a final effluent limitation for this phase of the TMDL analysis. Subsequent analyses (future phases) may result in refinements and/or adjustments to effluent limitations.

m) The TMDL analysis may be conducted at flow conditions greater than "low" flow such that loads other than from point sources can be included in the evaluation. To undertake this type of analysis, a definitive relationship between rainfall intensity, stream flow and pollutant loading should be established. In most situations, the data needed to define this relationship simply do not exist. Where ambient data and desk top analyses indicate that sources other than point sources are contributing to water quality standard excursions, an attempt should be made to conduct an integrated TMDL analysis.

n) The need for considering whole effluent toxicity testing should be based on the following factors, as appropriate:

- The presence of substances for which ambient water quality criteria do not exist.

- High natural background concentrations of a substance relative to water quality criteria such that allocation procedures cannot be applied.

- The presence of substances for which water quality-based effluent limits are below analytical detectability.

- The possibility of complex or synergistic interactions of chemicals.

- Observed detrimental effects on the receiving water biota.

o) Municipalities which are managing industrial waste pretreatment programs should be considered for whole effluent toxicity testing requirements. The number and type of industrial discharges to the municipal system in addition to the factors in item l) above should be reviewed in making a final toxicity testing monitoring determination. As with all other dischargers required to perform whole effluent toxicity testing, municipalities should also be required to perform toxicity reduction evaluations should effluent toxicity be demonstrated. It should be noted that whole effluent toxicity testing at municipal facilities should be performed on wastewater prior to disinfection particularly if chlorine is the disinfectant used.

p) When a discharger withdraws water from the same waterbody into which the treated effluent is discharged, "intake credits" may be established to account for concentrations of substances present in the water intake.

q) Seasonal water quality-based effluent limits may be developed, where appropriate.

r) A WQBEL resulting from the "phased" TMDL process for a given toxic substance should remain fixed for a practical time period (a few years or longer) to facilitate implementation of administrative permitting procedures. A "next phase" TMDL analysis should be conducted when significant changes occur. Examples of "significant" changes are changes in water quality standards, upgrades in receiving water classification, updated source loading data, updated ambient monitoring data, better modeling techniques, etc.

s) Chronic and Acute Mixing Zones

The presence of a mixing zone in a receiving water is accepted as a normal and expected consequence of a wastewater discharge. A mixing zone is that portion of the receiving water body which either surrounds or is immediately downstream of a point source discharge and where the concentration of the discharged material is progressively diluted by the receiving water until, at some distance from the discharge point, the applicable water quality criteria are satisfied. Thus, by definition, mixing zones are areas where water quality standards for individual pollutants are expected to be exceeded, potentially impairing habitat usability for fish and benthic communities. Toxic conditions would not occur outside the mixing zone. Mixing zone assessments should be conducted and are intended to assure that safe fish passage is maintained and that the overall biological integrity of the receiving water is protected.

The first step in a mixing zone assessment involves the gathering of site-specific information (e.g. - outfall location and configuration, receiving water depth and velocity, etc.) so that the size and shape of the mixing zone, along with the relative quickness and completeness of the mixing, can be appraised.

If <u>mixing is determined to occur relatively quickly,</u> the chronic and acute mixing zone principles described below should be applied.

1. <u>Streams and Rivers</u>

a. <u>Chronic Mixing Zones</u>

100% of the critical low flow (7Q10 or 30Q10) should be applied to chronic aquatic, wildlife and human protection criteria.

Wildlife and human protection criteria are developed based on lifetime exposure; therefore, the establishment of a zone of passage is not pertinent. If water supply intakes or sensitive wildlife areas are present in the vicinity of a wastewater discharge, additional precautions should be taken.

Allowing full mixing when using chronic aquatic criteria is expected to have only minimal impacts, and then only when the flow of the receiving stream approaches the 7Q10 flow. The duration of the minimal impacts should only last as long as the low flow condition persists.

b. Acute Mixing Zones

50% of critical low flow (7Q10) should be utilized for acute aquatic protection criteria. This will provide for an adequate zone of passage.

2. Overlapping Mixing Zones

If mixing zones from two or more proximate sources interact or overlap, the combined effect should be evaluated using the principles of the mixing zone assessment.

3. Large Flow Rivers

For large rivers, such as the Niagara and the St. Lawrence, application of a percentage of critical flow is not appropriate. For these rivers, a 100:1 and 50:1 dilution ratio for chronic and acute aquatic criteria, respectively, should be used as the limiting conditions for mixing zone assessments.

Outfall or stream conditions may be such that rapid and complete mixing is not possible. If mixing is determined to be incomplete, additional analyses should be undertaken. Using plume modeling techniques to calculate mixing zones, the following guidelines should be applied using best professional judgement.

- If no dilution is available (intermittent flow stream), standards should become end of pipe limits.

- If mixing is incomplete, mixing zone dimensions should have the following limitations:

  - streams and rivers
    chronic criteria - mixing length to be no more than 20 times the stream width.
    acute criteria - 50% of the cross-sectional area at the mixing length which is no more than 20 times the stream width.

  - inland lakes, reservoirs, estuaries and estuarine embayments
    chronic and acute criteria - 10:1 dilution or 10% of the volume, area or cross-section or site specific diffusion study or dispersion model analysis when available.

- Lakes Erie and Ontario
  chronic and acute criteria - 10:1 dilution

The analysis described above constitutes a mixing zone demonstration under procedure 3.F of the Great Lakes Guidance. Rapid mixing of a discharge with the receiving water is encouraged. The permittee is given the opportunity to submit outfall structure proposals to enhance mixing. If the outfall alterations result in rapid and complete mixing, the principles of paragraph 1. and 2. may be applied. The discharger may conduct additional analyses to develop an independent mixing zone demonstration.

t) When developing TMDLs for pollutants which are not conservative, the application of steady state or time variable dynamic modeling may be necessary for the establishment of WLAs and WQBELs.

GUIDANCE FOR OXYGEN DEMANDING SUBSTANCES

In terms of dissolved oxygen, the waste assimilative capacity of a waterbody reach or segment is determined by the use of mathematical water quality models. The models applied may range from simple, single system, steady state, mass balance desk-top computations to complex, time variable, non-conservative, multi-system, computer generated solutions.

Whenever possible, these models are calibrated and verified using physical and chemical stream survey data. The following factors should be considered, where appropriate, in model development:

water body advection	sediment oxygen demand and rate
water body diffusion	reaeration
carbonaceous oxygen demand and rate	photosynthetic oxygen production
nitrogenous oxygen demand and rate	aquatic plant respiration

The following principles apply to waste assimilative capacity determinations:

1) Unless source-specific data are available, non-point source loads are considered to be part of the background organic load

2) Analyses are conducted using the critical stream flow, i.e. the minimum average 7 consecutive day flow at a recurrence interval of 10 years (MA7CD10).

3) In regulated streams (controlled flow), 30% of the waste assimilative capacity is withheld as a safety/reliability factor. Flow regulation produces an artificial flow regime which prolongs periods of low flow for much longer periods than would occur naturally (i.e. the MA7CD10).

4) The temperature should be the average which can reasonably be expected to occur in the water body at the MA7CD10 flow. Unless it can be demonstrated otherwise, a critical temperature of 25°C will be used for non-trout waters and 24°C will be used for trout waters.

5) Complete mixing will typically be assumed for discharges to free flowing streams and rivers. For discharges to lakes, estuaries, estuarine embayments and the open ocean, site-specific data on waste dispersion is desirable. When dispersion information is not available, generic diffusion models can be applied. When site-specific data or dispersion models are not available, a 10:1 dilution ratio can generally be used as an approximation of an allowable mixing factor.

6) Hydroelectric power facilities should be reviewed from the standpoint of impact on the stream flow and waste assimilative capacity. The primary water quality parameter of concern is dissolved oxygen. The proposed project should not be allowed to alter stream flow and/or cause water quality standards violations.

The waste assimilative capacity analysis results in the designation of a water body segment as either "effluent limiting" or "water quality limiting." By definition, water quality standards for effluent limiting segments can be met through application of technology-based treatment requirements by industry and secondary treatment requirements by municipalities. For water quality-limiting segments, greater than technology-based/secondary treatment requirements are generally necessary. Treatment levels should be determined by the allocation of the waste assimilative capacity among the affected dischargers.

The following **principles and conditions** are considered in the waste assimilative capacity/wasteload allocation process:

1) When two or more discharges contribute to the violation, the incremental wasteload reduction should be proportioned according to the relative contribution to the dissolved oxygen deficit at the point of the violation. Before final allocations are assigned to affected discharges, consideration should be given to the degree of treatment required and the cost associated with that treatment.

2) When a new or expanded discharge to a waterbody segment causes that segment to be water quality limiting, a revision to the water quality management plan for the watershed should be prepared. The plan will present alternative wasteload allocation scenarios to achieve water quality standards. The plan should be made available for public review and comment before a final wasteload allocation is chosen and permit modifications are issued.

3) Water quality-based effluent limits should generally apply for the period June 1 through October 31, unless known conditions of wasteload variation, streamflow,

temperature or reaction kinetics indicate that such limits should apply for a different time period. Analyses may be conducted for other non-critical periods to determine if more or less stringent (seasonal) limits are appropriate. In no case should effluent limits be less stringent than those applicable to technology-based requirements or secondary treatment.

4) Water quality-based effluent limits for oxygen demanding substances should generally be expressed as time weighted averages, usually of 7 or 30 day duration. The duration of the averaging period should be determined by the specifics of the modeling analysis and/or the dilution available.

5) Small discharges of domestic waste to intermittent streams should be recognized as special water quality-limiting situations. (Also refer to TOGS 1.3.1.B) An intermittent stream is typically defined as one that: 1) periodically goes dry, or 2) has an MA7CD10 streamflow of less than 0.1 cfs as estimated by methods other than continuous daily flow measurements. In situations where continuous measurements are available, the MA7CD10 streamflow estimate based upon those measurements along with a critical review of site specific stream information (i.e., physical characteristics, actual quality data, potential as a fishery resource, etc.) should be used in waste assimilative capacity analyses.

Effluent discharges to streams where little or no streamflow is available for dilution should generally be subject to intermittent stream effluent limits (ISEL). These limits, generally recognized as representing the highest degree of treatment that can reasonably be achieved by a wastewater facility treating domestic type waste, should be applied as follows:

BOD5	5 mg/l (as max)
Suspended Solids	10 mg/l (as max)
Dissolved Oxygen	7 mg/l (as min)
Ammonia	Apply water quality standard for aquatic toxicity (as avg or max)
Chlorine Residual	Apply water quality standard for aquatic toxicity (as max)
pH	Appropriate to classification (as range)
Coliform Organisms	As appropriate to the classification
Other Pollutants	Apply water quality standards as appropriate

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<u>Appendix A</u>

ADDITIONAL GUIDANCE (TOGS) RELATED TO SPDES PERMIT DEVELOPMENT

1.1.1	Ambient Water Quality Standards and Guidance Values
1.2.1	Industrial Permit Development
1.3.1	Total Maximum Daily Loads and Water Quality-Based Effluent Limits
1.3.1A	Organic Substances
1.3.1B	Waste Assimilative Capacity Analysis for Discharges to Low and Intermittent Flow Streams
1.3.1C	Development of Water Quality-Based Effluent Limits for Metals
1.3.1D	Waste Assimilation Capacity Determinations for Isolated Wastewater Discharges in Fresh Water Streams
1.3.1E	Permit Limit Development for Certain Parameters
1.3.2	Toxicity Testing in the SPDES Program
1.3.3	SPDES Permit Development for POTWs
1.3.4	BPJ Methodologies
1.3.4A	BPJ Methodologies/Amendments
1.3.6	Phosphorus Removal Requirements for Wastewater Discharges to Lakes & Lake Watersheds
1.3.7	Analytical Detectability & Quantitation Guidelines for Selected Environmental Parameters
1.3.9	PCB Discharge Control (DRAFT)
1.6.3	Combined Sewer Overflow (CSO) Control Strategy

THE TMDL PROCESS

TMDL = WLA + LA + BK + MOS LC

Total maximum daily load (TMDL) -- The sum of the individual WLAs for point sources and LAs for nonpoint sources and natural background. TMDLs are usually expressed in terms of a loading rate, mass per time.

Wasteload allocation (WLA) -- The portion of a receiving water's loading capacity that is allocated to existing or future **point sources** of pollution.

Load allocation (LA) -- The portion of a receiving water's loading capacity that is attributed to existing or future **nonpoint sources** of pollution.

Background (BK) -- The portion of a receiving waters loading capacity that is attributed to **naturally** occurring pollutants.

Margin of Safety (MOS) -- A component of the TMDL that accounts for the **uncertainty** about the relationship between the pollutant loads and the quality of the receiving waterbody. The MOS is normally incorporated into the conservative assumptions used to develop TMDLs (generally within the calculations or models). If the MOS needs to be larger than that which is allowed through the conservative assumptions, additional MOS can be added as a separate component of the TMDL.

Loading capacity (LC) -- The greatest amount of loading that a water can receive without violating water quality standards.

References:

- 40 CFR Part 130, Water Quality Planning and Management
- EPA Technical Support Document for Water Quality-Based Toxics Control, EPA/505/2-90-001, March 1991
- EPA Guidance for Water Quality-Based Decisions; The TMDL Process, EPA/404/4-91-001, April 1991

Appendix C

DEFINITIONS

1. Technology Based Effluent Limit - This is a limit which is necessary to satisfy the technological requirements of the Clean Water Act and NPDES rules and regulations.

2. Water Quality Based Effluent Limit - This is a limit which is necessary to protect the receiving water with regard to its mandated best usages.

3. Effluent Limiting Segments - A designated portion of a water body that will meet applicable water quality standards with the application of technology based treatment requirements by industries and secondary treatment by municipalities.

4. Water Quality Limited Segment - A designated portion of a water body where water quality does not meet applicable standards, or is not expected to meet applicable standards, even after the application of technology based treatment requirements by industry and secondary treatment by municipalities.

5. Background Water Quality - Quality of surface waters unaffected by point source discharges but which may be affected by non-point sources.

6. Effluent Toxicity Testing - Effluent toxicity means the toxicity of the effluent as measured in acute and chronic tests specified in the "Manual for Toxicity Testing of Industrial and Municipal Effluents," NYSDEC, February 1985.

7. Chronic Human Health Criteria - Water quality standards or guidance values applicable to Class A, A-S, AA and AA-S waters at 30Q10 flows.

8. Chronic Aquatic Protection Criteria - Water quality standards or guidance values applicable to Class A, B or C waters at 7Q10 flows.

9. Acute Aquatic Protection Criteria - Water quality standards or guidance values applicable to Class D waters at 7Q10 flows.

REFERENCES

1. Environmental Conservation Law, Article 17, Water Pollution Control.

2. NYCRR, Parts 700, 701, 702, 704; Classifications and Standards of Quality and Purity.

3. NYCRR, Parts 750-757; State Pollutant Discharge Elimination System.

4. NYSDEC Policy and Procedure Manual Item, Title 9100, Water Quality.

Appendix D

ANALYSIS OF THE GLWQI RELATIVE TO THE MIXING ZONE DEMONSTRATION AND THE PROPOSED MIXING ZONE ASSESSMENT

The default mixing zone conditions of Procedure 3. of the GLI should be satisfied by the source specific mixing zone assessment contained in this guidance. The NYSDEC mixing zone assessment uses existing data and accepted analytical techniques to demonstrate that assumptions concerning pollutant dispersion, stream design flow for stream-specific and pollutant-specific conditions, zones of passage, and endangered and/or threatened species are consistent with the requirements described in Procedure 3.D, E and F of the GLI. The NYSDEC should implement procedure 3 through TOGS 1.3.1. A mixing zone assessment as described in TOGS 1.3.1. and the proposed amendments herein satisfies the mixing zone demonstration requirements of procedure 3.F.

Many of the requirements of procedure 3 are already included in TOGS 1.3.1. These include:

! From Procedure 3.D. - Open Waters of the Great Lakes

- Use of 10:1 dilution in lakes.
- Assessment of mixing zones for nonpoint sources on a case by case basis.
- Overlap or interaction of mixing zones.
- Protection of endangered or threatened species.

! From Procedure 3.E. - Tributaries

- Stream design flows.
- Application of dynamic modeling.
- Establishment of the loading capacity of the water body.
- Pollutants are assumed to be conservative.
- Overlap or interaction of mixing zones.
- Maintenance of an acute zone of passage.
- Assessment of dilution under all expected effluent flows.
- Protection of endangered or threatened species.

! From Procedure 3.F. - Mixing Zone Demonstration

- Description of dilution at the boundaries of the mixing zone (size, shape and location of mixing area).
- Definition of the edge of discharge-induced mixing in the open waters of the Great Lakes.
- Provision of a zone of passage.
- Protection of endangered or threatened species.

- Drinking water intake location relative to mixing zones.

- Protection of designated uses (identified in the surface water classification).
- Identification of background water quality concentrations.
- Freedom from floatables, settleables and color/odor/taste (provided for in the surface water classifications/standards).
- Interaction and overlap of mixing zones.
- Pollutant degradation does not occur in the mixing zone.

TOGS 1.3.1. satisfies the remaining elements of Procedures 3.D, E and F in the following ways;

! Acute Aquatic Life Criteria Design Flow: TOGS 1.3.1. uses 50% of the 7Q10 in lieu of the 1Q10. NYSDEC considers this flow, in conjunction with other elements of the TMDL analysis, to be equivalent to the 1Q10 flow.

! Substrate character and geomorphology in the mixing zone; organism attraction to the mixing zone; the promotion of undesirable or nuisance species; species naturally occurring in the mixing zone habitat: These conditions should be assessed using information available from fishery surveys, macroinvertebrate surveys, and chemical/physical monitoring programs conducted by the Department, the permittee, or other private/public entities.

Reference for Mixing Zone Analysis

Mixing Zones and Dilution Policy, USEPA Region VIII, Denver, Colorado, December 1994