91-e31

# GUIDANCE FOR DETERMINATION AND ALLOCATION OF TOTAL MAXIMUM DAILY LOADS (TMDL) IN WASHINGTON STATE

Prepared by

Watershed Assessments Section
Environmental Investigations and Laboratory Services Program
Washington State Department of Ecology
Olympia, Washington 98504-6814

August 1991

TABLE OF CONTENTS

Title . . . . . Page

Introduction . . . . . 1

Identification and Prioritization of TMDL Projects . . . . . 4

Determination of Loading Capacity and TMDL/WLA/LA . . . . . 4

Water Quality Modeling . . . . . 5
TMDL/WLA/LA Development . . . . . 8
Roles and Responsibilities . . . . . 10

Public and EPA Review of TMDL/WLA/LA . . . . . 11

Implementation of TMDL/WLA/LA . . . . . 13

# INTRODUCTION

Section 303(d) of the Federal Clean Water Act requires states to implement water quality-based pollution controls on segments where technology-based controls are insufficient to achieve water quality standards. To meet this requirement, a total maximum daily load (TMDL) must be established for each pollutant violating water quality criteria. The TMDL is then apportioned between point and nonpoint sources as wasteload and load allocations (WLAs and LAs), respectively. Allocations are implemented through NPDES permits, grant projects, and nonpoint source controls. Thus, the TMDL process helps bring problem waterbodies into compliance with water quality standards.

Federal law requires that EPA approve all TMDLs developed by the state. The review and approval process may be streamlined if the state and EPA reach formal agreement on technical and administrative procedures performing TMDLs. The present document outlines the generic process by which Ecology will complete TMDLs and related allocations in Washington.

The complexity of TMDLs may vary from more simple analyses, usually performed by permit managers in the Water Quality Program or Industrial Section, to more elaborate analyses typical of those conducted by the Environmental Investigations and Laboratory Services Program. The more complex TMDLs may involve multiple dischargers, politically sensitive situations, or calibration and verification of sophisticated computer models.

This document is intended to provide guidance to Ecology staff in the establishment of TMDLs and the implementation of WLAs and LAs. Much of the technical guidance contained herein is directed toward more complex TMDL analyses, though the fundamental principles and assumptions should prove useful to permit managers in the development of routine water quality-based permits. Some elements of this guidance are expected to change as Ecology implements the TMDL process and refines its approach. The regulatory framework for TMDL development may ultimately be included in the state's Surface Water Quality Standards (Chapter 173-201 WAC). Modifications of standards may also be required to better quantify the TMDL for a particular waterbody, as was done with the adoption of a phosphorus criterion for the Spokane River TMDL.

Figure 1 is a flow diagram of the TMDL process. Briefly, the procedure consists of identifying and prioritizing waterbodies requiring TMDLs; determining TMDLs , WLAs, and LAs; review by the public and EPA; implementing allocations through point and nonpoint source controls; and monitoring to evaluate if the TMDL/WLA/LAs achieve water quality standards. Roles and responsibilities within Ecology are summarized in Table 1. The various elements of the process are discussed in detail below.

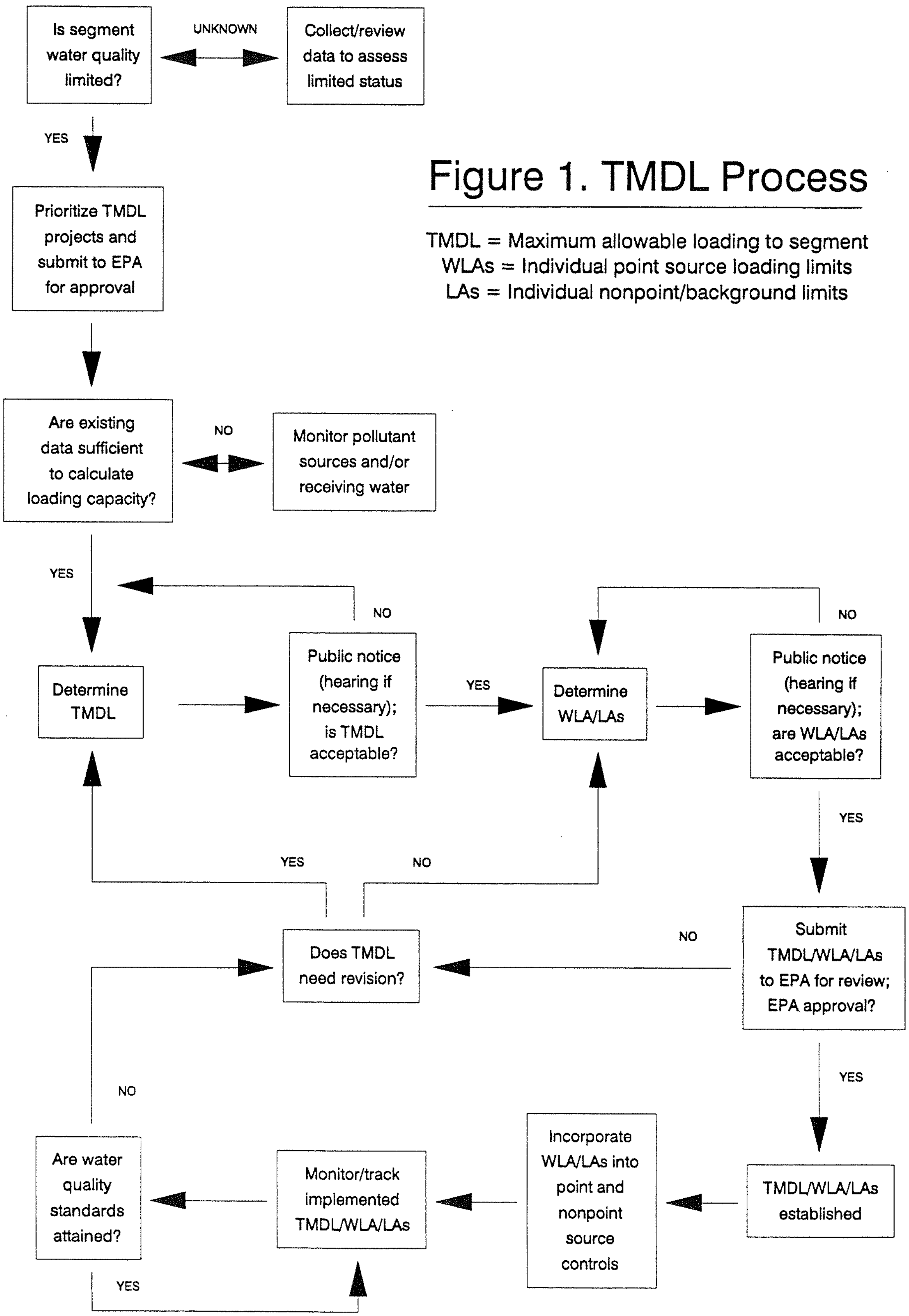
Is segment water quality limited?
UNKNOWN
Collect/review data to assess limited status
YES
Prioritize TMDL projects and submit to EPA for approval
Figure 1. TMDL Process
TMDL = Maximum allowable loading to segment
WLAs = Individual point source loading limits
LAs = Individual nonpoint/background limits
Are existing data sufficient to calculate loading capacity?
NO
Monitor pollutant sources and/or receiving water
YES
NO
NO
Determine TMDL
Public notice (hearing if necessary); is TMDL acceptable?
YES
Determine WLA/LAs
Public notice (hearing if necessary); are WLA/LAs acceptable?
YES
YES
NO
Does TMDL need revision?
NO
Submit TMDL/WLA/LAs to EPA for review; EPA approval?
YES
NO
Are water quality standards attained?
Monitor/track implemented TMDL/WLA/LAs
Incorporate WLA/LAs into point and nonpoint source controls
TMDL/WLA/LAs established
YES

Table 1. Activities and responsibilities within Ecology during TMDL implementation. Roles may vary (e.g., load capacity determination for simple water quality-based permits will often be performed by WQP or IS staff).

| Activity | Responsibility* |
|---|---|
| Monitor water quality statewide | EI |
| Identify water quality limited segments | WQP |
| Prioritize TMDL projects | WQP [EI, IS, WQFAP] |
| Submit prioritized TMDL list to EPA | WQP |
| Determine loading capacity and recommend TMDL/WLA/LA | EI [WQP, IS] |
| Prepare draft TMDL/WLA/LA | WQP, IS [EI] |
| Public review of TMDL | WQP, IS [EI] |
| Allocate loads as WLA/LAs | WQP, IS [EI] |
| Public review of WLA/LAs | WQP, IS [EI] |
| Prepare final TMDL/WLA/LA | WQP, IS [EI] |
| Submit TMDL/WLA/LA to EPA for review and approval | WQP |
| Incorporate WLA/LAs into point and nonpoint source controls | WQP, IS [WQFAP] |
| Monitor implemented TMDL/WLA/LA | EI [WQP, IS] |
| Track TMDL projects | WQP |

* Bracketed groups may assist with particular activity.

EI = Environmental Investigations Section
IS = Industrial Section
WQFAP = Water Quality Financial Assistance Program
WQP = Water Quality Program

## IDENTIFICATION AND PRIORITIZATION OF TMDL PROJECTS

The Clean Water Act stipulates that TMDLs be developed for all water quality limited segments - that is, all waters which do not meet, or are not expected to meet, water quality standards after application of technology-based source controls. The Water Quality Program compiles a list of limited segments biennially as part of the 305(b) statewide water quality assessment. The process for deriving this list is currently being revised, and will be documented in the next 305(b) report. During the 1990 statewide water quality assessment, Ecology categorized 167 segments as water quality limited (Appendix A).

Federal regulations require the state to establish a priority ranking for TMDL projects which considers the severity of pollution and beneficial uses of affected waterways (40 CFR Part 130.7). Ecology's priority ranking may also account for the following: vulnerability of waterbodies to degradation; risks to public health and aquatic life; extent of designated use impairment; timing of grant projects, NPDES permit issuance and renewal, and water quality management plan updates; degree of public interest and support; 304(l) and 319 list priorities; availability of technical support; short-term programmatic needs; court orders and decisions; and national policies and priorities.

The Water Quality Program prioritizes TMDL projects in consultation with Environmental Investigations, the Industrial Section, and the Water Quality Financial Assistance Program. The specific method for establishing the ranking priority is under development by Water Quality Program Staff, and will be documented in the next 305(b) report. Final priority rankings will be submitted to EPA for approval as part of the biennial 305(b) assessment or annual State-EPA agreement. Due to the resource intensive nature of TMDL/WLA/LA work, Ecology may only complete a few complex TMDL projects each year.

The TMDL process provides an excellent means to prevent water quality degradation on relatively clean waterbodies which are potentially subject to significant future development. Ecology may reserve some of its resources for establishing TMDLs on waters which are not presently impaired by pollution discharge, as was done for Lake Chelan. This action is consistent with EPA guidance which recommends that states include threatened good water quality waters in their identification and prioritization of TMDL projects. In the long term, it may be easier and more cost-effective to prevent, rather than remediate, water quality problems.

## DETERMINATION OF LOADING CAPACITY AND TMDL/WLA/LA

The loading capacity of a water quality limited segment must be quantified in order to establish a TMDL. The loading or assimilative capacity is the maximum pollutant load a segment can receive without violating water quality standards. Environmental Investigations conducts technical studies as needed to characterize the quality of limited segments and define their loading capacity. Water Quality Program and Industrial Section permit managers also define loading capacities as they develop water quality-based permits for individual dischargers.

TMDL studies commence with a review of historical information. If existing data are insufficient to determine the loading capacity, additional monitoring is undertaken by Ecology and/or dischargers. All pollutants and sources which are found to be water quality limiting are subject to coverage in the TMDL study. If there are too many parameters to address with existing resources, TMDL development is restricted to those pollutants which contribute to the most significant or widespread water quality problems in a basin. However, the TMDL monitoring program may still include sampling for other parameters as a screen for additional problems.

Water Quality Modeling

Loading capacities may be estimated by a variety of methods, ranging from simple dilution calculations to complex water quality modeling. A list of EPA technical guidance manuals which describe TMDL data collection and evaluation procedures is provided in Appendix B. Environmental Investigations staff generally rely on steady state water quality models to establish loading capacities. Steady state models introduce pollutant loads under constant water quality conditions referred to as "design conditions". The goal is to determine the load which will yield an instream pollutant concentration that meets the applicable water quality criterion and corresponding excursion frequency guidelines.

Environmental Investigations may also use dynamic or quasi-dynamic models to estimate loading capacities. Unlike steady state models, dynamic models predict temporal and spatial changes in instream pollutant concentrations under continually varying water quality conditions. Quasi-dynamic models are intermediate between steady state and dynamic models in that they assume most factors remain constant while one or a few vary with time.

The selection of a particular model for use in a TMDL study depends on the following factors:

- type of waterbody (river, lake, estuary, etc.);
- parameters of concern (dissolved oxygen, toxics, etc.);
- processes to be simulated (stratification, sedimentation, etc.);
- temporal boundaries (steady state vs. dynamic);
- spatial boundaries (near-field vs. far-field; one- vs. two- or three- dimensions); and
- practical constraints (model familiarity, ease of application, and data requirements).

Irrespective of which modeling approach is chosen, the ultimate objective is to protect against excursions in the magnitude, duration, and frequency of water quality criteria.

Environmental Investigations staff have developed simple spreadsheet models to predict dissolved oxygen sags, un-ionized ammonia toxicity, and chemical-specific or whole effluent toxicity in receiving waters which have a single point source discharge. These models are available to permit managers seeking to develop water quality-based effluent limits for individual dischargers (i.e., simple TMDLs).

Environmental Investigations staff perform near-field mixing zone simulations using simple spreadsheet programs, more advanced plume models (e.g., UDKHDEN), and the Cornell Mixing Zone Expert System (CORMIX), which predicts both initial dilution and downstream dispersion of effluent discharged from single- or multi-port diffusers. Among far-field models, Environmental Investigations staff have used the Enhanced Stream Water Quality Model (QUAL2E) for TMDL studies on the Snoqualmie and Puyallup Rivers, and may use the Water Quality Analysis Simulation Program (WASP4) on other systems. Additional models will be tested and applied on TMDL projects as needed (e.g., basin wash-off models for nonpoint source-dominated TMDLs).

Critical design conditions for steady state TMDL modeling are typically dictated by seasonal considerations. Point sources are most often limiting during the summer low flow season when dilution is minimal, and ambient water quality is susceptible to natural warming and deoxygenation. Nonpoint sources are usually limiting during the wet season when surface runoff from the watershed transports pollutants directly to waterbodies.

In rivers, the low flow design condition for steady state modeling is the annual 7Q10, which is the 7-day low flow expected to occur once in 10 years. If the TMDL parameter is based on a two-number criterion, like ammonia and some metals, the 7Q10 and 1Q10 river flows are the design flow conditions for chronic and acute toxicity, respectively. The harmonic mean flow should be used as the riverine design flow for TMDLs involving human carcinogens and other pollutants where bioaccumulation is the primary concern. Wet season design flows are not as standardized, but instead depend on TMDL objectives (e.g., is the fecal coliform loading related specifically to storm events, or to wet season runoff in general?).

In estuaries which are not vertically stratified, the critical near-field dilution condition includes a combination of low water slack at spring tide and design river flow. In estuaries with stratification, a site-specific analysis of minimum and maximum stratification (both at low water slack) is made to determine which scenario results in the lowest dilution. The critical design condition for ambient current velocity should be set at the lowest 10th percentile of historical data, or zero if no data are available. Far-field estuarine problems like nutrient enrichment should initially be approached as tidally-averaged steady state. Far-field estuarine design conditions should also incorporate flushing rates, which account for both tidal exchange and freshwater inflow. Where appropriate, flushing evaluations should include reflux, where a portion of out-flowing wastes are recirculated, thus reducing available dilution. If the TMDL parameter is most problematic during the wet season (i.e., high river flows), the estuarine design should reflect the poorest flushing rate expected during that time period.

Critical design conditions in lakes are dictated by seasonal variations in climate (wind speed and direction, solar radiation), water quantity and quality (lake level, extent of vertical stratification), and loading rates. For example, if the TMDL concerns eutrophication related to excess phosphorus loading from nonpoint sources, then the critical design condition should consider the effect of annual phosphorus loads on the lake water quality during the algal growing season. In lakes, ambient water circulation in response to density gradients will be assumed absent unless persistent currents are documented.

Irrespective of receiving water type (river, estuary, or lake), steady state design conditions for other parameters should be estimated by calculating the most restrictive (high or low) 10th percentile of the best available historical data set. This approach provides a conservative estimate of ambient conditions expected during the design event. Critical design conditions for point sources should be the seasonal or peak design flows and effluent limits specified in wastewater discharge permits. Where two effluent limits are specified for a single parameter, the more restrictive limit should be used as the design condition (e.g., use of weekly instead of monthly BOD limits).

Design events for nonpoint source-dominated TMDLs often represent wet weather, high flow conditions. Important considerations may include rainfall intensity and duration, time lapse since previous rainfall, pollutant accumulation rates, stream flow or tidal flushing magnitude, and land use. Design conditions for nonpoint source loading are not as easily defined as for point sources, and worst-case scenarios should be developed on a case-by-case basis.

If the TMDL for a given pollutant varies with season, the analyst should ensure that the risk of water quality impairment is no higher than that allowed under a nonseasonal program. The recurrence intervals for seasonal steady state design flows can be selected to maintain environmental risk equivalency with annual 7Q10 or 1Q10 flows as follows:

| Time Interval | Annual Risk-Equivalent Return Period (Years) |
|---|---|
| Annual | 10 |
| Semiannual | 20 |
| Quarterly | 38 |
| Monthly | 114 |

For example, if seasonal WLAs or LAs are calculated for six-month periods, then the design flow for equivalent risk (i.e., an annual ten percent risk) would be 7-day or 1-day low flows with 20-year recurrence intervals for each six-month season.

TMDL/WLA/LA Development

After a segment's loading capacity has been quantified, the TMDL can be established. In practice, the TMDL usually equals the loading capacity. TMDLs can be expressed in terms of mass per unit time, concentration, whole-effluent toxicity, or other appropriate measure.

Narrative water quality criteria pose a particular challenge when applied to the TMDL process. In situations involving contamination of fish or shellfish tissue via bioaccumulation, loading limits should be developed by relating contaminant levels in tissue to levels in water using EPA risk assessment methods and bioconcentration factors. The back-calculated water concentrations then provide the basis for water quality criteria determinations and TMDL establishment.

Contamination of sediment is less easily addressed. The ability to relate toxics accumulation in sediments to specific dischargers is often limited by a lack of knowledge concerning: sources of toxicant loading; sediment-water partitioning coefficients; transport and fate of suspended and dissolved materials; historical toxicant deposition in sediments; and the specific chemicals or chemical complexes which regulate toxicity. Until these processes are better understood on both a generic and site-specific basis, waterbodies limited by sediment contamination will be assigned a lower priority for TMDL determinations by the Water Quality Program.

Once established, the TMDL is allocated among point and nonpoint pollution sources as WLAs and LAs, respectively. TMDLs may be apportioned by several means:

- Uniform loading - each source allocated an equal mass discharge per day (or per capita per day, per unit of raw material used, per unit of production, etc.).
- Uniform treatment - each source applies similar treatment technology or discharges equal effluent concentration.
- Uniform reduction - each source reduces individual loading by an equal quantity or percentage.
- Proportional reduction - one or more sources targeted for disproportionate share of load reduction on a basis of magnitude of loading or effect on receiving water.
- Economic feasibility - allocation based on cost effectiveness.
- Pollution reduction trading - point and/or nonpoint sources trade allocations within the loading limits established by the TMDL.

The selection of a particular allocation scheme goes quickly to the issue of equity of economic impact on each pollutant discharger in the TMDL basin. Ecology may have good success with specifying a preferred allocation scheme, such as equal percent removal, on TMDL segments where little growth or change is expected, similar point source dischargers are present, and nonpoint sources are limited and readily controllable. In these ideal cases, all parties would equally share the load reduction burden. However, where there is an expectation of addition or expansion of loading sources, the newer sources may be required to provide a higher level of wastewater treatment or BMP implementation, at least for some well defined, intermediate period. At the end of this period, all allocations should be reassessed for equity and older dischargers may be required to provide additional pollution controls. For example, municipal sewage treatment plants may need to upgrade to advanced waste treatment, or contributors to nonpoint pollution may have to implement more restrictive BMPs.

The choice of an allocation scheme should ultimately be decided on a case-by-case basis, with active participation by affected parties in the TMDL basin. Ecology could explore the advantages and disadvantages of various allocation alternatives through a public participation process, and select the scheme which best addresses site-specific concerns. A hybrid of several allocation schemes may be the most appropriate in some circumstances. Negotiations between affected point source dischargers, regulators, and authorities responsible for nonpoint source controls may be instrumental in achieving desired load reductions.

Most TMDLs will include an LA for largely uncontrollable background sources of pollution, including: natural sources (e.g., fecal coliform loading from wildlife); historic anthropogenic sources (e.g., leaching of metals from mine tailings deposited 50 years ago); and current anthropogenic sources outside of state or federal jurisdiction (e.g., wastes originating in Canada). Background levels can be estimated by locating reference sample sites upstream of other pollution sources, or by using the 10th or 90th percentile of the best available historical data set. Where background sources are somewhat amenable to control, the LA should reflect expected load reductions from remedial actions.

WLAs and LAs may be assigned to both existing and future sources of pollution (40 CFR Part 130.2). Thus a portion of the TMDL may be reserved to accommodate future growth or provide a margin of safety. Allocations for growth should be based on comprehensive plan projections and preferably established through a local basin planning process. Allocations for safety should reflect scientific uncertainty in both the estimation of pollutant loads and the application of water quality criteria. A separate safety allocation is warranted when load estimates are highly variable, pollutant behavior and toxicity are poorly understood (e.g., bioaccumulation), or if the waterbody is judged to be of particular sensitivity or complexity. When uncertainty is low, a small margin of safety can be directly included in the TMDL through use of conservative design conditions; most TMDLs are developed using this approach.

When applied to water quality limited segments, the TMDL process is consistent with the state's antidegradation policy because it ensures that existing beneficial uses are maintained and protected, and prevents further degradation which could interfere with those uses. In the case of non-limited segments (i.e., threatened good quality waters), the antidegradation policy specifies that existing water quality be protected and that additional waste discharges which would reduce water quality be prohibited, unless those discharges are in the overriding interest of the public and are provided with AKART. In other words, TMDLs on non-limited waters cannot allow pollutant discharge to increase to the thresholds defined by state water quality standards, unless the above two conditions are met. If Ecology can demonstrate that lower water quality is necessary for important economic and social development in a TMDL basin, then additional discharges could be permitted, subject to provision of AKART and any limitation imposed by the allocation for future growth. Even then, water quality could not be allowed to degrade below the level necessary to protect existing beneficial uses.

Antibacksliding provisions generally prohibit reissuance of a wastewater discharge permit which contains less stringent effluent limits than the existing permit. Federal law provides exceptions to this in certain cases, for example when new information justifies a relaxation of permit limits. This implies that when an established TMDL is found to be overly protective, discharge limits could be relaxed upon formal revision of the TMDL. However, if the permittee has achieved the more stringent limits through improved treatment, then the treatment upgrade constitutes a new definition of AKART which all existing and future dischargers in the basin would have to meet. In this instance, federal exceptions to antibacksliding provisions are overridden by state law.

Roles and Responsibilities

In general, Environmental Investigations performs the water quality monitoring, data analysis, and modeling necessary to estimate loading capacities, determine TMDLs, and recommend a viable WLA/LA strategy. A TMDL project coordinator in the Water Quality Program or Industrial Section is regularly consulted during this process, and afterward is responsible for evaluating the recommended allocation strategy and exploring other WLA/LA alternatives. Environmental Investigations will provide technical assistance as needed in modeling and evaluating the various WLA/LA strategies. The Water Quality Program or Industrial Section will decide on final allocations after public review, and will ultimately be responsible for TMDL/WLA/LA implementation via permit revision and/or nonpoint control activities.

Determination of loading capacities and TMDLs is also made by permit managers in the course of developing water quality-based effluent limits for single discharge scenarios. Several analyses of this type have been completed, but permit managers were likely unaware that their efforts constituted the simplest form of a TMDL/WLA. Water quality-based permits developed by Water Quality Program and Industrial Section staff should be tracked by the Water Quality Program and submitted to EPA as completed TMDL/WLAs.

When TMDL activities on a waterbody cross Ecology regional boundaries, the several regions involved should reach agreement on TMDL priorities and timing as part of their planning process. Water Quality Program management staff should designate a single region to take the lead on a TMDL project which overlaps two or more regions. The TMDL project coordinator in the lead region is then responsible for ensuring cross-communication between affected regions on all aspects related to TMDL development and implementation.

Where TMDL projects involve significant pollution sources in other states or Canada, EPA Region 10 may be asked to assume a lead role. This approach was used to develop a dioxin TMDL for the Columbia River drainage. Region 10 would solicit input from all affected parties, particularly in the allocation process. Where a consensus of the various jurisdictions cannot be achieved, Region 10 would make the final determination because they are ultimately responsible for approving the TMDL/WLA/LA. If most of the waste loading is generated by one jurisdiction and the remaining jurisdictions have little interest or loading potential, the primary jurisdiction could take the lead on establishing TMDLs and allocating loads. In this scenario, Region 10 would be the final referee, taking the minor jurisdictions' interests into account.

The actual determination of TMDLs will generally not involve other Ecology programs or government agencies directly. However, other programs and natural resource agencies may be actively involved in WLA/LA determinations. For example, the Water Quality Financial Assistance Program may award a grant to a particular conservation district to develop a watershed action plan which implements LAs for nonpoint sources. Local governments and basin planning entities would likely play a key role in allocation decisions, especially in establishing and implementing future growth reserves.

Local, state, and federal agencies are currently expected to verify that the activities they regulate do not violate state water quality standards. Since TMDLs are established to protect standards, it follows that activities regulated by other agencies must comply with existing TMDLs. Ecology should routinely advise lead agencies when a project is proposed near a water quality limited segment. Where TMDLs are already established, Ecology could use the SEPA process to comment on projects that will be required to meet WLAs and LAs. When regulated activities are proposed on limited segments which do not yet have TMDLs in place, Ecology may request that the designated regulatory agency assist in developing TMDLs as part of the SEPA or NEPA process.

## PUBLIC AND EPA REVIEW OF TMDL/WLA/LA

The TMDL project leader within Environmental Investigations should coordinate preparation of a scientific report which presents methods, results, and discussion of water quality studies performed in support of TMDL development. The report should also include a comprehensive review of historical water quality and quantity information from the TMDL basin. The report should document and recommend TMDLs for pollutants of concern, and may present an analysis of several WLA/LA alternatives, although inclusion of allocation strategies will be at the discretion of the TMDL project client in the Water Quality Program or Industrial Section. The draft scientific report is reviewed by the client and revised as appropriate.

The TMDL project leader in Environmental Investigations then prepares an abstract report intended for public and EPA review. The abstract report follows a fixed format that provides a brief description of the TMDL segment(s) and its existing water quality condition; a derivation of TMDLs; an estimate of the percent load reduction that will be required of all sources; recommended WLAs and LAs (if appropriate); and a proposed monitoring strategy for evaluating if the TMDL achieves compliance with water quality standards. The abstract report should be similar in scope and content to the executive summary of the scientific report. After reviewing the abstract report, the client prepares a FOCUS sheet to provide public notice of the TMDL. The Water Quality Program will provide consistency review of both the abstract report and FOCUS sheet.

After internal reviews of the scientific report, abstract report, and FOCUS sheet are completed, the FOCUS sheet is distributed to all persons and organizations on the TMDL project mailing list (including the media). The FOCUS sheet highlights project findings, offers copies of the abstract and/or scientific reports to respondents, and initiates a 30-day review period. If interest is expected to be high, the review period will be extended to include public workshops. EPA Region 10 should be included in the public review phase for informational purposes only; submission of project reports for formal TMDL approval will occur after WLAs and LAs have been assigned.

Upon completion of the public review phase, the abstract and scientific reports are finalized by EILS and the TMDL is considered established. The TMDL project client then evaluates potential WLA/LA strategies and develops a fact sheet which critically reviews allocation alternatives and recommends a single one as optimal. The EILS project coordinator assists in this effort as needed. The client then prepares a second FOCUS sheet which describes the recommended allocation strategy, offers copies of the WLA/LA fact sheet to respondents, and initiates another 30-day review period. Again, the Water Quality Program will provide consistency review of the fact and FOCUS sheets.

The 30-day review period can be extended to include public workshops if there is sufficient interest. Once more, EPA Region 10 should be included in the WLA/LA public review phase for informational purposes only. After the public participation process is completed, the client finalizes the fact sheet and sends it, along with the abstract and scientific reports, to the Water Quality Program, which coordinates transmittal of the three-report TMDL "package" to EPA Region 10 for review and approval.

In summary, the FOCUS sheet serves as the public notice for TMDLs and WLA/LAs. The notice should indicate that public workshops can be scheduled if there is sufficient interest. The public may respond to proposed TMDLs or allocations through either written comment or public hearings. If there is significant interest, a hearing should be held. The question of what constitutes "significant" interest is left to the best professional judgement of the TMDL project client in the Water Quality Program or Industrial Section. A responsiveness summary should be developed if oral and/or written comments are received. The responsiveness summary for draft TMDLs should be prepared by the EILS project leader, while the TMDL project client should respond to comments on the draft WLA/LA. The responsiveness summary should describe any changes to the TMDL or WLA/LA which are planned as a result of public comment. If significant revisions are warranted, the TMDL project client may elect to repeat the public notice process after the revisions have been made. Again, the issue of what constitutes "significant" is left to the best professional judgement of the TMDL project client.

The public participation process will be resource intensive, especially for Water Quality Program and Industrial Section staff. One option for easing this workload is to address TMDL/WLA/LA decisions in conjunction with public involvement in NPDES permitting, grant projects, water quality standards revisions, and basin management plan updates. In these situations, the separate public reviews for the TMDL and WLA/LA may be combined for purposes of efficiency.

## IMPLEMENTATION OF TMDL/WLA/LA

TMDLs become part of the state's overall water quality management plan following review and approval by EPA. TMDLs are implemented through incorporation of WLAs into NPDES permits and LAs into nonpoint source controls. TMDL compliance schedules and monitoring/reporting requirements could be specified in permits, basin management plans, and other planning documents in order to achieve and maintain desired load reductions.

WLAs assigned to individual dischargers form the basis for derivation of water quality-based permit limits. The remaining step is to incorporate measures of effluent variability and exceedance probability. The objective is to establish daily maximum and monthly average permit limits that result in the effluent meeting the WLA under normal treatment plant operating conditions. EPA has provided extensive guidance on this subject (e.g., Technical Support Document for Water Quality-Based Toxics Control).

Ideally, wastewater discharge permits should be modified as soon as WLAs are approved by EPA. However, the workload associated with reopening multiple permits in a TMDL basin may well be prohibitive. Conversely, it makes little sense to develop water quality-based effluent limits and then delay implementation for several years while awaiting permit expiration. A compromise strategy may be to target permits approaching expiration first, with remaining permits being reopened to incorporate WLAs as soon as possible thereafter. The time frame for complete implementation of WLAs will depend on Water Quality Program or Industrial Section priorities, but in the interest of equity, permit managers should strive to revise all permits affected by the TMDL within two years of formal EPA approval. Permits issued in basins where TMDLs are in development should include a general condition which allows for the permit to be reopened in the event of a TMDL/WLA.

The objective of TMDL development on nonpoint-impaired waters is to target priority areas of the drainage for BMP implementation. The TMDL defines the load reduction needed to attain water quality standards, while load allocations (LAs) identify strategies for achieving the TMDL. LAs may prescribe specific BMPs for priority areas, and set measurable goals for implementation (e.g., 50% of BMPs to be in place within two years).

Ecology should implement nonpoint LAs through existing elements of its nonpoint source control program, including cost-sharing or other cooperative agreements with local authorities. For instance, TMDL compliance schedules could be included in grant projects which direct the development of watershed action plans in basins impaired by nonpoint sources. Schedules for LA implementation may often be influenced by interagency policies like the Agricultural MOA and T/F/W Agreement. As an example, consider an LA for a waterbody which receives farmland runoff from several dairies. The LA may identify a load reduction target and possible remedial actions, but the Agricultural MOA dictates that local conservation districts be afforded up to two years to work with affected farmers on development of farm plans and implementation of BMPs. In the case of forest practices, the LA may prescribe that Water Quality Program staff prioritize the review and conditioning of forest practice applications on basins or sub-basins which are subject to a TMDL.

WLAs and LAs should also be factored into Ecology's rating process for awarding grant projects. When grant project applications are ranked, specific emphasis should be placed on point and nonpoint source control projects proposed within TMDL basins. If the project is expected to significantly reduce pollutant loading to the segment of concern, it should be awarded extra points in the grant rating process. Projects which represent the addition of new pollutant loads to a TMDL segment should not be promoted via grant funding unless there is sufficient load capacity available in the receiving water. The WQFAP project manager will coordinate with the Water Quality Program and Environmental Investigations to ensure that grant project design criteria meet all load limitations imposed by the TMDL.

In some instances, TMDL development may be included as a requirement of the grant project. For example, EPA has recently declared that future Phase II funding for lake restoration projects will be conditioned on completion of a TMDL/WLA after Phase I work is finished. Ecology may wish to adopt a similar strategy for other types of grant projects proposed on water quality limited segments.

During and following implementation of WLAs and LAs, monitoring programs should be established to evaluate if the TMDL achieves compliance with water quality standards. Environmental Investigations may conduct post-implementation monitoring of TMDL basins, but only at the expense of other water quality monitoring activities elsewhere. For example, several floating stations in the ambient monitoring network could be reserved for post-implementation TMDL work. In addition, Environmental Investigations staff could review receiving water data collected by others to evaluate changes water quality attributable to WLA/LA implementation. If problems appear to persist, more intensive monitoring could be initiated in support of TMDL/WLA/LA verification or revision.

An alternate and preferable strategy is to require pollutant dischargers to monitor receiving water quality during or following TMDL implementation. Section 308 of the Clean Water Act authorizes the imposition of monitoring requirements on point source dischargers, provided there is a reasonable need for the information. RCW 90.48.260 authorizes Ecology to take all actions necessary to meet the requirements of the Act, including those related to monitoring. Existing wastewater discharge permits require effluent monitoring to evaluate compliance with technology-based controls. By extension, when water quality-based controls are needed, as in TMDL basins, it is not unreasonable to expect dischargers to evaluate their impact on receiving water quality. To accomplish this, upstream/downstream monitoring is required and should be provided for in the permit. In the case of multiple dischargers, Ecology should encourage establishment of cooperative monitoring programs to promote consistency and eliminate redundancy.

Ecology should also seek to establish cooperative monitoring programs with designated local authorities responsible for nonpoint source control in TMDL basins. For example, cost-sharing agreements for BMP implementation should include sufficient funding to monitor the effectiveness of BMPs in improving water quality. Final study designs for BMP monitoring projects should be subject to review and approval by Ecology. Where forest practices are concerned, cooperative monitoring could be implemented within the existing T/F/W Cooperative Monitoring, Evaluation and Research (CMER) framework.

Ideally, TMDL projects should be targeted geographically, where water quality studies and TMDL development/implementation are carried out within priority basins. This approach concentrates limited resources on water quality problems which are common to several segments within a watershed. Under this scenario, all wastewater discharge permits within a basin would expire in the same year. The geographical boundaries of each basin would be dependent on both drainage size and workload (i.e., number of permits). Basin-expirable permitting would expedite load reductions and ensure equitable treatment of permittees by Ecology. In addition, as the permit renewal year approaches, monitoring could be focused on the basin in a coordinated fashion to evaluate the effectiveness of the WLA/LA strategy. Ecology could gradually implement basin-expirable permitting by targeting watersheds where TMDLs are currently in development. The additional permitting workload would be eased by delaying permit renewal in other basins.

Ecology is certain to encounter situations where water quality standards do not appear attainable. For example, this may occur where there is inadequate dilution of effluent and receiving water, and advanced treatment technology is not available or affordable. Standards may also be unachievable where background conditions are already severely impaired by natural or anthropogenic sources. There are few options available in these instances. If there are unusual circumstances where a single criterion cannot be met, a special condition could be proposed for that segment, provided beneficial uses are maintained and protected. Alternately, a waterbody could be reclassified downward (e.g., Class A to B). This requires that beneficial uses be waived through completion of a use-attainability analysis. However, the test which must be met in a use-attainability analysis is substantial (it involves extensive biosurveys, etc.), thus downward reclassification is not really a viable option. Another option would be to collect more data in order to narrow the safety margin or identify unknown sources attributed to background. Ecology's only other recourse is removal of pollutant discharge from the affected segment. This action could take two forms, depending on the pollutant source. For point sources, this would entail revocation of surface water discharge privileges (land application of treated wastewater would remain an option). Activities contributing to nonpoint source pollution would need to be restricted until more effective best management practices could be developed and implemented.

The Water Quality Program is responsible for administrative tracking of TMDL projects and activities. This function may best be accomplished within the 305(b) waterbody database, where the initial water quality limited designation is established and where related waterbody data are stored. Use of the waterbody system for tracking additionally provides EPA ready access to the current status of Ecology TMDL activities; in turn, this would relieve Ecology of some anticipated reporting burden. However, the waterbody system will need to be customized to allow detailed tracking of the various components of the TMDL process. Associated Ecology data systems, such as WDIS for point sources, should contain TMDL segment flags to alert staff to special constraints that may apply to the receiving water. Likewise, nonpoint source assessments conducted under CWA Section 319 should also flag TMDL waters for special consideration.

Post-implementation tracking must be designed to evaluate if the TMDL achieved water quality standards. The tracking system should trigger a review of monitoring data about two to three years after implementation of WLAs and LAs. This timeframe coincides with the mid-term of discharge permits, and it allows time to conduct additional studies if needed in support of TMDL verification or WLA revision. The two to three year timeframe likewise dovetails with nonpoint LA implementation in agricultural basins, where the Agricultural MOA allows farmers up to two years to implement BMPs.

TMDLs, WLAs and LAs are counted by EPA when they are approved. Allocations do not have to be implemented through permits or nonpoint source controls prior to being counted. For purposes of tracking, the following definitions apply:

- Each waterbody segment counts as a TMDL. Thus a TMDL which applies to two segments counts as two TMDLs.

- Each discharger counts as one WLA, even if multiple water quality-based limits are imposed.

- Each nonpoint load estimate which results in projected BMP controls counts as one LA. Multiple pollutants from the same nonpoint source count as additional LAs only if different BMP controls are projected.

- When a water quality analysis demonstrates that technology-based controls are adequate to maintain water quality standards, the analysis counts as a TMDL.

- When a water quality analysis results in relocation or elimination of a source, the analysis counts as a TMDL and a WLA or LA.

- Revisions of a TMDL, WLA or LA count as an additional TMDL, WLA or LA.

APPENDICES

Appendix A. Water quality limited segments in Washington, 1990.

| Waterbody Number | Name | Waterbody Number | Name |
|---|---|---|---|
| **Streams:** | | | |
| WA-01-1010 | Nooksack River | WA-08-1115 | Tibbetts Creek |
| WA-01-1012 | Tenmile Creek | WA-08-1120 | Coal Creek |
| WA-01-1013 | Fourmile Creek | WA-08-1130 | May Creek |
| WA-01-1014 | Deer Creek | WA-08-1140 | Cedar River |
| WA-01-1015 | Kamm Slough | WA-09-1010 | Duwamish Waterway and River |
| WA-01-1030 | Nooksack River, South Fork | WA-09-1015 | Springbrook (Mill) Creek |
| WA-01-1040 | Nooksack River, South Fork | WA-09-1020 | Green River |
| WA-01-1070 | Nooksack River | WA-09-1022 | Mill (Hill) Creek |
| WA-01-1101 | Silver Creek | WA-09-1026 | Soos Creek System |
| WA-01-1115 | Fishtrap Creek | WA-09-1028 | Newaukum Creek |
| WA-01-1145 | Racehorse Creek | WA-10-1010 | Puyallup River |
| WA-01-1155 | Boulder Creek | WA-10-1011 | Hylebos Creek |
| WA-01-1160 | Canyon Creek | WA-10-1012 | Fife Ditch |
| WA-01-1290 | Howard Creek | WA-10-1015 | Wapato Creek |
| WA-01-2010 | Sumas River | WA-10-1020 | Puyallup River |
| WA-01-3110 | Whatcom Creek | WA-10-1021 | Clear Creek (Pierce County) |
| WA-03-2010 | Samish River | WA-10-1022 | Swan Creek |
| WA-05-1020 | Stillaguamish River, North Fork | WA-10-1025 | Clarks Creek |
| WA-05-1021 | Deer Creek | WA-10-1026 | Unnamed Trib. #1 to Clarks Creek |
| WA-05-1022 | Rick Creek | WA-10-1027 | Diru Creek |
| WA-05-1023 | Little Deer Creek | WA-11-1010 | Nisqually River |
| WA-05-1024 | Deforest Creek | WA-13-1010 | Deschutes River |
| WA-05-1025 | Higgins Creek | WA-13-1100 | McLane Creek |
| WA-05-1040 | Stillaguamish River, South Fork | WA-13-1500 | Woodland Creek |
| WA-07-1010 | Snohomish River | WA-14-1200 | Schneider Creek |
| WA-07-1012 | Allen Creek | WA-14-1400 | Skookum Creek |
| WA-07-1015 | Quilceda Creek | WA-14-1450 | Lynch Creek |
| WA-07-1020 | Snohomish River | WA-15-1015 | Purdy Creek |
| WA-07-1050 | Snohomish River | WA-15-1200 | Coulter Creek |
| WA-07-1052 | French Creek | WA-15-1300 | Minter Creek |
| WA-07-1062 | Cherry Creek | WA-15-1400 | Burley Creek |
| WA-07-1100 | Snoqualmie River | WA-15-2011 | Belfair Creek |
| WA-07-1102 | Patterson Creek | WA-15-2030 | Dogfish Creek |
| WA-07-1163 | Woods Creek | WA-16-1020 | Skokomish River, North Fork |
| WA-08-1010 | Juanita Creek | WA-17-3010 | Chimacum Creek |
| WA-08-1012 | Forbes Creek | WA-22-4010 | Chehalis River |
| WA-08-1016 | Fairweather Bay Tributary | WA-22-4040 | Chehalis River |
| WA-08-1018 | Kelsey Creek | WA-23-1010 | Chehalis River |
| WA-08-1020 | Thornton Creek | WA-23-1020 | Chehalis River |
| WA-08-1030 | McAleer Creek | WA-23-1023 | Salzer Creek |
| WA-08-1040 | Lyon Creek | WA-23-1027 | Dillenbaugh Creek |
| WA-08-1060 | Swamp Creek | WA-24-2010 | Willapa River |
| WA-08-1065 | North Creek | WA-24-2020 | Willapa River |
| WA-08-1070 | Sammamish River | WA-24-2030 | Willapa River |
| WA-08-1080 | Sammamish River | WA-25-5010 | Longview Ditches |
| WA-08-1085 | Little Bear Creek | WA-26-1020 | Coweeman River |
| WA-08-1090 | Sammamish River | WA-26-1050 | Toutle River |
| WA-08-1095 | Bear-Evans Creeks | WA-26-1060 | Toutle River, North Fork |
| WA-08-1100 | Sammamish River | WA-26-1070 | Toutle River, North Fork |
| WA-08-1110 | Issaquah Creek System | WA-28-1023 | Cougar Creek |

Appendix A. Continued.

| Waterbody Number | Name | Waterbody Number | Name |
|---|---|---|---|
| **Streams:** | | **Lakes:** | |
| WA-28-1027 | Weaver Creek | WA-07-9880 | Big Heart Lake |
| WA-28-1040 | Burnt Bridge Creek | WA-08-9270 | Sammamish Lake |
| WA-28-2020 | Lackamas Creek | WA-CR-901 | Franklin D. Roosevelt Lake |
| WA-32-1010 | Walla Walla River | | |
| WA-32-1020 | Touchet River | **Estuaries:** | |
| WA-33-1010 | Snake River | | |
| WA-34-1010 | Palouse River | WA-01-0020 | Drayton Harbor |
| WA-34-1020 | Palouse River, South Fork | WA-01-0050 | Inner Bellingham Bay/Whatcom Waterway |
| WA-34-1030 | Palouse River | WA-07-0010 | Port Gardner/Inner Everett Harbor |
| WA-35-1010 | Snake River | WA-09-0010 | Elliott Bay |
| WA-35-1020 | Snake River | WA-10-0010 | Commencement Bay (Outer) |
| WA-35-2010 | Tucannon River | WA-10-0020 | Commencement Bay (Inner) |
| WA-37-1010 | Yakima River | WA-10-0030 | City Waterway |
| WA-37-1012 | Snipes Creek | WA-13-0010 | Henderson Inlet |
| WA-37-1020 | Yakima River | WA-13-0020 | Budd Inlet (Outer) |
| WA-37-1024 | Granger Drain | WA-13-0030 | Budd Inlet (Inner) |
| WA-37-1030 | Sulphur Creek Wasteway | WA-14-0020 | Eld Inlet |
| WA-37-1040 | Yakima River | WA-14-0050 | Inner Shelton Harbor |
| WA-37-1047 | Wide Hollow Creek | WA-15-0020 | Eagle Harbor |
| WA-37-1048 | Moxee Drain (Birchfield Drain) | WA-15-0040 | Sinclair Inlet |
| WA-37-1050 | Toppenish Creek | WA-15-0050 | Dyes Inlet & Port Washington Narrows |
| WA-38-1200 | Wide Hollow Creek | WA-15-0070 | Henderson Bay |
| WA-39-1010 | Yakima River | WA-15-0080 | Port Gamble |
| WA-39-1020 | Wilson Creek | WA-17-0030 | Port Townsend |
| WA-39-1032 | Cherry Creek | WA-17-0050 | Sequim Bay |
| WA-39-1037 | Crystal Creek | WA-18-0020 | Port Angeles Harbor |
| WA-39-1110 | Selah Ditch | WA-22-0020 | Grays Harbor (Outer) |
| WA-49-1010 | Okanogan River | WA-22-0030 | Grays Harbor (Inner) |
| WA-49-1020 | Okanogan River | WA-24-0020 | Willapa Bay |
| WA-49-1040 | Okanogan River | WA-PS-0010 | Skagit Bay and Similk Bay |
| WA-54-1020 | Spokane River | WA-PS-0020 | Port Susan |
| WA-55-1010 | Little Spokane River | | |
| WA-56-1010 | Hangman Creek | | |
| WA-57-1010 | Spokane River | | |
| WA-59-1010 | Colville River | | |
| WA-CR-101 | Columbia River | | |
| WA-CR-102 | Columbia River | | |
| WA-CR-102 | Columbia River | | |
| WA-CR-103 | Columbia River | | |

Appendix B. EPA guidance documents for performing TMDL/WLA/LA analyses.

Ambrose, R.B., and J.L. Martin (eds.). 1989. Technical Guidance Manual for Performing Wasteload Allocations, Book III - Estuaries; Part I - Estuaries and Wasteload Allocation models. EPA Draft Report, Washington, DC.

Ambrose, R.B., and J.L. Martin (eds.). 1989. Technical Guidance Manual for Performing Wasteload Allocations, Book III - Estuaries; Part II - Application of Estuarine Wasteload Allocation Models. EPA Draft Report, Washington, DC.

Bowie, G.L., W.B. Mills, D.B. Porcella, C.L. Campbell, J.R. Pagenkopf, G.L. Rupp, K.M. Johnson, P.W.H. Chan, and S.A. Gherini. 1985. Rates, Constants, and Kinetics Formulations in Surface Water Quality Modeling. 2nd ed., EPA Report 600/3-85-040, Washington, DC.

Delos, C.G., W.L. Richardson, J.V. DePinto, R.B. Ambrose, P.W. Rodgers, K. Rygwelski, J.P. St. John, W.J. Shaughnessy, T.A. Faha, and W.N. Christie. 1984. Technical Guidance Manual for Performing Wasteload Allocations, Book II - Streams and Rivers; Chapter 3 - Toxic Substances. EPA Report 440/4-84-022, Washington, DC.

Driscoll, E.D., J.L. Mancini, and P.A. Mangarella. 1983. Technical Guidance Manual for Performing Wasteload Allocations, Book II - Streams and Rivers; Chapter 1 - Biochemical Oxygen Demand/Dissolved Oxygen. EPA Report 440/4-84-020, Washington, DC.

EPA. 1980. Technical Guidance Manual for Performing Wasteload Allocations, Simplified Analytical Method for Determining NPDES Effluent Limitations for POTWs Discharging into Low-Flow Streams. Washington, DC.

EPA. 1983. Technical Guidance Manual for Performing Wasteload Allocations, Book II - Streams and Rivers; Chapter 2 - Nutrient/Eutrophication Impacts. EPA Report 440/4-84-021, Washington, DC.

EPA. 1983. Technical Support Manual; Waterbody Surveys and Assessments for Conducting Use Attainability Analyses, Volume I: Stream and River Systems. Washington, DC.

EPA. 1984. Technical Guidance Manual for Performing Wasteload Allocations, Book VII - Permit Averaging Periods. EPA Report 440/4-84-023, Washington, DC.

EPA. 1984. Technical Support Manual; Waterbody Surveys and Assessments for Conducting Use Attainability Analyses, Volume II: Estuarine Systems. Washington, DC.

EPA. 1985. Guidance for State Water Monitoring and Wasteload Allocation Programs. EPA Report 440/4-85-031, Washington, DC.

Appendix B. Continued.

EPA. 1986. Guidance on EPA's Review and Approval Procedure for State Submitted TMDLs/WLAs. Washington, DC.

EPA. 1986. Technical Guidance Manual for Performing Wasteload Allocations, Book VI - Design Conditions; Chapter 1 - Stream Design Flow for Steady-State Modeling. EPA Report 440/4-87-004, Washington, DC.

EPA. 1988. Final Guidance for Implementation of Requirements Under Section 304(l) of the Clean Water Act as Amended. Washington, DC.

EPA. 1988. Technical Guidance Manual for Performing Wasteload Allocations, Book VI - Design Conditions: Chapter 2 - Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. Washington, DC.

EPA. 1989. Assessing Human Health Risks from Chemically Contaminated Fish and Shellfish; A Guidance Manual. EPA Report 503/8-89-002, Washington, DC.

EPA. 1991. Guidance for Water Quality - Based Decisions: The TMDL Process. EPA Report 440/4-91-001, Washington, DC.

EPA. 1991. Technical Support Document for Water Quality-Based Toxics Control. EPA Report 505/2-90-001, Washington, DC.

GKY and Associates, Inc. 1984. Technical Guidance Manual for Performing Wasteload Allocations, Book IX - Innovative Wasteload Allocations. EPA Draft Report, Washington, DC.

HydroQual, Inc. 1986. Technical Guidance Manual for Performing Wasteload Allocations, Book IV - Lakes, Reservoirs and Impoundments: Chapter 3 - Toxic Substances Impact. EPA Report 440/4-87-002, Washington, DC.

Mancini, J.L., G.G. Kaufman, P.A. Mangarella, and E.D. Driscoll. 1983. Technical Guidance Manual for Performing Wasteload Allocations, Book IV - Lakes and Impoundments: Chapter 2 - Eutrophication. EPA Report 400/4-84-019, Washington, DC.

Mills, W.B., D.B. Porcella, M.J. Ungs, S.A. Gherini, K.V. Summers, Lingfung Mok, G.L. Rupp, G.L. Bowie, and D.A. Haith. 1985. Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water - Part I. EPA Report 600/6-85-002a, Athens, GA.

Appendix B. Continued.


Mills, W.B., D.B. Porcella, M.J. Ungs, S.A. Gherini, K.V. Summers, Lingfung Mok, G.L. Rupp, G.L. Bowie, and D.A. Haith. 1985. Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants is Surface and Ground Water - Part II. EPA Report 600/6-85-002b, Athens, GA.

Mills, W.B., G.L. Bowie, T.M. Grieb, K.M. Johnson, and R.C. Whittemore. 1986. Stream Sampling for Wasteload Allocation Applications. EPA Report 625/6/86-013, Washington, DC.

Schnoor, J.L., C. Sato, D. McKechnie, and D. Sahoo. 1987. Processes, Coefficients, and Models for Simulating Toxic Organics and Heavy Metals in Surface Waters. EPA Report 600/3-87-015, Washington, DC.

Walton, R., T.S. George, and L.A. Roesner. 1984. Selecting Estuarine Models. EPA Draft Report, Washington, DC.