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Part III

Environmental Protection Agency

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40 CFR Part 122

Interpretative Policy Memorandum on Reapplication Requirements for Municipal Separate Storm Sewer Systems; Final Rule

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ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 122

[FRL-5533-7]

Interpretative Policy Memorandum on Reapplication Requirements for Municipal Separate Storm Sewer Systems

AGENCY: Environmental Protection Agency (EPA).

ACTION: Policy statement; interpretation.

SUMMARY: By today's notice EPA announces federal policy, signed by Robert Perciasepe, Assistant Administrator for Water, on May 17, 1996, regarding application requirements for renewal or reissuance of

National Pollutant Discharge Elimination System (NPDES) permits for municipal separate storm sewer systems (MS4s). Today's action responds to requests from municipalities and NPDES permit writers for clarification about regulations which do not appear to address reapplication requirements, i.e., permit reissuance. Today's notice explains that MS4 permit applicants and NPDES permit writers have considerable discretion to customize appropriate and streamlined reapplication requirements on a case-by-case basis, specifically, by using the fourth year annual report as the principal reapplication document.

EFFECTIVE DATE: This policy is effective May 17, 1996.

FOR FURTHER INFORMATION CONTACT: Marilyn Fonseca, Office of Wastewater Management, MC-4203, U.S. Environmental Protection Agency, 401 M Street SW., Washington, DC 20460, (202)-260-0592, e-mail: Fonseca.Marilyn@epamail.epa.gov

SUPPLEMENTARY INFORMATION: The text of this policy is as follows:

Municipal Separate Storm Sewer System Permit Reapplication Policy

The 1987 amendments to the Clean Water Act added Section 402(p) which directed the Environmental Protection Agency to establish regulations governing storm water discharges under the National Pollutant Discharge Elimination System (NPDES) program. Early in the program, Congress specifically required NPDES permits for municipal separate storm sewer systems (MS4s) serving populations over 100,000. In response, EPA promulgated regulations in 1990 that established permit application requirements for MS4s that serve populations over 100,000. MS4 permits have since been drafted and finalized for many municipal systems. A number of MS4 permits are due to expire and must be reissued.

EPA is providing this policy memorandum to outline permit reapplication requirements for regulated MS4s. There are three components to EPA's reapplication policy. First, EPA is not requiring that the process used for part 1 and 2 of the initial permit application be repeated in full. Second, EPA has identified basic information that should be included in every reapplication package. Finally, EPA is seeking to improve existing MS4 storm water management programs by using information and experience municipalities have gained during the previous permit term.

Is a Permit Reapplication Necessary?

Yes. The requirement that all point source discharges authorized by a NPDES permit must reapply is well established at 40 CFR 122.41(b) and 122.46(a):

Duty to reapply. If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit.

Duration of permits. NPDES permits shall be effective for a fixed term not to exceed 5 years.

The reapplication requirement is also found at 40 CFR 122.21(d):

Duty to reapply. . . . All other permittees with currently effective permits shall submit a new application 180 days before the existing permit expires.

Therefore, all regulated Phase I MS4s need to participate in a

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permit reapplication process.

Where a complete reapplication package has been submitted as directed by the permit authority, conditions of an expired MS4 permit will continue until the effective date of a new permit, as stated in 40 CFR 122.6(a) and (b):

(a) EPA permits. When EPA is the permit-issuing authority, the conditions of an expired permit continue in force . . . until the effective date of a new permit . . . and (b) Effect. Permits continued under this section remain fully effective and enforceable.

Are Initial MS4 Permit Application Requirements Applicable To Permit Reapplication?

No. The scope of the initial permit application requirements was comprehensive and regulated MS4s invested considerable resources to develop these applications. The initial applications have laid the foundation for the long-term implementation of MS4 storm water management programs. EPA believes reapplications should focus on maintenance and improvement of these programs.

The MS4 permit application requirements at 40 CFR 122.26(d)(1) and (2) apply to the first round permit applications required of large and medium MS4s. The permit application deadline regulations in 40 CFR 122.26(e) (3) & (4) clearly reflect the ``one time'' nature of the Part I & II application requirements for large and medium MS4s. EPA has not promulgated regulations applicable to reapplication for MS4s. Requirements to demonstrate adequate legal authority, perform source identification (e.g., identify major outfalls and facility inventory), characterize data, and develop a storm water management program should have been addressed in the initial application phase. Therefore, to request the same information again, where it has already been provided and has not changed, would be needlessly redundant. Thus, as a practical matter, most first-time permit application requirements are unnecessary for purposes of second round MS4 permit application.

What Basic Information Must Be Submitted for an MS4 Permit Reapplication?

EPA is committed to allowing permitting authorities to develop flexible reapplication requirements that are site-specific. In the absence of reapplication regulations specific to MS4s, minimum reapplication requirements are drawn from the generic NPDES permit application regulations at 40 CFR 122.21(f). EPA regulations suggest the following basic information be included as part of any permit reapplication:

--name and mailing address(es) of the permittee(s) that operate the MS4, and
--names and titles of the primary administrative and technical contacts for the municipal permittee(s).

In addition, in the reapplication, municipalities should identify any proposed changes or improvements to the storm water management program and monitoring activities for the upcoming five year term of the permit, if those proposed changes have not already been submitted pursuant to 40 CFR 122.42(c). [A requirement to submit proposed changes to the storm water management program is specified in the annual reporting requirements in 40 CFR 122.42(c)(2).] EPA encourages permitting authorities to make use of the fourth year annual report as the basic permit reapplication package.

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Changes to the storm water management program may be justified due to the availability of new information on the relative magnitude of a problem or new data on water quality impacts of the storm water discharges. Municipalities may also propose to de-emphasize some program components and strengthen others, based on the experience gained under the first permit. Proposed elimination of a program component might be justified upon permit renewal; for example, when a component is no longer a problem area (i.e., all detention basins have been retrofitted) or when a different water quality program would serve the same goals.

The components of the original storm water management program which are found to be effective should be continued and made an ongoing part of the proposed new storm water management program. Such components may include:

--continued emphasis on public education programs, particularly programs on proper disposal of waste oil and household hazardous waste and pesticide application;
--continued, if not greater, emphasis on addressing impacts of new development/construction;
--proper storm design criteria for all new developments;
--retrofitting and/or upgrading of the existing storm sewer system according to a priority system;
--more frequent maintenance of storm sewer systems and storm water treatment systems;
--coordination with adjacent MS4s on monitoring or other efforts; and
--using a watershed approach to storm water management.

The accumulated annual report information as outlined in 40 CFR 122.42(c) should be evaluated and, to the extent applicable, be incorporated by reference into the reapplication package.

To reiterate, MS4s may use the fourth year annual report, which emphasizes proposed changes to the storm water management program, with the additional required basic information, as the MS4 permit reapplication. Changes to the storm water management program should be jointly developed by the permitting authority and the permit applicant. In this regard, we urge permit issuance authorities and permittees to work together to assure that the permit reapplication is complete and addresses all appropriate issues. The permitting agency may request additional technical information be submitted in the reapplication. NPDES permitting authorities, therefore, can exercise their information gathering authority under CWA Section 308, or analogous State provisions to complete the permit reapplication on a case-by case basis, as appropriate.

What Additional Information Should Be Considered for a Reapplication?

EPA also recommends the following information be provided by reapplicants to the permitting authority, as outlined in 40 CFR 122.26(d)(1)(iv)(C):

--identification of any previously unidentified water bodies that receive discharges from the MS4, and
--a summary of any known water quality impacts on the newly identified receiving waters (based on best available data).

In addition, EPA recommends the following information be provided to the permitting authority as well:

--a description of changes in co-applicants since issuance of initial MS4 permit, and

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--identification number of the existing NPDES MS4 permit.

Further, EPA encourages permitting authorities to work with permittees to determine if storm water monitoring efforts are appropriate and useful. For example, during the previous permit term, municipalities may have found that their monitoring program was not fully successful in characterizing the nature and extent of storm water problems. Reapplication is an appropriate time for MS4s to evaluate their monitoring program and propose changes to make the program more appropriate and useful. To accomplish this, municipalities may wish to consider using monitoring techniques other than end-of-the pipe chemical-specific monitoring, including habitat assessments, bioassessments and/or other biological methods.

Permitting authorities should incorporate any such new information, together with assembled materials from the initial application and the existing permit, to form the administrative record for any reissued MS4 permits. Such administrative records should be made publicly available as part of the process to reissue the permit.

Dated: June 28, 1996.
Michael B. Cook,
Director, Office of Wastewater Management.
[FR Doc. 96-20228 Filed 8-8-96; 8:45 am]
BILLING CODE 6560-50-P

Dear State Water Program Directors:

The purpose of this letter is to transmit to you the final Interim Permitting Approach for Water Quality-Based Effluent Limitations in Storm Water Permits. The policy addresses issues relating to the type of effluent limitations that are most appropriate for National Pollutant Discharge Elimination System storm water permits to provide for the attainment of water quality standards. Since this policy only applies to water quality-based effluent limitations, it is not intended to affect technology-based limitations, such as those based on effluent guidelines or the permit writer's best professional judgement, that are incorporated into storm water permits. With this policy, the Office of Water is seeking to fulfill objectives of the 1996-1997 National Water Program Agenda for the Future (January 16, 1996), including reducing the threat of wet weather discharges to water quality, providing States and local governments with greater flexibility to solve wet weather problems, and identifying and taking appropriate steps to reduce the existing burden of the Storm Water Phase I program.

Numerous parties were involved in preparing this policy. In addition to receiving significant input from the Urban Wet Weather Flows Advisory Committee, EPA also consulted with State and Regional Storm Water Coordinators.

If you have questions regarding this policy, please contact William Hall at (202) 260-1458 or Bill Swietlik at (202) 260-9529. I thank you for your assistance.

Sincerely,

Robert Perciasepe
Assistant Administrator

Enclosure

MEMORANDUM

SUBJECT: Interim Permitting Approach for Water Quality-Based Effluent Limitations in Storm Water Permits

FROM: Robert Perciasepe, Assistant Administrator

TO: EPA Water Management Division Directors

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If you have questions regarding this policy, please contact William Hall at (202) 260-1458 or Bill Swietlik at (202) 260-9529. I thank you for your assistance.

Attachment

INTERIM PERMITTING APPROACH FOR WATER QUALITY-BASED EFFLUENT LIMITATIONS IN STORM WATER PERMITS

In response to recent questions regarding the type of water quality-based effluent limitations that are most appropriate for National Pollutant Discharge Elimination System (NPDES) storm water permits, the Environmental Protection Agency (EPA) is adopting an interim permitting approach for regulating wet weather storm water discharges. Due to the nature of storm water discharges, and the typical lack of information on which to base numeric water quality-based effluent limitations (expressed as concentration and mass), EPA will use an interim permitting approach for NPDES storm water permits.

The interim permitting approach uses best management practices (BMPs) in first-round storm water permits, and expanded or better-tailored BMPs in subsequent permits, where necessary, to provide for the attainment of water quality standards. In cases where adequate information exists to develop more specific conditions or limitations to meet water quality standards, these conditions or limitations are to be incorporated into storm water permits, as necessary and appropriate. This interim permitting approach is not intended to affect those storm water permits that already include appropriately derived numeric water quality-based effluent limitations. Since the interim permitting approach only addresses water quality-based effluent limitations, it also does not affect technology-based effluent limitations, such as those based on effluent limitations guidelines or developed using best professional judgement, that are incorporated into storm water permits.

Each storm water permit should include a coordinated and cost-effective monitoring program to gather necessary information to determine the extent to which the permit provides for attainment of applicable water quality standards and to determine the appropriate conditions or limitations for subsequent permits. Such a monitoring program may include ambient monitoring, receiving water assessment, discharge monitoring (as needed), or a combination of monitoring procedures designed to gather necessary information.

This interim permitting approach applies only to EPA; however, EPA also encourages authorized States and Tribes to adopt similar policies for storm water permits. This interim permitting approach provides time, where necessary, to more fully assess the range of issues and possible options for the control of storm water discharges for the protection of water quality. This interim permitting approach may be modified as a result of the ongoing Urban Wet Weather Flows Federal Advisory Committee policy dialogue on this subject.

Qs & As FOR INTERIM PERMITTING APPROACH FOR WATER QUALITY-BASED EFFLUENT LIMITATIONS IN STORM WATER PERMITS

QUESTION 1: Must EPA require that storm water dischargers, industrial or municipal, be subject to numeric water quality-based effluent limitations (expressed as concentration and mass) in order to attain water quality standards (WQS)?

ANSWER 1: No. Although National Pollutant Discharge Elimination System (NPDES) permits must contain conditions to ensure that water quality standards are met, this does not require the use of numeric water quality-based effluent limitations. Under the Clean Water Act (CWA) and NPDES regulations, permitting authorities may employ a variety of conditions and limitations in storm water permits, including best management practices, performance objectives, narrative conditions, monitoring triggers, action levels (e.g., monitoring benchmarks, toxicity reduction evaluation action levels), etc., as the necessary water quality-based limitations, where numeric water quality-based effluent limitations are determined to be unnecessary or infeasible.

ANALYSIS:

A. The Clean Water Act does not require numeric effluent limitations.

Section 301 of the CWA requires that discharger permits include effluent limitations necessary to meet State or Tribal WQS. Section 502 defines "effluent limitation" to mean any restriction on quantities, rates, and concentrations of constituents discharged from point sources. The CWA does not say that effluent limitations need be numeric. As a result, EPA and States have flexibility in terms of how to express effluent limitations.

B. EPA's regulations do not always require numeric effluent limitations.

EPA has, through regulation, interpreted the statute to allow for non-numeric limitations (e.g., "best management practices" or BMPs, see 40 CFR 122.2) to supplement or replace numeric limitations in specific instances that meet the criteria specified at 40 CFR 122.44(k). This regulation essentially codifies a court case addressing storm water discharges. NRDC v. Costle, 568 F.2d 1369 (D.C. Cir. 1977). In that case, the Court stated that EPA need not establish numeric effluent limitations where such limitations were infeasible.

C. EPA has interpreted the statute and regulations to allow BMPs in lieu of numeric limitations.

EPA has defended use of BMPs as a substitute for numeric limitations in litigation involving storm water discharges (CBE v. EPA, 91-70056 (9th Cir.)(brief on merits)) and in correspondence (Letter from Michael Cook, EPA, to Peter Lehner, NRDC, May 31, 1995). EPA has found that numeric limitations for storm water permits can be very difficult to develop at this time because of the existing state of knowledge about the intermittent and variable nature of these types of discharges and their effects on receiving waters. Some storm water permits, however, currently do contain numeric water quality-based effluent limitations where adequate information exists to derive such limitations.

QUESTION 2: Has EPA provided guidance on a methodology for deriving numeric water quality-based effluent limitations?

ANSWER 2: Yes, but primarily for continuous wastewater discharges at low flow conditions in the receiving water, not intermittent wet weather discharges during high flow conditions. Regulations at 40 CFR 122.44(d) specify the requirements under which permitting authorities establish water quality-based effluent limitations when a facility has the "reasonable potential" to cause or contribute to an excursion of numeric or narrative water quality criteria. In addition, EPA guidance in the Technical Support Document for Water Quality-Based Toxics Control (TSD) and the NPDES Permit Writers Training Manual, supplemented with total maximum daily load (TMDL) and modeling guidance, supports issuing permits that include numeric water quality-based effluent limitations. This guidance was based on crafting numeric water quality-based effluent limitations using TMDLs, or calculations similar to those used in developing TMDLs, and wasteload allocations (WLAs) derived through modeling. EPA expects the Urban Wet Weather Flows Federal Advisory Committee (60 FR 21189, May 1, 1995) will review this issue at greater length and may provide recommendations on how to proceed.

QUESTION 3: Why can numeric water quality-based effluent limitations be difficult to derive for storm water permits?

ANSWER 3: Storm water discharges are highly variable both in terms of flow and pollutant concentrations, and the relationships between discharges and water quality can be complex. The water quality impacts of storm water discharges are related to the uses designated by States and Tribes in their WQS, the quality of the storm water discharge (e.g., conventional or toxic pollutants conveyed to the receiving water) and quantity of the storm water (e.g., erosion and loss of habitat caused by increased flows and velocity). Uses may be impacted by both water quality and water quantity. Depending on site-specific considerations, some of the water quality impacts of storm water discharges may be more related to the physical effects (e.g. stream bank erosion, streambed scouring, extreme temperature variations, sediment smothering) than the type and amount of pollutants present in the discharge. For municipal storm water discharges in particular, the current use of system-wide permits and a variety of jurisdiction-wide BMPs, including educational and programmatic BMPs, does not easily lend itself to the existing methodologies for deriving numeric water quality-based effluent limitations. These methodologies were designed primarily for process wastewater discharges which occur at predictable rates with predictable pollutant loadings under low flow conditions in receiving waters. Using these methodologies, limitations are typically derived for each specific outfall to be protective of low flows in the receiving water. Because of this, permit writers have not made wide-spread use of the existing methodologies and models for storm water discharge permits. In addition, wet weather modeling is technically more difficult and expensive than the simple dilution models generally used in the permitting process.

QUESTION 4: Has EPA previously recognized the technical difficulty in deriving numeric water quality-based effluent limitations for storm water discharges?

ANSWER 4: Yes. EPA recognized the technical difficulty in deriving numeric water quality-based effluent limitations for wet weather discharges in its brief on the merits in Citizens for a Better Environment (CBE) v. United States Environmental Protection Agency, 91-70056 (9th Cir.) and in the Great Lakes Water Quality Guidance (58 FR 20841, April 16, 1993).

In the CBE case, EPA explained why it was technically infeasible to derive numeric water quality-based effluent limitations for the discharge of metals in storm water into South San Francisco Bay and asserted that a water quality-based effluent limitation could take the form of a narrative statement, such as a BMP, if it was infeasible to derive a numeric limitation. In explaining its arguments in the CBE case, EPA cited 40 CFR 122.44(k)(2), which provides that BMPs may be imposed in NPDES permits "to control or abate the discharge of pollutants when ... (2) [numeric effluent limitations are infeasible."

In the Great Lakes Water Quality Guidance, EPA did not extend the method for calculating wasteload allocations, the basis for numeric water quality-based effluent limitations, to storm water or combined sewer overflow (CSO) discharges because the varying nature of these discharges is inconsistent with the assumptions used in developing the guidance. The Great Lakes Water Quality Guidance defers to national guidance and policy on wet weather and does not seek to establish a separate and distinct set of wet weather requirements. EPA expects the Urban Wet Weather Flows Advisory Committee to provide recommendations about how to address the broader technical issues involved in achieving compliance with WQS in a wet weather context.

QUESTION 5: What are the potential problems of using standard methodologies to derive numeric water quality-based effluent limitations for storm water permits?

ANSWER 5: Correctly derived numeric water quality-based effluent limitations provide a greater degree of confidence that a discharge will not cause or contribute to an exceedance of the WQS, because numeric water quality-based effluent limitations are derived directly from the numeric component of those standards. In addition, numeric water quality-based effluent limitations can avoid the expense associated with overly protective treatment technologies because numeric water quality-based effluent limitations provide a more precisely quantified target for permittees. Potential problems of incorporating inappropriate numeric water quality-based effluent limitations rather than BMPs in storm water permits at this time are significant in some cases. Deriving numeric water quality-based effluent limitations for any NPDES permit without an adequate effluent characterization, or an adequate receiving water exposure assessment (which could include the use of dynamic modeling or continuous simulations) may result in the imposition of inappropriate numeric limitations on a discharge. Examples of this include the imposition of numeric water quality criteria as end-of-pipe limitations without properly accounting for the receiving water assimilation of the pollutant or failure to account for a mixing zone (if allowed by applicable State or Tribal WQS). This could lead to overly stringent permit requirements, and excessive and expensive controls on storm water discharges, not necessary to provide for attainment of WQS. Conversely, an inadequate effluent characterization could lead to water quality-based effluent limitations that are not stringent enough to provide for attainment of WQS. This could result because effluent characterization and exposure assessments for discharges with high variability of pollutant concentrations, loadings, and flow are more difficult than with process wastewater discharges at low flows.

QUESTION 6: How are water quality-based effluent limitations developed for combined sewer overflow (CSO) discharges?

ANSWER 6: The CSO Control Policy issued by EPA on April 19, 1994 (59 FR 18688) provides direction on compliance with the technology-based and water quality-based requirements of the CWA for communities with combined sewer systems. The CSO Policy provides for implementation of technology-based requirements (expressed as "nine minimum controls") by January 1, 1997.

In addition, under the CSO Policy, communities are also expected to develop long-term control plans that will provide for attainment of WQS through either the "presumption approach" or the "demonstration approach." Under the presumption approach, CSO controls would be presumed to attain WQS if certain performance criteria are met. A program that meets the criteria specified in the CSO policy is presumed to provide an adequate level of control to meet the water quality-based requirements of the CWA, provided the permitting authority determines that such presumption is reasonable based on characterization, monitoring, and modeling of the system, including consideration of sensitive areas. Under the demonstration approach, the permittee would demonstrate that the selected CSO controls, when implemented, would be adequate to meet the water quality-based requirements of the CWA.

The CSO Policy anticipates that it will be difficult in the early stages of permitting to determine whether numeric water quality-based effluent limitations are necessary for CSOs, and, if so, what the limitations should be. For that reason, in the absence of sufficient data to evaluate the need for numeric water quality-based effluent limitations, the Policy recommends that the first phase of CSO permits ("Phase I") contain a narrative requirement to comply with WQS. Further, so-called "Phase II" permits would contain water quality-based effluent limitations, as provided in 40 CFR 122.44(d)(1) and 122.44(k), that may take the form of numeric performance or design standards, such as a certain number of overflow events or a certain percent volume capture. Generally, only after the long-term control plan is in place and after collection of sufficient water quality data (including applicable wasteload allocations developed during a TMDL process) would numeric water quality-based effluent limitations be included in the permit. This would likely occur only after several permitting cycles.

QUESTION 7: If BMPs alone are demonstrated to provide adequate water quality protection, are additional controls necessary?

ANSWER 7: No. If the permitting authority determines that, through implementation of appropriate BMPs required by the NPDES storm water permit, the discharges have the necessary controls to provide for attainment of WQS and any technology-based requirements, additional controls need not be included in the permit. Conversely, if a discharger (municipal or industrial) fails or refuses to adopt and implement adequate BMPs , the permitting authority may have to consider other approaches to ensure water quality protection.

If, however, the permitting authority has adequate information on which to base more specific conditions or limitations, such limitations are to be incorporated into storm water permits, as necessary and appropriate. Such conditions or limitations may include an integrated suite of BMPs, performance objectives, narrative standards, monitoring triggers, numeric water quality-based effluent limitations, action levels, etc. Storm water permits may also need to include additional requirements to receive State or Tribal 401 certifications.

QUESTION 8: What is EPA doing to develop information about the linkage between BMPs and water quality and to facilitate a watershed-based approach to storm water permitting?

ANSWER 8: The Agency has cooperative agreements with WERF (Water Environment Research Foundation) and ASCE (American Society of Civil Engineers) to research which BMPs are most effective under which circumstances. The results of this research should provide permitting authorities and permittees with information about how to evaluate the effectiveness of different kinds of BMPs in different circumstances and to select the most appropriate controls to achieve water quality objectives. EPA also has cooperative agreements with the Watershed Management Institute and other organizations to conduct research over the next two to four years that will examine the capability of storm water BMPs to improve receiving water quality and restore/protect the biological integrity of those waters. EPA expects the Urban Wet Weather Flows Federal Advisory Committee to provide recommendations on how to permit storm water discharges on a watershed basis.

QUESTION 9: The interim permitting approach states that permits should include monitoring programs to generate necessary information to determine the extent to which permits are providing for the attainment of water quality standards. What types of monitoring should be included and how much monitoring is necessary?

ANSWER 9: The amount and types of monitoring necessary will vary depending on the individual circumstances of each storm water discharge. EPA encourages dischargers and permitting authorities to carefully evaluate monitoring needs and storm water program objectives so as to select useful and cost-effective monitoring approaches. For most dischargers, storm water monitoring can be conducted for two basic reasons: 1) to identify if problems are present, either in the receiving water or in the discharge, and to characterize the cause(s) of such problems; and 2) to assess the effectiveness of storm water controls in reducing contaminants and making improvements in water quality.

Under the NPDES storm water program, large and medium municipal separate storm sewer system permittees are required to conduct monitoring. EPA recommends that each such municipal permittee design the monitoring effort to be supportive of the goals and objectives of its storm water management program when developing such a program for the term of its NPDES permit. To accomplish this, a municipal permittee may use a variety of storm water monitoring tools including receiving water chemistry; receiving water biological assessments (benthic invertebrate surveys, fish surveys, habitat assessments, etc.); effluent monitoring; including chemical, whole effluent and visual examinations; illicit connections screening; and combinations thereof, or other methods. Techniques that assess receiving waters will help to identify the degree to which storm water discharges are contributing to any water quality problems. Techniques that assess storm water discharge characteristics will help to identify potential causes of any identified water quality problems. The municipal permittee, in conjunction with the applicable NPDES permitting authority, should determine which monitoring approaches would be most appropriate given the objectives of the storm water management program. If municipal permittees conduct ambient monitoring, it may be most cost-effective to pool resources with other organizations (including, for example, other municipalities, States, and Tribes) conducting monitoring within the same watershed. This could be best accomplished through a coordinated watershed monitoring strategy.

For industrial storm water dischargers, monitoring may be required under the terms of an NPDES permit for storm water discharges. For those industrial storm water permits that do require monitoring, this is typically done to characterize contaminants that might be found in the industrial runoff and/or to assess the effectiveness of the industrial storm water pollution prevention plan in reducing these contaminants. This typically involves end-of-pipe chemical-specific monitoring. End-of-pipe monitoring may be more appropriate for an industrial facility than for a municipal permittee, given the industrial facility's more discrete site characteristics, which make management strategies such as collection and treatment more feasible. Industries, for the most part, have readily defined storm water conveyances into which runoff flows from discrete drainage areas. Industries may more readily identify and control existing on-site sources of storm water contamination or provide collection and treatment within these discrete drainage areas to control pollutant concentrations in their storm water discharges.

EPA and other organizations are currently working to improve approaches for monitoring storm water and the potential effects upon water quality. These new approaches are called storm water program "environmental indicators." Environmental indicators are designed to be more meaningful monitoring tools that storm water dischargers can use to conduct storm water monitoring for the purposes described above. A manual describing each of the recommended storm water program environmental indicators is being prepared by the Center for Watershed Protection in Silver Spring, Maryland. That manual is expected to be ready by the end of August 1996 and should provide useful information for storm water dischargers contemplating the need to develop a cost-effective, meaningful storm water monitoring program. In addition, EPA expects the Urban Wet Weather Flows Federal Advisory Committee to provide recommendations on how to better monitor storm water and other wet weather discharges using a watershed approach.

QUESTION 10: Does this interim permitting approach apply to both storm water discharges associated with industrial activity and storm water discharges from municipal separate storm sewer systems?

ANSWER 10: Yes. The interim permitting approach is applicable to both discharges from municipal separate storm sewer systems and storm water discharges associated with industrial activity (as defined by 40 CFR 122.26(b)(14)). The interim permitting approach would not affect, however, permits that already incorporate appropriately derived numeric water quality-based effluent limitations. Since the interim permitting approach only addresses water quality-based effluent limitations, it also does not affect technology-based effluent limitations, such as those based on effluent limitations guidelines or developed using best professional judgement, that are incorporated into storm water permits. In addition, particularly for some industries, adequate information may already have been collected with which to assess the reasonable potential for a storm water discharge to cause or contribute to an excursion of a WQS, and from which a numeric water quality-based effluent limitation can be (or has been) appropriately derived. An adequate amount of storm water pollutant source information may also exist with which to assess the effectiveness of the industrial storm water control measures in complying with the limitations and in reducing storm water contaminants for protecting water quality.

Chapter 5

Technology-Based Effluent Limits

When developing effluent limits for a NPDES permit, a permit writer must consider limits based on both the technology available to treat the pollutants (i.e., technology-based effluent limits), and limits that are protective of the designated uses of the receiving water (water quality-based effluent limits). This chapter discusses considerations for deriving technology-based effluent limitations for both non-municipal (i.e., industrial) and municipal discharges.

There are two general approaches for developing technology-based effluent limits for industrial facilities: (1) using national effluent limitations guidelines (ELGs) and (2) using Best Professional Judgment (BPJ) on a case-by-case basis (in the absence of ELGs). Technology-based effluent limits for municipal facilities (POTWs) are derived from secondary treatment standards. The intent of a technology-based effluent limitation is to require a minimum level of treatment for industrial/municipal point sources based on currently available treatment technologies while allowing the discharger to use any available control technique to meet the limitations.

For industrial sources, the national ELGs are developed based on the demonstrated performance of a reasonable level of treatment that is within the

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economic means of specific categories of industrial facilities. Where national ELGs have not been developed, the same performance-based approach is applied to a specific industrial facility based on the permit writer's BPJ. In some cases, effluent limits based on ELGs and BPJ (as well as water quality considerations) may be included in a single permit.

5.1 Application of Technology-Based Effluent Limitations for Non-Municipal Dischargers

When developing technology-based effluent limitations for non-municipal dischargers, the permit writer must consider all applicable standards and requirements for all pollutants discharged. As indicated above, applicable technology-based requirements may include national standards and requirements applicable to all facilities in specified industrial categories, or facility-specific technology-based requirements based on the permit writer's BPJ. It is important, therefore, that permit writers understand the basis of the national standards and the differences between the various required levels of treatment performance. This section describes the statutory and regulatory foundation of the performance-based standards, and discusses considerations in the application of these standards for non-municipal dischargers.

5.1.1 Statutory and Regulatory Foundation

Originally, the Federal Water Pollution Control Act amendments of 1972 directed EPA to develop standards of performance (effluent limitation guidelines) for industrial categories. Specifically, for "existing" industrial dischargers, the Act directed the achievement:

> "...by July 1, 1977, of effluent limitations which will require application of the best practicable control technology currently available [BPT], and by July 1, 1983, of effluent limitations which will require application of the best available technology economically achievable [BAT]."

EPA defined BPT performance as the "average of the best existing performance by well operated plants within each industrial category or subcategory." The BAT level of performance was defined as the "very best control and treatment measures that have been or are capable of being achieved." The 1972 amendments, however, made no distinction regarding the application of BPT or BAT to different types of pollutants (i.e.,

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BPT and BAT applied to all pollutants). The CWA did provide additional guidance for determining the economic achievability of BPT and BAT. The BPT standards required that effluent limits be justified in terms of the "total cost of [industry wide] application of the technology in relation to the effluent reduction benefits to be achieved." Thus, BPT required EPA to consider a cost-benefit test that considered a broad range of engineering factors relating to a category's ability to achieve the limits. For BAT, the Agency must still consider the cost of attainability, however, it is not required to balance cost against the effluent reduction benefit.

In addition to BPT and BAT requirements, Section 306 of the 1972 amendments established more restrictive requirements for "new sources." EPA has defined "new source" as any facility that commenced construction following the publication of the proposed standards of performance. The intent of this special set of guidelines is to set limitations that represent state-of-the-art treatment technology for new sources because these dischargers have the opportunity to install the latest in treatment technology at the time of start-up. These standards, identified as new source performance standards (NSPS), are described as the best available demonstrated control technology, processes, operating methods, or other alternatives including, where practicable, standards permitting no discharge of pollutants. NSPSs are effective on the date of the commencement of a new facility's operation and the facility must demonstrate compliance within 90 days [see 40 CFR §122.29(d)]. A major difference between NSPS and either BPT or BAT, is the absence of the kind of requirements for a detailed consideration of costs and benefits when establishing the technology requirements.

As noted above, the 1972 amendments tasked EPA with developing ELGs representing application of BPT, BAT, and NSPS; however, EPA was unable to complete development of all effluent guidelines within the statutory deadlines. In addition, EPA did not fully address toxic discharges in the guidelines it did promulgate. As a result, EPA was sued by several environmental groups for failing to accomplish the promulgation of effluent guidelines as directed by the 1972 amendments. As a consequence of the suit, EPA and the environmental groups entered into a settlement agreement that required EPA to develop a program and adhere to a schedule for promulgating BAT effluent guidelines, pretreatment standards, and NSPSs (NRDC v. Train, 1976). The standards focused on 65 toxic "priority pollutants" (including classes

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of pollutants) for 21 major categories of industries (known as "primary" industries). This settlement was incorporated in the 1977 amendments to the Act. This settlement was further amended to include a total of 34 major categories of industries and 129 priority pollutants (NRDC v. Costle, March 1979). [Note: The list of priority pollutants was subsequently revised to include 126 specific parameters which are listed in Appendix A of 40 CFR §423.]

In light of the settlement agreement, the 1977 amendments to the Federal Water Pollution Control Act (renamed the Clean Water Act [CWA]) revised the scope and application of BAT requirements to focus solely on toxic and nonconventional pollutants. The amendments also required the application of the best conventional pollutant control technology (BCT) for conventional pollutants. Both the BAT and BCT standards were defined to represent the best control and treatment measures that have been developed or that are capable of being developed within the industrial category or subcategory. With respect to the cost reasonableness, the 1977 CWA left the BAT definition relatively unchanged. For BCT, EPA was to consider the reasonableness of the relationship between the cost of attaining a reduction in effluent discharge and the benefits that would result. The cost of meeting BCT limits was expected by Congress to be comparable to the costs of achieving secondary treatment [see discussion in Section 5.2] for POTWs.

As noted in the discussion of the statutory evolution of the technology-based standards, deadlines for development of the various standards were established by the CWA and amendments. Due to technical and administrative difficulties, most of the initial deadlines were postponed. A summary of final statutory deadlines for the different required levels of treatment technologies is provided in **Exhibit 5-1**.

When applying applicable ELGs in permits, permit writers need to be aware that they do not have the authority to extend statutory deadlines in a NPDES permit; thus, all applicable technology-based requirements (i.e., ELGs and BPJ) must be applied in NPDES permits without the benefit of a compliance schedule.

EXHIBIT 5-1
Statutory Deadlines for BPT, BAT, and BCT

Pollutant	Level of Treatment	Statutory Deadlines
Conventional	BPT	July 1, 1977
Conventional	BCT	March 31, 1989
Nonconventional	BPT	July 1, 1977
Nonconventional	BAT	March 31, 1989
Toxic	BPT	July 1, 1977
Toxic	BAT	March 31, 1989

5.1.2 Development of National Effluent Limitations Guidelines and Performance Standards

Effluent limitations guidelines and performance standards are established by EPA for different industrial categories since the best control technology for one industry is not necessarily the best for another. These guidelines are developed based on the degree of pollutant reduction attainable by an industrial category through the application of control technologies, irrespective of the facility location. Using these factors, similar facilities are regulated in the same manner. In theory, for example, a pulp and paper mill on the west coast of the United States would be required to meet the same technology-based limitations as an identical plant located on the east coast (unless there were special site-specific concerns that had to be addressed).

To date, EPA has established guidelines and standards for more than 50 different industrial categories (e.g., metal finishing facilities, steam electric power plants, iron and steel manufacturing facilities). These guidelines appear in 40 CFR Parts 405-499, a list of which is provided in **Appendix B**. Additionally, Section 304(m) of the 1987 Water Quality Act (WQA) requires EPA to publish a biennial plan for developing new ELGs and a schedule for the annual review and revision of existing promulgated guidelines. As such, EPA is constantly developing new guidelines, and revising or updating existing guidelines.

Developing ELGs is a complicated and time-consuming effort. A schematic showing the general guidelines development process is presented in **Exhibit 5-2**. The regulations are based on complex engineering and economic studies that determine a subcategorization scheme for each industrial category and the wastewater

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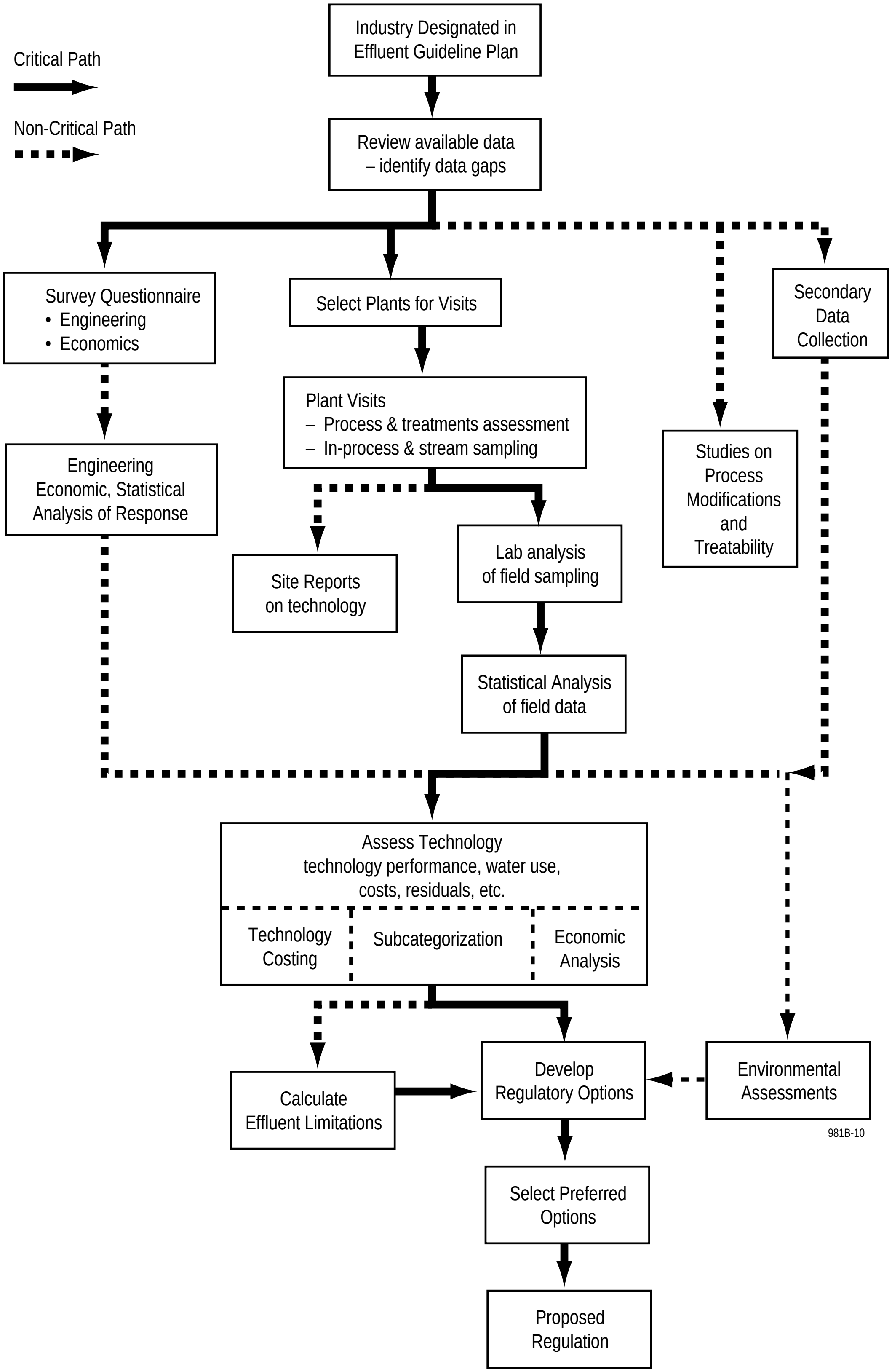
EXHIBIT 5-2
Effluent Guidelines Flowchart



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characteristics and treatment capabilities of each industrial category and/or subcategory. The CWA requires EPA to assess certain factors when establishing ELGs, including the following:

- Age of the equipment and facilities involved
- Manufacturing processes used
- Engineering aspects of the application of recommended control technologies, including process changes and in-plant controls
- Non-water quality impacts, including energy requirements
- Cost
- Other factors, as deemed appropriate.

Where necessary, EPA sets multiple ELGs for facilities within a given category, where data indicates varying conditions warranting different requirements. These subdivisions, known as subcategories, provide EPA with a second level of regulatory control to improve consistency of the guidelines within an industrial category.

EPA develops both daily maximum and long-term average limitations for all ELGs, both of which must be included in the permit by the permit writer. The daily maximum limitations are based on the assumption that daily pollutant measurements are lognormally distributed. Long-term average limitations are based on the distribution of averages of measurements drawn from the distribution of daily measurements. When designing a treatment system, EPA recommends that the permittee target the design of its treatment system to meet the long-term average rather than the daily maximum. The daily maximum is intended to account for variation in effluent concentration above the long-term average.

It should be noted that ELGs are not always established for every pollutant present in a point source discharge. In many instances, ELGs are established only for those pollutants that are necessary to ensure that industrial facilities comply with the technology-based requirements of the CWA (i.e., BPT, BCT, BAT, NSPS). These are often referred to as “indicator” pollutants. For example, EPA may choose to regulate only one of several metal pollutants that are present in the effluent from an industrial category; however, compliance with the ELG (i.e., implementation of technology-based controls) will ensure that all metals present in the discharge are adequately treated.

EPA produces a number of documents that will prove useful to permit writers responsible for applying ELGs in permits. Most notable are the "Development Documents," prepared by EPA for every industrial category with ELGs. Development Documents are produced by EPA as part of the development of ELGs and provide a detailed overview of the limitations development process, including decisions made on applicability of the regulations to various process operations.

5.1.3 General Considerations Concerning the Use of Effluent Limitation Guidelines

Derivation of effluent limits based on ELGs requires that the permit writer have a general understanding of the ELGs for all industrial categories, and detailed knowledge of the ELGs applicable to the permittee. In order to properly apply effluent guidelines, there are several considerations that a permit writer must take into account:

- **Categorization—**Determination of the proper category and subcategory of the facility and proper use of the guidelines applicable to the category or subcategory under consideration
- **Multiple Products or Multiple Categories—**Classification of plants that fall under more than one subcategory and/or have multiple products with multiple measures of production
- **Production/Flow-based Limitations—**Determination of the appropriate measure of production or flow
- **Tiered Permit Limits—**Use of alternate limits for varying production and flow scenarios
- **Mass Versus Concentration Limits—**Considerations in the application of mass versus concentration limits.

Each of these considerations is discussed further below.

Once the appropriate ELGs have been identified, application of the limitations is relatively straightforward since it involves the application of a guideline that has already been technically derived (and sometimes litigated). Implementation of ELGs does require familiarity with several sources of information, particularly the CFR and the *Federal Register* (*FR*). As an example, two pages of the ELGs for the Iron and Steel Manufacturing industrial category are presented as **Exhibit 5-3**.

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EXHIBIT 5-3
ELGs for Iron and Steel Manufacturing

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EXHIBIT 5-3
ELGs for Iron and Steel Manufacturing (continued)

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Categorization

To properly use and apply ELGs, the permit writer must first determine which industrial category(s) applies to the facility being permitted. In determining the appropriate category(s) into which a facility falls, the Standard Industrial Classification (SIC) code is often very helpful. SIC codes were developed and are maintained by the Federal government as a way to classify establishments by type of activity for comparing economic and other types of facility-specific data. A listing of SIC codes corresponding with ELG categories is provided in **Appendix C** and is useful for determining applicable industrial categories.

Item V-II of NPDES Application Form I requires that the applicant provide the SIC code for the activity covered by the permit application. In some instances, the SIC code will identify both the industrial category and the subcategory of a particular facility. Often, the SIC code will identify the appropriate industrial category, but may not necessarily identify the subcategory.

Example:

A primary smelter of copper, SIC code 3331, falls under the Nonferrous Metals Manufacturing category listed in 40 CFR Part 421. In this particular case, SIC code 3331 also clearly identifies the facility in the Copper Smelting Subcategory.

Example:

A facility that manufactures acrylic acids and acrylic acid esters (SIC code 2869) can easily be classified as subject to the Organic Chemicals, Plastics, and Synthetic Fibers (OCPSF) category based on its SIC code; however, determination of the applicable subcategory requires additional effort. In this example, the permit writer can determine from a review of the industrial categorization discussion in the Development Document for the OCPSF industry that facilities performing these manufacturing operations are subject to Subpart G (bulk organic chemicals).

Although SIC codes provide a helpful starting point for categorizing a facility, the permit writer should be cautious of relying exclusively on SIC codes for determining the appropriate industrial category. SIC codes were not developed based on EPA's industrial classification scheme, or vice versa, and, therefore, may not always correspond exactly with the categorization process. It is also important to note that more than one SIC code may apply to a facility. EPA's Development Documents,

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provide detailed information on the applicability of the regulations to specific types of facilities and are useful sources of information when categorizing a facility. Similarly, *FR* notices of the promulgated ELGs provide additional insight into applicability of the guideline to various types of facilities.

When determining applicable ELGs, it is best to identify the categories first, and then, through a careful analysis of plant operations, determine the subcategories. The determination of applicable categories can be accomplished by quickly classifying the categories as “not applicable” or “potentially applicable.”

Example:

If a brewery is under consideration, the Iron and Steel Manufacturing category would obviously not be applicable but Organic Chemicals might be, depending on the extent of recovery and processing of byproducts. A careful analysis of the production of the plant and comparison to the subcategories under Organic Chemicals would establish which, if any, of the subcategories are applicable.

In many cases, industrial facilities may not clearly fall into a category or a subcategory, thus requiring some research on the part of the permit writer to identify the applicable category and subcategory.

Example:

An integrated washing machine producer (SIC code 3633) would be categorized in the Household Laundry Equipment category (as specified under the SIC code system). However, depending on the activities occurring at the facility, it may also fall under the Porcelain Enameling, Metal Finishing, or Plastic Molding and Forming categories for purposes of regulation under effluent guidelines.

After determination of potential categories, the permit writer can conduct a more detailed evaluation to narrow the list to only the applicable categories and subcategories using more detailed facility information.

Multiple Products or Multiple Categories

There are instances when one facility produces multiple products, or whose production process is covered by multiple categories and subcategories. In these cases, the permit writer must examine the applicable guidelines closely to ensure that (1) one guideline does not supersede another, and (2) the guidelines are properly applied. For example, as presented in **Exhibit 5-4**, the preamble to the final rule for the OCPSF ELGs (52 *FR* 42523) identified numerous circumstances where the OCPSF regulations are superseded by existing ELGs for other industrial categories.

When a facility is subject to multiple effluent guidelines, the permit writer must apply each of the effluent guidelines in deriving the technology-based effluent limits for the particular facility. If all wastewaters regulated by effluent guidelines are combined prior to treatment and discharge to navigable waters, then the permit writer could simply combine the allowable pollutant loadings from each effluent guideline to arrive at a single technology-based effluent limit for the facility (i.e., a "building block" approach).

Circumstances will also arise when an effluent guideline for one subcategory regulates a different set of pollutants than the effluent guidelines applicable to another subcategory. If all regulated wastestreams are combined, there are two approaches to ensure proper application of the effluent guidelines:

- If one wastestream containing a pollutant that is not covered by an effluent guideline is combined with another wastestream that has applicable effluent guidelines for the same pollutant, then the permit writers must use BPJ to establish a technology-based effluent limit for the non-regulated wastewater (see Section 5.1.4).
- If one wastestream that does not contain a pollutant is combined with another wastestream that has applicable effluent guidelines for the pollutant, the permit writer must ensure that the non-regulated wastestream does not dilute the regulated wastestream to the point where the pollutant is not analytically detectable. If this circumstance occurs, then the permit writer will most likely need to establish internal outfalls, as allowed under 40 CFR §122.45(h).

Effluent guidelines may also specify inconsistent limit expressions that will have to be adjusted. For example, effluent guidelines for one category (e.g., porcelain enameling) may contain limits with a daily maximum limit, while effluent guidelines for another category (e.g., electroplating) sets a 4-day average limit for the same pollutant. In this case, both ELGs must be applied in the permit. If this situation arises, a permit writer has several alternatives such as:

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EXHIBIT 5-4
OCPSF Effluent Limitations Guidelines

- Place both limits in the permit (i.e., both the daily maximum and 4-day average)
- Apply the applicable effluent guidelines at internal outfalls [as allowed under 40 CFR §122.45(h)].

Example 1:

A facility with a newly constructed metal plating production line is added to a facility with an existing metal plating production line. Wastewater from both of these lines is commingled prior to treatment, treated, and then discharged. In this situation, the combination of the NSPS (for the new line) and BAT/BCT standards (for the older line) would be used to derive a limitation.

Example 2:

An integrated lamp maker conducts copper forming, aluminum forming, metal finishing, and porcelain enameling processes with wastewater combined prior to treatment and discharge. In this situation, the appropriate effluent guidelines for these categories must be applied to each waste stream and combined when developing limitations.

Production/Flow-Based Limitations

Most ELGs are expressed in terms of allowable pollutant discharge per unit of production (or some other measure of production) or are based on wastewater flow rates. In general, production/flow-based standards are developed for industries that incorporate flow reduction practices, and EPA considers this in the ELG development process. This methodology forces permittees to implement comparable measures to comply with the limitations. To determine permit limits, and in accordance with the requirements at 40 CFR §122.45(b), these standards are multiplied by a reasonable measure of the facility's actual production/flow rate (i.e., not the design production or flow rate). Thus, it is necessary for the permit writer to determine the facility's actual production or flow, based on information supplied by the facility in the permit application.

The ideal situation for the application of ELGs is where production or flow is constant from day-to-day and month-to-month. Production or flow for the purposes of calculating the limitations would then be the average rate. In actuality, production or flow rates are not as constant as this ideal situation. They vary based on factors such as the market demand, maintenance, product changes, down times, breakdowns, and facility modifications. As such, the production or flow rate of a facility will vary with time.

To apply production/flow-based ELGs to a facility with varying production or flow rates, the permit writer should determine a single estimate of the long-term average rate that is expected to exist during the term of the permit being prepared. It is recommended that the permit writer establish this average from the past 5 years of facility data. This single value is then multiplied by the ELGs to obtain permit limits. In certain instances, the permit writer may find that fewer than 5 years of data may better represent conditions that are anticipated for the next 5 years. This would be the case for a facility that has undergone major renovations that would impact production or flow; making use of data prior to this construction inappropriate to model future process options.

The objective in determining a production or flow estimate for a facility is to develop a single estimate of the long-term average production rate (in terms of mass of product per day or volume of process wastewater per day), which can reasonably be expected to prevail during the next term of the permit. The following example illustrates the proper application of production-based guidelines:

Example:

Company A has produced 331,000 tons, 301,500 tons, 361,500 tons, 332,000 tons, and 331,500 tons per year for the previous 5 years operating 255 days per year. What would be a reasonable measure of production for permitting purposes? Assuming that pollutant X has an effluent limitation guideline of 0.1 lbs/1,000 lbs for the monthly average and 0.15 lbs/1,000 lbs for the daily maximum, what would be the resulting effluent limitations?

Discussion:

The use of the long-term average production (i.e., average production over past 5 years = 331,500 tons per year) would be an appropriate and reasonable measure of production, if this figure represents the actual production expected to occur over the next term of the permit. Also, in evaluating these gross production figures, the number of production days must be considered. If the number of production days per year is not comparable, the numbers must be converted to production per day before they may be compared. To convert from the annual production rate to average daily rate, the annual production rate is divided by the number of production days per year. To determine the number of production days, the total number of normally scheduled nonproduction days are subtracted from the total days in a year.

If Company A normally has 255 production days per year, the annual production rate of 331,500 tons per year would yield an average daily rate of 1,300 tons per day.

Monthly average limit:
1,300 tons/day x 2,000 lbs/ton x 0.10 lbs/1,000 lbs = 260 lbs/day

Daily maximum limit:
1,300 tons/day x 2,000 lbs/ton x 0.15 lbs/1,000 lbs = 390 lbs/day

In the example above, the average production rate during the last 5 years was used as the estimate of production. This average rate is appropriate when production is not expected to change significantly during the permit term. However, if historical trends, market forces, or company plans indicate that a different level of production will prevail during the permit term, a different basis for estimating production should be used.

Tiered Permit Limits

If production rates are expected to change significantly during the life of the permit, the permit writer can include alternate or tiered limits. These tiered limits would become effective when production exceeds a threshold value, such as during seasonal production variations. As a general rule of thumb, up to a 20 percent fluctuation in production is within the range of normal variability, while changes in production higher than 20 percent could warrant consideration of alternate limits. The major characteristics of tiered limits are best described by illustration and example.

Example:

Plant B produced approximately 40 tons per day of product during spring and summer months (i.e., March through August) and 280 tons per day during fall and winter months during the previous 5 years. Production during the fall and winter months are significantly higher than during the off-season and the permittee has made a plausible argument that production is expected to continue at that level. The guideline for pollutant X is 0.08 lbs/1,000 lbs for the monthly average and 0.14 lbs/1,000 lbs for the daily maximum. What are the tiered effluent limitations?

Discussion:

The first tier or lower limits would be based on a production rate of 40 tons per day. These limits would apply between March and August.

Monthly average limit:
40 tons/day x 2,000 lbs/ton x 0.08 lbs/1,000 lbs = 6.4 lbs/day

Daily maximum limit:
40 tons/day x 2,000 lbs/ton x 0.14 lbs/1,000 lbs = 11.2 lbs/day

The second tier or higher limits would be based on a production rate of 280 tons per day. These limits would apply between September and February.

Monthly average limit:
280 tons/day x 2,000 lbs/ton x 0.08 lbs/1,000 lbs = 44.8 lbs/day

Daily maximum limit:
280 tons/day x 2,000 lbs/ton x 0.14 lbs/1,000 lbs = 78.4 lbs/day

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Tiered permits with alternate limits should be used only after careful consideration of production data and only when a substantial increase or decrease in production is likely to occur. In the example above, the lower limits would be in effect when production was at "low" levels. During periods of significantly higher production, the higher limits would be in effect. In addition, alternate limits may also be appropriate in the case of special processes or product lines. The thresholds, measures of production, and special reporting requirements must be detailed in the permit. Special reporting requirements include provisions such as:

- The permittee notifying the permitting authority at least two business days prior to the month they expect to be operating at a higher level of production and the duration this level of production is expected to continue
- The permittee reporting, in the discharge monitoring report, the level of production and the limitation and standards applicable to that level.

Mass Versus Concentration Limits

The regulations at 40 CFR §122.45(f)(1) require that all permit limits, standards, or prohibitions be expressed in terms of mass units (e.g., pounds, kilograms, grams) except under the following conditions:

1) For pH, temperature, radiation, or other pollutants that cannot appropriately be addressed by mass limits;
2) When applicable standards and limitations are expressed in terms of other units of measurement; or
3) If in establishing technology-based permit limitations on a case-by-case basis limitations based on mass are infeasible because the mass or pollutant cannot be related to a measure of production. The limitations, however, must ensure that dilution will not be used as a substitute for treatment.

While the regulations require that limitations be expressed in terms of mass, a provision is included at 40 CFR §122.45(f)(2) that allows that permit writer, at his or her discretion, to express limits in additional units (e.g., concentration units). Where limits are expressed in more than one unit, the permittee must comply with both.

As provided by the regulations, the permit writer may determine that expressing limits in more than one unit is appropriate under certain circumstances. For example,

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expressing limitations in terms of concentration as well as mass encourages the proper operation of a treatment facility at all times. In the absence of concentration limits, a permittee would be able to increase its effluent concentration (i.e., reduce its level of treatment) during low flow periods and still meet its mass-based effluent limits. Concentration limits discourage the reduction in treatment efficiency during low flow periods, and require proper operation of treatment units at all times.

The derivation of concentration limits should be based on evaluating historical monitoring data and using engineering judgment to be sure they are reasonable. In certain situations, the use of concentration limits may not be appropriate since they may discourage the use of innovative techniques, such as water conservation by the permittee. For example, if a facility had a history of providing efficient treatment of its wastewater and also wished to practice water conservation, inclusion of concentration limits would not be appropriate (i.e., concentration limits would prohibit decreases in flow that would concurrently result in an increase in pollutant concentration). To summarize, the applicability of concentration limits should be a case-by-case determination based upon the professional judgment of the permit writer.

It should be noted that the long-term average flow should be used to calculate both the monthly average and daily maximum concentrations. The use of the long-term average flow is most appropriate for the calculation of concentration limits because it will reflect the range of concentrations that could be expected in a well operated plant. The use of the maximum daily flow is not appropriate to determine concentration limits from the mass limitations because it will reduce the concentration below the value which could be expected in a well operated plant. Alternatively, use of the lowest flow value will increase the concentration limit to levels above what would be expected in a well operated plant.

Example 1:

An industrial facility (leather tanner) is subject to effluent limitations guidelines based on its rate of production. The permit writer calculates the applicable mass-based limits based on the long-term production rate at the facility and incorporates the mass limits in accordance with 40 CFR §122.45(f)(1).

In reviewing the past inspection records for the facility, the permit writer notes that while the facility is generally in compliance with its mass limits, the effluent flow and concentration vary widely. To ensure that the treatment unit is operated properly at all times, the permit writer determines that concentration-based limits are also appropriate. The permit writer consults the EPA Development Document for the leather tanning effluent limitations guidelines and bases the concentration-based limits on the demonstrated performance of the treatment technology upon which the effluent guidelines were based. The concentration-based limits are then incorporated in the permit in accordance with 40 CFR §122.45(f)(2).

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Example 2:

For Company A, the mass limits for pollutant X have been set at 260 lbs/day and 390 lbs/day monthly average and daily maximum, respectively. What are the monthly average concentration limitations in milligrams per liter (mg/l) using both an average flow of 0.9 mgd and the low flow of 0.6 mgd? Note: 8.34 is a conversion factor with the units (lbs/day)/(mgd)(mg/l).

Discussion:

Monthly average limit (based on average flow):
260 lbs/day/(8.34 x 0.9 mgd) = 35 mg/l

Monthly average limit (based on low flow):
260 lbs/day/(8.34 x 0.6 mgd) = 52 mg/l

This is almost 150 percent more than the concentration during average flow!

In determining applicable effluent concentration limitations, the monthly average and daily maximum mass limits divided by the average flow will provide appropriate concentrations.

Monthly average limit:
260 lbs/day/(8.34 x 0.9 mgd) = 35 mg/l

Daily maximum limit:
390 lbs/day/(8.34 x 0.9 mgd) = 52 mg/l

5.1.4 Best Professional Judgment Permit Limits

Best Professional Judgment (BPJ)-based limits are technology-based limits derived on a case-by-case basis for non-municipal (industrial) facilities. BPJ limits are established in cases where ELGs are not available for, or do not regulate, a particular pollutant of concern. BPJ is defined as the highest quality technical opinion developed by a permit writer after consideration of all reasonably available and pertinent data or information that forms the basis for the terms and conditions of a NPDES permit.

The authority for BPJ is contained in Section 402(a)(1) of the CWA, which authorizes the EPA Administrator to issue a permit containing “such conditions as the Administrator determines are necessary to carry out the provisions of this Act” prior to taking the necessary implementing actions, such as the establishment of ELGs. During the first round of NPDES permits in the early-to-mid-1970s, a majority of permits were based on the authority of Section 402(a)(1) of the CWA. These first round so-called best engineering judgment permits were drafted because effluent guidelines were not available for many industries. As effluent guidelines began to be promulgated, permit writers had to rely less on their best engineering judgment and could apply the ELGs in permits. As the implementation of the age of toxic pollutant

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control continues, the use of BPJ conditions in permits has again become more common. However, the statutory deadline for compliance with technology-based effluent limits (including BPJ-based pollutant limits) was March 31, 1989. Therefore, compliance schedules cannot be placed in permits to allow for extensions in meeting BPJ pollutant limits.

BPJ has proven to be a valuable tool for NPDES permit writers over the years. Because it is so broad in scope, BPJ allows the permit writer considerable flexibility in establishing permit terms and conditions. Inherent in this flexibility, however, is the burden on the permit writer to show that the BPJ is reasonable and based on sound engineering analysis. If this evaluation of reasonableness does not exist, the BPJ condition is vulnerable to a challenge by the permittee. Therefore, the need for and derivation of the permit condition, and the basis for its establishment, should be clearly defined and documented. References used to determine the BPJ condition should be identified. In short, the rationale for a BPJ permit must be carefully drafted to withstand the scrutiny of not only the permittee, but also the public and, ultimately, an administrative law judge.

Establishment of BPJ Permit Limits

The NPDES regulations in 40 CFR §125.3 state that permits developed on a case-by-case basis under Section 402(a)(1) of the CWA must consider (1) the appropriate technology for the category class of point sources of which the applicant is a member, based on all available information, and (2) any unique factors relating to the applicant. To set BPJ limits, a permit writer must first determine a need for additional controls beyond existing ELGs. The need for additional controls may be the result of the facility not falling under any of the categories for which ELGs exist (e.g., barrel reclaimers, transportation equipment cleaning facilities, or industrial laundries) or discharging pollutants of concern that are not directly or indirectly addressed by the development of the ELGs (e.g., a pharmaceutical manufacturer or a petroleum refiner may discharge elevated levels of organic solvents for which category-specific guidelines do not exist). It should be noted that prior to establishing BPJ-based limits for a pollutant not regulated in an effluent guideline, the permit writer should ensure that the pollutant was not considered by EPA while developing the ELGs (i.e., BPJ-based effluent limits are not required for pollutants that were considered by EPA for regulation under the effluent guidelines, but for which EPA determined that no ELG

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was necessary). Information contained in the appropriate "Development Document" should assist permit writers in making this determination.

In setting BPJ limitations, the permit writer must consider several specific factors as they appear in 40 CFR §125.3(d). These factors, which are enumerated below, are the same factors required to be considered by EPA in the development of ELGs and, therefore, are often referred to as the Section 304(b) factors:

- For BPT requirements:
  - The total cost of application of technology in relation to the effluent reduction benefits to be achieved from such application
  - The age of equipment and facilities involved*
  - The process employed*
  - The engineering aspects of the application of various types of control techniques*
  - Process changes*
  - Non-water quality environmental impact including energy requirements*
- For BCT requirements:
  - All items in the BPT requirements indicated by an asterisk (*) above
  - The reasonableness of the relationship between the costs of attaining a reduction in effluent and the effluent reduction benefits derived
  - The comparison of the cost and level of reduction of such pollutants from the discharge of POTWs to the cost and level of reduction of such pollutants from a class or category of industrial sources
- For BAT requirements:
  - All items in the BPT requirements indicated by an asterisk (*) above
  - The cost of achieving such effluent reduction.

A permit writer must consider each of these factors in establishing BPJ-based conditions in permits. Since BPJ contains an element of judgment or educated opinion, a permit writer with the proper tools should be able to establish BPJ conditions in permits that are both technically sound and reasonable.

A technically sound and reasonable permit is not likely to be successfully challenged by the permittee or a third party. In this context, "technically sound permit conditions" means that the conditions are achievable with existing technology.

"Reasonable" means that the conditions are achievable at a cost that the facility can afford. Historically, some of the other factors, such as age, process employed and non-water quality impacts have assumed lesser importance than the technical and economic feasibility evaluations.

BPJ Permitting Tools and References

Permit writers can develop BPJ limits using one of two different methods. A permit writer can either transfer numerical limitations from an existing source such as from a similar NPDES permit or an existing ELG, or derive new numerical limitations. Numerous tools and references for BPJ permit writing exist. As one gains experience drafting BPJ permits, it is common practice to rely on some references more than others. **Exhibit 5-5** lists references and provides some examples for selected BPJ data sources that have proven useful to permit writers over the years.

Most of the tools and references listed in Exhibit 5-5 can be used to derive new BPJ-based permit limits. They provide information related to the expected performance of wastewater treatment systems. For example, the *Treatability Manual*[4] and associated data base provides treatability information for over 1,400 pollutants. Information collected for use in developing effluent guidelines and standards can also provide treatability data for a significant number of pollutants and for a variety of types of industrial wastewaters. The *Technical Support Document for Water Quality-Based Toxics Control*[5] provides extensive information and guidance related to the statistical considerations when establishing effluent limits.

Since best management practices (BMPs) can also be used by permit writers as the basis for effluent limits, the *Guidance Manual for Developing Best Management Practices*[6] can be used by permit writers to identify potentially applicable BMPs that could be used for the facility to be permitted. In addition, *Storm Water Management*

[4]USEPA (1980). *Treatability Manual, Volumes I - V*. EPA-600/8-80-042a-e. Office of Research and Development.

[5]USEPA (1991). *Technical Support Document for Water Quality-Based Toxics Control*. EPA-505/2-90-001. Office of Water Enforcement and Permits.

[6]USEPA (1993). *Guidance Manual for Developing Best Management Practices*. (BMPs). EPA-833-B-93-004. Office of Water.

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EXHIBIT 5-5
BPJ Permitting Tools

- Abstracts of Industrial NPDES Permits
- Treatability Manual and Data Base
- NPDES Best Management Practices Guidance Document
- Guidance Manual for Developing Best Management Practices (BMPs). EPA 833-B-93-004. (USEPA, 1993) Office of Water and Storm Water Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices. EPA 832-R-92-006. (USEPA, 1992) Office of Water.
- Technical Support Document for the Development of Water Quality-based Permit Toxic Control
- Workbook for Determining Economic Achievability for NPDES Permits
- National Environmental Investigation Center reports on specific facilities
- Toxicity reduction evaluations for selected industries
- Industry experts within EPA Headquarters, Regions, and States
- Effluent guidelines development information
  - CWA Section 308 questionnaires
  - Screening and verification data
  - Development documents
  - Contractor's reports
  - Proposed regulations
  - Project Officers
- Permit Compliance System data
- Permit/compliance file information
  - Previous NPDES application forms
  - Discharge Monitoring Reports
  - Compliance Inspection reports
- Other media permit files (e.g., Resource Conservation and Recovery Act (RCRA) permit applications and Spill Prevention Countermeasure and Control (SPCC) plans)
- Literature (e.g., technical journals and books).

for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices[7] can be used by permit writers responsible for establishing BPJ permit limits for storm water discharges.

[7]USEPA (1992). *Storm Water Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices*. EPA 832-R-92-006. Office of Water.

To assist permit writers in identifying other NPDES permits from which technology-based effluent limits can be transferred, EPA has developed the *NPDES Industrial Permit Abstracts*[8]. The abstracts are a compilation of NPDES permits issued by authorized State agencies and EPA Regional offices to a variety of non-municipal dischargers. The abstracts assist permit writers by providing rapid access to permit information in a standardized, cross-referenced and easy-to-read format.

As previously discussed, permit writers must consider the costs to comply when establishing BPJ permit limits for toxic and nonconventional pollutants. To assist permit writers in determining whether the estimated costs are reasonable for the facility to be permitted, a draft document, *Workbook for Determining Economic Achievability for National Pollutant Discharge Elimination System Permits*[9], has been developed. This guidance document provides a step-by-step procedure for permit writers to determine the economic achievability of BPJ effluent limits.

BPJ Statistical Considerations

The quality of the effluent from a treatment facility will normally vary over time. If BOD_5 data for a typical treatment plant are plotted against time, the day-to-day variations of effluent concentrations can be seen. Some of this behavior can be described by constructing a frequency-concentration plot. From this plot, one can see that for most of the time, BOD_5 concentrations are near some average value. Any treatment system can be described using the mean concentration of the parameter of interest (i.e., the long-term average) and the variance (or coefficient of variation) and by assuming a particular statistical distribution (usually lognormal).

Permit limits are generally set at the upper bounds of acceptable performance. As required at 40 CFR §122.45(d), two expressions of permit limits are required—an average monthly limit and a maximum daily limit. The use of average and maximum limits can vary depending on the effluent guidelines and water quality criteria that are consulted. Instantaneous maximums, daily averages and daily maximums, weekly averages, and monthly averages are all commonly used limitation expressions.

[8]USEPA (1993). *NPDES Industrial Permit Abstracts 1993*. EPA-833/B-93-005. Office of Water.

[9]USEPA (1982). *Workbook for Determining Economic Achievability for National Pollutant Discharge Elimination System Permits* (DRAFT). Permits Division Prepared by Putnam, Wayes & Bartlett, Inc.

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Generally, the definitions are consistent with those set forth in the Glossary of this manual.

If permit limits are set too lenient relative to the long-term average, a discharger not complying with expected performance will not exceed the limits. If permit limits are set too stringently, a discharger that is complying with expected performance may frequently exceed the limits. It is important to note that statistical variability is already built in with respect to the ELGs, and the permit writer may not perform a separate evaluation in those cases where a permit limitation is derived from a guideline.

When developing a BPJ limit, permit writers can use an approach consistent with EPA's ELG statistical approach. Specifically, the daily maximum limitation can be calculated by multiplying the long-term average by a daily variability factor. The monthly maximum limitation can be calculated similarly except that the variability factor corresponds to the distribution of monthly averages instead of daily concentration measurements.

The daily variability factor is a statistical entity defined as the ratio of the estimated 99th percentile of a distribution of daily values divided by the mean of the distribution. Similarly, the monthly variability factor is typically defined as the estimated 95th percentile of the distribution of 4-day averages divided by the mean of the monthly averages.

A modified delta-lognormal distribution can be fit to concentration data. Variability factors can then be computed for a facility distribution. The modified delta-lognormal distribution models the data as a mixture of non-detect observations and measured values. This distribution is often selected because the data for most analytes consists of a mixture of measured values and non-detects. The modified delta-lognormal distribution assumes that all non-detects have a value equal to the detection limit and that the detected values follow a lognormal distribution.

For more details on EPA's use of statistical methods for developing ELGs, refer to *Development Document for Effluent Limitations Guidelines and Standards for the*

Organic Chemicals, Plastics and Synthetic Fibers Point Source Category[10] or *Technical Support Document for Water Quality-Based Toxics Control*[11].

5.2 Application of Technology-Based Effluent Limitations for Municipal Dischargers

The largest category of dischargers requiring individual NPDES permits is municipal POTWs. Similar to its approach for controlling the discharges from industrial sources, the 1972 CWA required POTWs to meet performance-based requirements based on available wastewater treatment technology. Section 301 of the CWA established a required performance level, referred to as "secondary treatment," that all POTWs were required to meet by July 1, 1977.

More specifically, Section 301(b)(1)(B) of the CWA requires that EPA develop secondary treatment standards for POTWs as defined in Section 304(d)(1) of the Act. Based on this statutory requirement, EPA developed secondary treatment regulations which are specified in 40 CFR Part 133. These technology-based regulations apply to all municipal wastewater treatment plants and identify the minimum level of effluent quality attainable by secondary treatment in terms of BOD_5, TSS, and pH. The regulations provide for special considerations regarding combined sewers, industrial wastes, waste stabilization ponds, and less concentrated influent wastewater for combined and separate sewers. Pursuant to Section 304(d)(4) of the CWA, the regulations also define "treatment equivalent to secondary treatment" and the alternative standards that apply to facilities meeting this definition.

5.2.1 Secondary Treatment

An important aspect of municipal wastewater is that it is amenable to biological treatment. The biological treatment component of a municipal treatment plant is termed secondary treatment and is usually preceded by simple settling (primary treatment). In response to the CWA requirements, EPA evaluated performance data

[10] USEPA (1987). *Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics, and Synthetic Fibers Point Source Category.* Vol I and Vol II. EPA 440/1-87/009. Office of Water, Industrial Technology Division.

[11] USEPA (1991). *Technical Support Document for Water Quality-Based Toxics Control.* EPA-505/2-90-001. Office of Water Enforcement and Permits.

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for POTWs practicing secondary treatment and established performance standards based on its evaluation. Secondary treatment standards, therefore, are defined by the limitations provided in **Exhibit 5-6**.

EXHIBIT 5-6
Secondary Treatment Standards

Parameter	30-Day Average	7-Day Average
5-Day BOD	30 mg/l	45 mg/l
TSS	30 mg/l	45 mg/l
pH	6 - 9 s.u. (instantaneous)	–
Removal	85% BOD_5 and TSS	–

According to 40 CFR §122.45(f), permit writers must apply these secondary treatment standards as mass-based limits using the design flow of the plant. Permit writers may also apply concentration-based effluent limitations for both 30-day and 7-day average limitations.

Example:

A POTW with a design flow rate of 2.0 mgd would have permit limits based on secondary treatment standards as follows:

Mass-Based Limit = Design Flow × Concentration-Based Limit × Conversion Factor

BOD

(30-day average) 2.0 mgd × 30mg/l × 8.34 (lb)(l)/(mg)(gal) = 500 lb/day
(7-day average) 2.0 mgd × 45mg/l × 8.34 (lb)(l)/(mg)(gal) = 750 lb/day

TSS

(30-day average) 2.0 mgd × 30mg/l × 8.34 (lb)(l)/(mg)(gal) = 500 lb/day
(7-day average) 2.0 mgd × 45mg/l × 8.34 (lb)(l)/(mg)(gal) = 750 lb/day

pH

(instantaneous) 6-9 s.u.

Removal

(30-day average) 85% BOD_5 and TSS removal

Where nitrification is occurring in a treatment process, BOD_5 may not provide a reliable measure of the oxygen demand of the effluent. This is because nitrifying bacteria use a large amount of oxygen to consume unoxidized nitrogen and ammonia-

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nitrogen and convert these to oxidized nitrate. In these instances, basing permit limits on carbonaceous BOD_5 ($CBOD_5$) instead of BOD_5 eliminates the impact of nitrification on effluent limits. EPA, therefore, allows for the use of $CBOD_5$ limits to minimize false indications of poor facility performance as a result of nitrogenous pollutants. Allowed under 40 CFR §133.102(a)(4), the permit writer does have the discretion to set effluent limits for $CBOD_5$ in lieu of a BOD_5 limit. EPA has studied the use of a $CBOD_5$ limit and has concluded that a 25 mg/l 30-day average and 40 mg/l 7-day average are effectively equivalent to the (30/45) BOD_5 limits.

Chemical oxygen demand (COD) and total organic carbon (TOC) laboratory tests can provide an accurate measure of the organic content of wastewater in a shorter time frame than a BOD_5 test (i.e., several hours versus 5 days). Pursuant to 40 CFR §133.104(b), the permit writer may substitute COD or TOC monitoring for BOD_5 when a long-term BOD:COD or BOD:TOC correlation has been demonstrated.

Municipal wastewater treatment facilities are required to meet secondary treatment standards with few exceptions. The exceptions, identified at 40 CFR §133.103, include:

- Treatment works that receive flows from combined sewers during wet weather can qualify for alternative monthly percent removal limits during wet weather events.
- Treatment works that receive wastes from industrial categories that have ELGs for BOD_5 and TSS less stringent than the secondary treatment requirements in 40 CFR Part 133, can qualify to have their BOD_5 and TSS limits adjusted upwards provided that: (1) the permitted discharge is less than would be permitted under the corresponding ELGs for direct discharges, and (2) the flow or loading of such pollutants introduced by the industrial category exceeds ten percent of the design flow or loading of the POTW.
- Treatment works that use waste stabilization ponds as the principal process for secondary treatment and whose operation and maintenance data indicate that the TSS values specified in the equivalent-to-secondary regulations (discussed in Section 5.2.2) cannot be achieved, can qualify to have their minimum TSS levels adjusted upwards.
- Treatment works that receive less concentrated wastes from separate sewer systems can qualify to have their percent removal limit reduced or receive a mass loading limit provided that: (1) the facility can consistently meet its permit effluent concentration limits but cannot meet its percent

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removal limits because of less concentrated effluent water, (2) the facility would have been required to meet significantly more stringent limitations than would otherwise be required by the concentration-based standards, and (3) the less concentrated effluent is not the result of excessive infiltration/inflow (I/I).

[Note: The determination of excessive I/I is based on (1) the "excessive I/I" definition in 40 CFR §35.2005(b)(16) as the quantities of I/I which can be economically eliminated from a sewer system as determined in a cost-effectiveness analysis that compares the costs for correcting the I/I conditions to the total costs for transportation and treatment of the I/I and (2) I/I is not excessive if the total flow (i.e., wastewater plus I/I) to the POTW is less than 275 gallons per capita per day.]

- Treatment works receiving less concentrated wastes from combined sewers during dry weather can qualify to have their percent removal limit reduced or receive a mass loading limit provided that: (1) the facility can consistently meet its permit effluent concentration limits, but cannot meet its percent removal limits because of less concentrated effluent water, (2) the facility would have been required to meet significantly more stringent limitations than would otherwise be required by the concentration-based standards, and (3) the less concentrated influent wastewater does not result from either excessive infiltration or clear water industrial discharges during dry weather periods. If the less concentrated influent is the result of clear water industrial discharges, the treatment works must control such discharges pursuant to 40 CFR Part 403.

  [Note: The determination of excessive infiltration is based on (1) the "excessive infiltration" definition in 40 CFR §35.2005(b)(28) as the quantity of flow which is less than 120 gallons per capita per day (domestic flow and infiltration) or the quantity of infiltration which cannot be economically and effectively eliminated from a sewer system as determined in a cost effectiveness analysis and (2) the criterion that either 40 gallons per capita per day or 1,500 gallons per inch diameter per mile of sewer may be used as the threshold value for that portion of the dry weather base flow attributed to infiltration.]

The NPDES regulations also provide for a waiver from secondary treatment requirements for discharges into marine waters. In these instances, the POTW must file a modification request for a marine discharge in accordance with the requirements of 40 CFR Part 125, Subpart G. More detail on marine variance requests is provided in Section 10.1.3.

5.2.2 Equivalent-to-Secondary Treatment Definition

Following publication of the secondary treatment regulations, legislative history indicates that Congress was concerned that EPA had not "sanctioned" the use of certain biological treatment techniques that were effective in achieving significant reductions in BOD_5 and SS for secondary treatment. Therefore, to prevent unnecessary construction of costly new facilities, Congress included language in the 1981 amendment to the Construction Grants statutes [Section 23 of Pub. L. 97-147] that required EPA to provide allowances for alternative biological treatment technologies, such as a trickling filter or waste stabilization pond. In response to this requirement, definition of secondary treatment was modified on September 20, 1984, and June 3, 1985, and published in the revised secondary treatment regulations contained in 40 CFR §133.105. These regulations allow alternative limits for facilities using trickling filters and waste stabilization ponds that meet the requirements for "equivalent to secondary treatment." Several important concepts form the basis for this revision of the regulations:

- Certain classes of biological treatment facilities that are capable of achieving significant reductions in BOD_5 and TSS, but cannot consistently achieve secondary treatment, should be defined as separate and distinct from secondary treatment facilities.
- These facilities (equivalent-to-secondary) are cheaper and easier to operate and, therefore, are utilized by smaller communities. The provisions established by EPA should provide for continued use of these technologies where possible.
- The technology-based effluent limitation approach used to establish secondary treatment should be retained for equivalent-to-secondary treatment limits.
- Water quality must not be adversely affected by the application of equivalent-to-secondary treatment.
- Costly treatment plant upgrading or replacement should be avoided where equivalent facilities are operating sufficiently (e.g., achieving their original design performance levels).
- Regulations should address variations in facility performance due to geographic, climatic, or seasonal conditions.

In recognition of the above factors, the revisions to include a definition for equivalent-to-secondary treatment entail a change in the traditional definition of secondary treatment for some POTWs. The capability and performance of an

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individual plant is assessed, and limits are selected from a range of possible values. Although this process has been used for industrial facilities, the concept has generally not been applied to municipal permits (with the exception of interim permit limits).

To be eligible for equivalent-to-secondary limitations, a POTW must meet all of the following criteria:

- The principal treatment process must be either a trickling filter or waste stabilization pond (e.g., the largest percentage of BOD_5 and TSS removal is provided by the trickling filter or waste stabilization pond system).
- The effluent quality consistently achieved, despite proper operations and maintenance, is in excess of 30 mg/l BOD_5 and TSS.
- Water quality is not adversely affected by the discharge.
- The treatment works as a whole provides significant biological treatment such that a minimum 65 percent reduction of BOD_5 is consistently attained (30-day average).

A treatment works that is operating beyond its design hydraulic or organic loading limit is not considered an eligible facility. If overloading or structural failure is causing poor performance, the solution to the problem is construction, not effluent limitations adjustment. There are several important implications of the equivalent-to-secondary treatment regulation as it applies to specific municipal permitting issues. These issues are discussed below.

New Facility Limitations

As specified in 40 CFR §133.105(f), the permitting authority must set more stringent limits for new facilities if an analysis of new plant performance shows that more stringent limits than the maximum equivalent-to-secondary limits (45/45) can be met. Recently, a wide range of designs (e.g., solids contact channels, covers) have been used on trickling filters to improve their performance. This situation creates a performance dichotomy between old trickling filters and current state-of-the-art plants. The regulations recognize this disparity and encourage States to establish separate limits for new trickling filters based on current design practices in the State. Where possible, an analysis of similar plants is the preferred method for establishing permit limits where in-state data on new trickling filters are not available. Where no performance data are available for determining new plant capability, literature values may be used.

Calculation of Permit Limits for Equivalent-to-Secondary Facilities

In most cases, the permit limits for equivalent-to-secondary facilities will be selected from the 30 to 45 mg/l BOD_5 and TSS monthly average, and 45 to 65 mg/l BOD_5 and TSS weekly average range established by the regulation. Obviously, not all permits will be set at the 45 mg/l monthly average and 65 mg/l weekly average top of the range. The selection should be based on current performance data for the last two years of operation, at a minimum.

Where the plant performance data contain erroneous values because of plant upsets, or other situations not associated with poor operation or maintenance, an adjustment to the permit limit calculation may be made. The data for the month in question may be adjusted by dropping the erroneous daily value and recalculating the monthly average based on the remaining daily values. Another alternative is to analyze monthly average values for a period greater than two years and drop the monthly averages that are erroneous because of explained upset situations. Discharge Monitoring Report (DMR) data should be used for calculations whenever possible. The DMRs must support the permit writer's decision for an equivalent to secondary facility. It should be noted that the burden of proof for performance data and demonstration of proper operation and maintenance is the responsibility of the municipality.

A trickling filter or lagoon will often be combined with another biological process (i.e., activated sludge process) in one treatment plant. In this case, if the trickling filter or lagoon qualifies for equivalent-to-secondary limits, the permit limits for the treatment plant can be derived by averaging the equivalent-to-secondary and conventional secondary treatment limits. To accomplish this, a flow-weighted average of the two effluent concentration limits should be calculated and applied as the outfall limitation for the permit. An alternative to this approach is the use of internal waste stream limitations as authorized by 40 CFR §122.45(h) for each biological process effluent line. The permit writer should encourage the continued use of existing trickling filters and lagoons, where appropriate, through the application of appropriate equivalent-to-secondary limits. However, the permit writer must be sure that these facilities are capable of meeting the proposed effluent limits without causing water quality impacts before the permit limits can be adjusted. If one cannot determine this, equivalent-to-secondary limits cannot be used in the permit.

Alternative State Requirements (ASRs)

The Alternative State Requirement (ASR) provision contained in 40 CFR §133.105(d) of the regulation allows States the flexibility to set permit limits above the maximum levels of 45 mg/l monthly average and 65 mg/l weekly average BOD_5 and TSS from lagoons meeting certain requirements. Where lagoon suspended solids requirements are already above 45 mg/l in accordance with 40 CFR §133.103(c), an ASR by the State is not necessary, unless higher limits are desired. To establish an ASR, the State must do two things:

- Identify a group of equivalent facilities that warrant different limits in exceedance of the equivalent-to-secondary values contained in 40 CFR Part 133
- Justify the higher permit limitations for these facilities.

The group of facilities can be selected because of climatic or geographic location, the type of technology used, or any other supportable criteria. The analysis of plant data for the group must be statistically sound and should follow the methods presented in EPA's *Technical Support Document for Water Quality-Based Toxics Control*.[12] The ASR must be approved by the EPA Region before permits can be written using the ASR values. The public notice of a proposed ASR is the responsibility of the State. EPA has published approved ASRs in 49 *FR* 37005, September 20, 1984. **Exhibit 5-7** is a summary of the ASRs for each State.

Carbonaceous BOD Limits

EPA recognizes that the carbonaceous BOD (CBOD) test can provide accurate information on treatment plant performance in many cases. However, the use of CBOD in permits should be focused on facilities with known or suspected nitrification

[12] USEPA (1991). *Technical Support Document for Water Quality-Based Toxics Control*. EPA-505/2-90-001. Office of Water Enforcement and Permits.

problems such as underloaded facilities and new facilities with long detention times. These conditions favor nitrifying bacteria and can lead to erroneous BOD_5 test results.

The equivalent-to-secondary treatment regulations in 40 CFR §133.105(e) allow optional use of a CBOD limit and test procedure in municipal permits as a substitute for the standard BOD_5. This substitution is at the discretion of the permitting authority. To establish a CBOD limit for an equivalent-to-secondary treatment facility, the permitting authority must have data to show that nitrifying bacteria in the treatment plant are causing the BOD_5 test results to be significantly impacted. Extensive BOD_5/CBOD comparisons should not be necessary because the actual CBOD limit will be established by (1) determining the BOD_5 limit that can be met through proper operation and maintenance, and (2) if the BOD_5 limit is between 30 and 45 mg/l, setting the CBOD limit 5 units lower (e.g., between 25 and 40 mg/l).

The EPA-approved test procedures in 40 CFR Part 136 now contain a CBOD (nitrogen inhibited) test procedure. The CBOD test can be specified for any municipal permit. However, the BOD_5/CBOD relationship (5 mg/l difference) may not apply outside the 30 to 45 mg/l BOD_5 range. If CBOD limits will be used for equivalent-to-secondary permits above 45 mg/l (BOD_5), a BOD_5/CBOD relationship should be established during the ASR process. Where parallel BOD_5/CBOD test data are available, they must be submitted to the EPA Regional office with the proposed ASRs for approval. For permit limits below 30 mg/l BOD_5 the corresponding CBOD limit should be developed during an advanced treatment review or from the wasteload allocation. The use of CBOD in the permit is not a substitute for nitrogen or ammonia limits if in-stream nitrification or ammonia toxicity is creating a problem.

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EXHIBIT 5-7
State-Specific ASRs

Location	Alternate TSS Limit (30-day average) (mg/l)
Alabama	90
Alaska	70
Arizona	90
Arkansas	90
California	95
Colorado	
Aerated ponds	75
All others	105
Connecticut	None
Delaware	None
District of Columbia	None
Florida	None
Georgia	90
Guam	None
Hawaii	None
Idaho	None
Illinois	37
Indiana	70
Iowa	
Controlled discharge, 3 cell	Case-by-case but not greater than 80
All others	80
Kansas	80
Kentucky	None
Louisiana	90
Maine	45
Maryland	90
Massachusetts	None
Michigan: Controlled seasonal discharge	
Summer	70
Winter	40
Minnesota	None
Mississippi	90
Missouri	80
Montana	100

EXHIBIT 5-7
State-Specific ASRs (continued)

Location	Alternate TSS Limit (30-day average) (mg/l)
Nebraska	80
North Carolina	90
North Dakota	
North and East of Missouri River	60
South and West of Missouri River	100
Nevada	90
New Hampshire	45
New Jersey	None
New Mexico	90
New York	70
Ohio	65
Oklahoma	90
Oregon	
East of Cascade Mountains	85
West of Cascade Mountains	50
Pennsylvania	None
Puerto Rico	None
Rhode Island	45
South Carolina	90
South Dakota	120
Tennessee	100
Texas	90
Utah	None
Vermont	55
Virginia	
East of Blue Ridge Mountains	60
West of Blue Ridge Mountains	78
East slope counties: Loudoun, Fauquier, Rappahannock, Madison, Green, Albemarle, Nelson, Amherst, Bedford, Franklin, Patrick.	Case-by-base application of 60/78 limits.
Virgin Islands	None
Washington	75
West Virginia	80
Wisconsin	80
Wyoming	100
Trust Territories and N. Marianas	None

Source: 49 *FR* 37005; 9/20/84

Chapter 6

Water Quality-Based Effluent Limits

Permit writers must consider the impact of every proposed surface water discharge on the quality of the receiving water. Water quality goals for a water body are defined by State water quality standards. A permit writer may find, by analyzing the effect of a discharge on the receiving water, that technology-based permit limits are not sufficiently stringent to meet these water quality standards. In such cases, the CWA and EPA regulations require development of more stringent, water quality-based effluent limits (WQBEL) designed to ensure that water quality standards are met. In order to develop effective WQBELs, permit writers must be familiar with State water quality standards methods for predicting water quality impacts from discharges, and procedures for establishing WQBELs. This chapter provides basic information on these subjects. For more detailed information on water quality-based permitting, refer to the *Technical Support Document for Water Quality-Based Toxics Control* (TSD),[13] or equivalent State or regional procedures.

[13] USEPA (1991). *Technical Support Document for Water Quality-Based Toxics Control*. EPA-505/2-90-001. Office of Water Enforcement and Permits.

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6.1 Overview of Water Quality Standards

WQBELs involve a site-specific evaluation of the discharge and its effect on the receiving water. A WQBEL is designed to protect the quality of the receiving water by ensuring that State water quality standards are met. To understand how to develop WQBELs, the permit writer must understand State water quality standards and the water quality goals they define.

Section 303(c) of the CWA requires every State to develop water quality standards applicable to all water bodies or segments of water bodies that lie within the State. Once standards are developed, EPA must approve or disapprove them. Water quality standards should (1) include provisions for restoring and maintaining the chemical, physical, and biological integrity of State waters, (2) provide, wherever attainable, water quality for the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water ("fishable/swimmable"), and (3) consider the use and value of State waters for public water supplies, propagation of fish and wildlife, recreation, agriculture and industrial purposes, and navigation. Currently, States are required to review their water quality standards at least once every three years and revise them as necessary. When writing a permit, the permit writer must use the most current State water quality standards. For more information regarding procedures for developing water quality standards, refer to EPA's Water Quality Standards Regulation at 40 CFR Part 131 and the *Water Quality Standards Handbook: Second Edition*.[14]

Under §510 of the CWA, States may develop water quality standards more stringent than required by the Water Quality Standards Regulation. Also, EPA reviews and approves or disapproves State-adopted water quality standards. EPA's review is to ensure that the State water quality standards meet the requirements of the CWA and the Water Quality Standards Regulation. EPA may promulgate a new or revised standard for a State where necessary to meet the requirements of the CWA.

[14] USEPA (1994). *Water Quality Standards Handbook: Second Edition*. EPA 823-B-94-005a. Office of Water.

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6.1.1 Components of Water Quality Standards

Water quality standards are composed of three parts:

- Use classifications
- Numeric and/or narrative water quality criteria
- Antidegradation policy.

Each of these three components is described below.

Use Classification

The first part of a State's water quality standard is a classification system for water bodies based on the expected beneficial uses of those water bodies. The CWA describes various uses of waters that are considered desirable and should be protected. These uses include public water supply, recreation, and propagation of fish and wildlife. The States are free to designate more specific uses (e.g., cold water aquatic life, agricultural), or to designate uses not mentioned in the CWA, with the exception of waste transport and assimilation which is not an acceptable designated use (see 40 CFR §131.10(a)). Designated uses should support the "fishable/swimmable" goal of Section 101(a)(2) of the CWA where such uses are attainable. A State must perform a use attainability analysis under 40 CFR §131.10(j) where it: (1) does not designate a "fishable/swimmable" use for a water; (2) wishes to remove a "fishable/swimmable" designated use; or (3) wishes to adopt subcategories of a designated "fishable/swimmable" use that would require less stringent criteria. The use attainability analysis is a structured scientific assessment of the factors affecting the attainment of a use. The analysis may include physical, chemical, biological, and economic factors as described in 40 CFR §131.10(g).

Water Quality Criteria

The second part of a State's water quality standard is the water quality criteria deemed necessary to support the designated uses of each water body. Section 303(a-c) of the CWA requires States to adopt criteria sufficient to protect designated uses for State waters. These criteria may be numeric or narrative. The CWA requires States to adopt numeric criteria for certain toxic pollutants where they are necessary to protect designated uses. EPA's Water Quality Standards Regulation encourages

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States to adopt both numeric and narrative water quality criteria. See Section 6.1.2, Establishing Water Quality Criteria, of this manual for additional information on the development of numeric and narrative criteria.

Antidegradation Policy

The third part of a State's water quality standard is the State's antidegradation policy. Each State is required to adopt an antidegradation policy consistent with EPA's antidegradation regulations (40 CFR §131.12) and to identify the methods it will use for implementing the policy. Antidegradation policies provide three tiers of protection from degradation of water quality:

- **Tier 1—**Protects existing uses and provides the absolute floor of water quality for all waters of the United States. Existing instream water uses are those uses that were attained on or after November 28, 1975, the date of EPA's first Water Quality Standards Regulation, or uses for which existing water quality is suitable unless prevented by physical problems such as substrate or flow.
- **Tier 2—**Protects the level of water quality necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water in waters that are currently of higher quality than required to support these uses. Before water quality in Tier 2 waters can be lowered, there must be an antidegradation review consisting of: (1) a finding that it is necessary to accommodate important economical or social development in the area where the waters are located; (2) full satisfaction of all intergovernmental coordination and public participation provisions; and (3) assurance that the highest statutory and regulatory requirements for point sources and best management practices for nonpoint sources are achieved. Furthermore, water quality may not be lowered to less than the level necessary to fully protect the "fishable/swimmable" uses and other existing uses.
- **Tier 3—**Protects the quality of outstanding national resources, such as waters of national and State parks and wildlife refuges and waters of exceptional recreational or ecological significance. There may be no new or increased discharges to these waters and no new or increased discharges to tributaries of these waters that would result in lower water quality (with the exception of some limited activities that result in temporary and short-term changes in water quality).

Additional information on water quality standards is available in the *Water Quality Standards Handbook: Second Edition*.[15]

6.1.2 Establishing Water Quality Criteria

Water quality criteria set ambient levels of individual pollutants or parameters, or describe conditions of a water body that, if met, will generally protect the designated use of the water. Water quality criteria are developed to protect aquatic life and human health, and, in some cases, wildlife from the deleterious effects of pollutants. Section 304(a) of the CWA directs EPA to publish water quality criteria guidance to assist States in developing water quality standards. EPA criteria or guidance consists of three components:

- **Magnitude—**The level of pollutant (or pollutant parameter), generally expressed as a concentration, that is allowable.
- **Duration—**The period of time (averaging period) over which the instream concentration is averaged for comparison with criteria concentrations.
- **Frequency—**How often criteria can be exceeded.

EPA's efforts on criteria development have been focused on the 65 pollutants listed in Section 307(a) of the CWA. Some of the 65 pollutants on the list are actually families or classes of organic compounds consisting of many individual chemicals. EPA translated this list into a new list of 129 priority toxic pollutants. Subsequently, two volatile chemicals and one water unstable chemical were removed from the list so that the present list contains 126 priority toxic pollutants. Criteria for the priority toxic pollutants that EPA has developed to date are contained in individual criteria documents and summarized in a document entitled *Quality Criteria for Water 1986,*[16] more commonly referred to as the *Gold Book*.

[15] USEPA (1994). *Water Quality Standards Handbook: Second Edition.* EPA 823-B-94-005a. Office of Water.

[16] USEPA (1986). *Quality Criteria for Water, 1986.* EPA-440/5-86-001. Office of Water Regulations and Standards.

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Numeric Criteria

Numeric water quality criteria are values expressed as levels, constituent concentrations, toxicity units (see discussion of whole effluent toxicity below), or numbers deemed necessary to protect designated uses. These criteria often form the basis for NPDES WQBELs. They also can be useful in assessing and managing nonpoint sources. In 1987, Congress increased the emphasis of the CWA on numeric criteria for toxic pollutants by enacting Section 303(c)(2)(B) of the act. This section requires States to adopt numeric criteria for the 126 priority toxic pollutants for which EPA has developed criteria guidance and where the discharge or presence of the pollutant could reasonably be expected to interfere with the designated uses of a water body. States may establish numeric criteria using EPA criteria guidance, modified to reflect site specific conditions, or other scientifically defensible methods.

EPA criteria for the protection of aquatic life address both short-term (acute) and long-term (chronic) effects on both freshwater and saltwater species. The following example shows the current EPA criteria for cadmium.

Example:

Aquatic Life

The procedures described in the *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses* indicate that, except possibly where a locally important species is very sensitive, freshwater aquatic organisms and their uses should not be affected unacceptably if the 4-day average concentration (in ug/L) of cadmium does not exceed the numerical value given by $e^{(0.7852[1n(hardness)]-3.490)}$ more than once every 3 years on the average and if the one-hour average concentration (in ug/L) does not exceed the numerical value given by $e^{(1.128[1n(hardness)]-3.828)}$ more than once every 3 years on the average. For example, at hardnesses of 50, 100, and 200 mg/L as $CaCO_3$ the 4-day average concentrations of cadmium are 0.66, 1.1, and 2.0 ug/L, respectively, and the 1-hour average concentrations are 1.8, 3.9 and 8.6 ug/L. If brook trout, brown trout, and striped bass are as sensitive as some data indicate, they might not be protected by this criterion.

Human health criteria are designed to protect people from exposure resulting from consumption of water and fish or other aquatic life (e.g., mussels, crayfish). The following example contains EPA’s human health criteria for cadmium.

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Example:

Human Health

The ambient water quality criterion for cadmium is recommended to be identical to the existing drinking water standard which is 10 ug/L. Analysis of the toxic effects data resulted in a calculated level which is protective of human health against the ingestion of contaminated water and contaminated aquatic organisms. The calculated value is comparable to the present standard. For this reason a selective criterion based on exposure solely from consumption of 6.5 grams of aquatic organisms was not derived.

Narrative Criteria

All States have adopted narrative criteria to supplement numeric criteria for toxicants. Narrative criteria are statements that describe the desired water quality goal. Examples of narrative criteria are provided below. Narrative criteria can be the basis for limiting specific pollutants where the State has no numeric criteria for those pollutants or they can be used to limit toxicity where the toxicity cannot be traced to a specific pollutant. EPA's Water Quality Standards Regulation requires States to develop implementation procedures for narrative criteria that address all mechanisms to be used by the State to ensure that narrative criteria are attained.

Example:

Narrative criteria can be statements, requiring that discharges be "free from toxics in toxic amounts" or "free of objectionable color, odor, taste, and turbidity."

6.1.3 Future Directions for Water Quality Standards

The water quality standards program is constantly evolving. New scientific, regulatory, and policy developments affect the nature of the program. For example, three new areas where criteria are being developed include biological, sediment, and wildlife criteria.

- **Biological Criteria—**EPA is developing numerical values or narrative expressions that describe the reference biological integrity of aquatic communities inhabiting unimpaired waters of a designated aquatic life use. The biological communities in these waters represent the best attainable condition for the organisms. According to EPA policy, States should develop and implement biological criteria in their water quality standards.
- **Sediment Criteria—**Sediment contamination can result from the deposition of toxicants over long periods of time and is also responsible for water

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quality impacts when these toxicants are released back into the water column. EPA has proposed sediment criteria for five organic chemicals (phenanthrene, fluoranthene, dieldrin, acenaphthene, and endrin) (59 *FR* 2652; 1/18/94). EPA also is developing sediment criteria for metals, and has begun development of implementation guidance for sediment criteria.

- **Wildlife Criteria—**EPA is undertaking an initiative to develop numeric wildlife criteria to establish ambient concentrations of certain chemicals to protect mammals and birds from adverse impacts due to consumption of food and/or water containing those chemicals.

6.2 Approaches to Implementing Water Quality Standards

The control of toxic discharges to waters of the United States in an important objective of the CWA. To effectively accomplish this objective, EPA recommends an integrated approach to implementing water quality standards and developing WQBELs. This integrated approach includes three elements: a chemical-specific approach, a whole effluent toxicity (WET) approach, and a biological criteria or bioassessment approach. Each of the three approaches is briefly described below. **Exhibit 6-1** summarizes the capabilities and limitations of each approach.

6.2.1 Chemical-Specific Approach

The chemical-specific approach uses the chemical-specific criteria for protection of aquatic life, human health, and wildlife adopted into a State's water quality standards. The criteria are used as the basis to analyze an effluent, decide which chemicals need controls, and derive permit limits that will control those chemicals to the extent necessary to achieve water quality standards in the receiving water. Chemical-specific WQBELs in NPDES permits involve a site-specific evaluation of the discharge and its effect upon the receiving water. This approach allows for the control of individual chemicals before a water quality impact has occurred or to assist in returning water quality to a level that will meet designated uses.

6.2.2 Whole Effluent Toxicity (WET) Approach

WET, the second approach to water quality-based toxics control, protects the receiving water quality from the aggregate toxic effect of a mixture of pollutants in the effluent. WET tests measure the degree of response of exposed aquatic test organisms to an effluent. The WET approach is useful for complex effluents where it

EXHIBIT 6-1
Components of an Integrated Approach to Water Quality-Based Toxics Control

Control Approach	Capabilities	Limitations
Chemical-Specific	– Human health protection – Complete toxicology – Straightforward treatability – Fate understood – Less expensive testing if only a few toxicants are present – Prevents impacts	– Does not consider all toxics present – Bioavailability not measured – Interactions of mixtures (e.g., additivity) unaccounted for – Complete testing can be expensive – Direct biological impairment not measured
Whole effluent toxicity	– Aggregate toxicity – Unknown toxicants addressed – Bioavailability measured – Accurate toxicology – Prevents impacts	– No direct human health protection – Incomplete toxicology (few species may be tested) – No direct treatment – No persistency or sediment coverage – Conditions in ambient may be different – Incomplete knowledge of causative toxicant
Bioassessments	– Measures actual receiving water effects – Historical trend analysis – Assesses quality above standards – Total effect of all sources, including unknown sources	– Critical flow effects not always assessed – Difficult to interpret impacts – Cause of impact not identified – No differentiation of sources – Impact has already occurred – No direct human health protection

may be infeasible to identify and regulate all toxic pollutants in the discharge or where chemical-specific pollutant limits are set, but synergistic effects are suspected to be problematic. The WET approach allows the permit writer to be protective of the narrative “no toxics in toxic amounts” criterion that is applicable to all waters of the United States and implement numeric criteria for toxicity (see the discussion below on acute and chronic toxicity).

There are two types of WET tests: acute and chronic. An acute toxicity test is usually conducted over a short time period (e.g., 48 hours) and the endpoint measured is mortality. The endpoint for an acute test is often expressed as an LC50

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(i.e., the concentration of effluent that is lethal to 50 percent of the exposed test organisms). A chronic toxicity test is usually conducted over a longer period of time (e.g., 7 days) and the endpoint measured is mortality and sublethal effects, such as changes in reproduction and growth. The endpoint is often expressed as the no observed effect concentration (NOEC), the lowest observed effect concentration (LOEC), or the inhibition concentration (IC). The NOEC is the highest concentration of effluent at which no adverse effects are observed on the aquatic test organisms. The LOEC is the lowest concentration of effluent that causes observable adverse effects in exposed test organisms. The IC is an estimate of the effluent concentration that would cause a given percent reduction in a biological measurement of the test organisms.

To express criteria, facilitate modeling, and express permit limits, EPA recommends that toxicity be expressed in terms of "toxic units." A toxic unit (TU) is merely the inverse of the sample fraction. Toxicity, expressed as percent sample, is divided into 100 to obtain toxic units.

Example:

If a chronic test result is a NOEC of 25 percent effluent, that result can be expressed as 100/25 or 4.0 chronic toxic units (4.0 TUc);

If an acute test result is a LC_{50} of 60 percent, that result can also be expressed as 100/60 or 1.7 acute toxic units (1.7 TUa).

It is important to distinguish acute toxic units (TUa) from chronic toxic units (TUc). The difference between TUa and TUc can be likened to the difference between miles and kilometers. Thus, to compare a TUa and a TUc, a conversion factor called an acute-to-chronic ratio (ACR), must be developed. The ACR is a conversion factor that changes TUa into equivalent TUc. If data are insufficient to calculate an ACR (i.e., less than 10 sets of WET data), EPA recommends a default value of ACR=10. Where sufficient data are available, the ACR should be calculated as the mean of the individual ACRs for each pair of acute and chronic WET test data. The following examples show: (1) how the ACR converts TUa into TUc; (2) how to calculate an ACR from existing data; and (3) how the ACR allows permit writers to compare TUa and TUc.

Acute to Chronic Ratio Formulas:

$$ACR = \frac{\text{Acute Endpoint}}{\text{Chronic Endpoint}} = \frac{LC_{50}}{NOEC}$$

- By definition:

$$TUa = \frac{100}{LC_{50}} \qquad TUc = \frac{100}{NOEC}$$

- Thus:

$$LC_{50} = \frac{100}{TUa} \qquad NOEC = \frac{100}{TUc}$$

- Substituting:

$$ACR = \frac{LC_{50}}{NOEC} = \frac{(100/TUa)}{(100/TUc)} = \frac{TUc}{TUa}$$

Example 1:

Given: LC_{50} = 28%
NOEC = 10%

$$ACR = \frac{LC_{50}}{NOEC} = \frac{28\%}{10\%} = 2.8$$

Example 2:

Given: TUc = 10.0
TUa = 3.6

$$ACR = \frac{TUc}{TUa} = \frac{10.0}{3.6} = 2.8$$

Example:

Toxicity data from POTW Discharge Monitoring Reports (C. dubia):

	LC_{50} (% Effluent)	NOEC (% Effluent)	Acute to Chronic Ratio* (ACR)
	62	10	6.2
	18	10	1.8
	68	25	2.7
	61	10	6.1
	63	25	2.5
	70	25	2.8
	17	5	3.4
	35	10	3.5
	35	10	3.5
	35	25	1.4
	47	10	4.7
Mean	**46**	**15**	**3.5**

* Calculated value.

Example:

Where:	Wasteload Allocation (WLA)	=	toxicity level in discharge that will meet state water quality criteria (calculated value)
	Acute WLA	=	1.5 TUa
	Chronic WLA	=	4.9 TUc

Because TUc and TUa are in different units, we can use the ACR to convert TUa to TUc assuming an ACR = 10 (default value).

TUa x ACR	=	TUa,c [where "TUa,c" = acute toxicity expressed in chronic toxicity units]
1.5 TUa x 10	=	15 TUa,c

4.9 TUc < 15 TUa,c: therefore the chronic WLA (4.9 TUc) is more stringent than the acute WLA (1.5 TUa); thus 4.9 TUc is used to develop the permit limit.

The ACR allows us to directly compare the chronic WLA of 4.9 TUc with the acute WLA of 1.5 TUa. Using the ACR of 10, we can express 1.5 TUa in chronic toxicity units as 15 TUa,c. We see that 4.9 TUc is less than 15 TUa,c, (the acute WLA expressed in chronic toxicity units). The more stringent value should be used for developing permit limits. Thus, the appropriate requirement that would meet both acute and chronic criteria for toxicity is 4.9 TUc.

6.2.3 Biological Criteria or Biological Assessment Approach

The biological criteria or biological assessment approach is the third approach to water quality-based toxics control. This approach is used to assess the overall biological integrity of an aquatic community. Biological criteria, or “biocriteria,” are numerical values or narrative statements that describe the reference biological integrity of aquatic communities inhabiting waters of a given designated aquatic life use. When incorporated into State water quality standards, biological criteria and aquatic life use designations serve as direct, legal endpoints for determining aquatic life use attainment. Once biocriteria are developed, the biological condition of a water body may be assessed through a biological assessment, or “bioassessment.” A bioassessment is an evaluation of the biological condition of a waterbody using biological surveys and other direct measurements of resident biota in surface waters. A biological survey, or “biosurvey,” consists of collecting, processing, and analyzing representative portions of a resident aquatic community to determine the community structure and function. The results of biosurveys may be compared to the reference water body to determine if the biocriteria for the designated use of the water body are

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being met. EPA issued guidance on this approach in *Biological Criteria: National Program Guidance for Surface Waters*.[17]

To be fully protective of water quality, EPA developed the concept of "independent application" to characterize the relationship of the three approaches to implementing water quality standards. Independent application says that the results of one approach should not be used to contradict or overrule the results of the others. Independent application recognizes that each approach has unique as well as overlapping attributes, sensitivities, and program applications; thus, no single approach for detecting impact should be considered uniformly superior to any other approach. For example, the inability to detect receiving water impacts using a biosurvey alone is insufficient evidence to waive or relax a permit limit established using either the chemical-specific or WET method.

6.3 Determining the Need for WQBELs

Once the applicable designated uses and water quality criteria for a water body are determined, the permit writer must ensure that dischargers do not cause exceedences of these criteria. If, after technology-based limits are applied, the permit writer projects that a point source discharger may exceed an applicable criterion, a WQBEL must be imposed. EPA regulations at 40 CFR §122.44(d) require that all effluents be characterized by the permitting authority to determine the need for WQBELs in the permit.

6.3.1 Defining "Reasonable Potential" to Exceed Applicable Criteria

In deciding whether or not WQBELs are needed to protect water quality, a permit writer must determine whether the discharge causes, has the reasonable potential to cause, or contributes to an excursion of numeric or narrative water quality criteria. EPA's regulation at 40 CFR §122.44(d)(1) establishes the basis for determining if there is an excursion of the numeric or narrative water quality criteria. At a minimum, the permit writer must make this determination at each permit reissuance and must develop WQBELs as necessary to control the discharge of pollutants.

[17] USEPA (1990). *Biological Criteria: National Program Guidance for Surface Waters*. EPA-440/5-91-004. Office of Science and Technology.

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Reasonable Potential and Numeric Criteria

When conducting an effluent characterization to determine if WQBELs are needed based on chemical-specific numeric criteria in the water quality standards, the permit writer projects the receiving water concentration of pollutants contained in the effluent once that effluent enters the receiving water. If the projected concentration exceeds the applicable numeric water quality criterion for a specific pollutant, there is reasonable potential that the discharge may cause or contribute to an excursion above the applicable water quality standards and the permit writer must develop a WQBEL.

If a State has numeric criteria for WET, the permit writer projects the toxicity once the effluent enters the receiving water. The permit writer then compares the toxicity of the receiving water to the applicable State water quality criteria. If the projected toxicity exceeds the applicable numeric water quality criterion for WET, there is reasonable potential that the discharge may cause or contribute to an excursion above the applicable water quality standards and the permit writer must develop a WQBEL for WET.

Reasonable Potential and Narrative Criteria

If the permit writer determines that a discharge causes, has the reasonable potential to cause, or contributes to an in-stream excursion above a **narrative** criterion, the permit must contain effluent limits for WET unless the permit writer demonstrates that chemical-specific limits for the effluent are sufficient to attain and maintain applicable numeric and narrative water quality criteria.

The permit writer must investigate effluents for the presence of specific chemicals for which the State has not adopted numeric criteria, but which may be contributing to an excursion above a narrative criterion. In such cases, permit writers must establish limits using one of three options: (1) use EPA's national criteria, (2) develop their own criteria, or (3) control the pollutant through the use of an indicator.

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General Considerations

When determining whether WQBELs are needed in a permit, the permit writer is required to consider, at a minimum: (1) existing controls on point and nonpoint sources of pollution; (2) the variability of the pollutant or pollutant parameter in the effluent; (3) the sensitivity of the species to toxicity testing; and (4) where appropriate, the dilution of the effluent in the receiving water (40 CFR §122.44(d)(ii)). The permit writer also must consider whether technology-based limits are sufficient to maintain State water quality standards. Finally, the permit writer should consider other available data and information pertaining to the discharger (e.g., compliance history, in-stream survey data, dilution, data from similar facilities) in addition to effluent monitoring data to assist in making an informed reasonable potential determination.

6.3.2 Determining Reasonable Potential With Effluent Monitoring Data

When characterizing an effluent for the need for a WQBEL, the permit writer should use any available effluent monitoring data as well as other information pertaining to the discharge (e.g., type of industry, compliance history, stream surveys) as the basis for a decision. The permit writer may already have effluent data available from previous monitoring, or he or she may decide to require the permittee to generate effluent monitoring data prior to permit issuance or as a condition of the issued permit. EPA recommends monitoring data be generated prior to permit limit development for the following reasons: (1) the presence or absence of a pollutant can be more clearly established or refuted; and (2) effluent variability can be more clearly defined. Data collection should begin far enough in advance of permit development to allow sufficient time for conducting toxicity tests and chemical analyses.

The permit writer can use the available effluent data and a water quality model to perform a reasonable potential analysis. The mass balance equation, presented in **Exhibit 6-2**, is a simple water quality model that can be used for this analysis. The permit writer would use the maximum observed effluent concentration, or a statistically projected worst-case value, to calculate a projected in-stream concentration, under critical stream conditions. The permit writer would then compare the projected receiving water concentration to the applicable water quality criteria to determine whether a water quality-based effluent limit is needed.

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EXHIBIT 6-2
Basic Mass Balance Water Quality Equation

$$Q_d C_d + Q_s C_s = Q_r C_r$$

Q_d = waste discharge flow in million gallons per day (mgd) or cubic feet per second (cfs)
C_d = pollutant concentration in waste discharge in milligrams per liter (mg/l)
Q_s = background stream flow in mgd or cfs above point of discharge
C_s = background in-stream pollutant concentration in mg/l
Q_r = resultant in-stream flow, after discharge in mgd or cfs
C_r = resultant in-stream pollutant concentration in mg/l in the stream reach (after complete mixing occurs)

All toxic effects testing and exposure assessment parameters, for both effluent toxicity and individual chemicals, have some degree of uncertainty associated with them. The more limited the amount of data, the larger the uncertainty. To better characterize the effects of effluent variability and reduce uncertainty in the process of deciding whether to require an effluent limit EPA has developed a statistical approach to determining reasonable potential. This approach is described in detail in Chapter 3 of the *Technical Support Document for Water Quality-Based Toxics Control*[18] (hereafter referred to as the "TSD"). The statistical approach combines knowledge of effluent variability with the uncertainty due to a limited number of data to project an estimated maximum concentration for the effluent. This projected maximum concentration, after considering dilution, can then be compared to an appropriate water quality criterion to determine the need for an effluent limit.

Example:

Q_s	=	Available dilution from upstream river flow	= 1.2 cfs
Q_d	=	Discharge flow	= 0.31 cfs
C_s	=	Upstream river concentration	= 0.8 mg/l
C_d	=	Statistically projected maximum discharge concentration	= 2.0 mg/l
C_r	=	Receiving water concentration	
Water Quality Criterion			= 1.0 mg/l

$$C_r = \frac{Q_d\ C_d + Q_s\ C_s}{Q_r} = \frac{(0.31\,\text{cfs})\ (2.0\,\text{mg/l}) + (1.2\,\text{cfs})\ (0.8\,\text{mg/l})}{(1.2\,\text{cfs}) + (0.31\,\text{cfs})}$$

C_r = 1.05 mg/l

Discussion: Since the downstream concentration (C_r) exceeds the water quality criterion, there is a reasonable potential for water quality standards to be exceeded.

[18] USEPA (1991). *Technical Support Document for Water Quality-Based Toxics Control*. EPA-505/2-90-001. Office of Water Enforcement and Permits.

Example:

$$C_r = \frac{(C_d)\ (Q_d)\ +\ (C_s)\ (Q_s)}{Q_r}$$

C_r = Receiving water (downstream) concentration (in toxic units)		
C_s = Receiving water background concentration	= 0 TU
Q_s = Receiving water flow	= 23.6 cfs (for acute protection) 70.9 cfs (the 7Q10 for chronic protection)
Q_d = Discharge flow	= 7.06 cfs
C_d = Discharge TUa	= 2.49 TUa
TUc	= 6.25 TUc
Q_r = Downstream flow	= $Q_d + Q_s$
Water quality criterion for acute protection	= 0.3 TUa
Water quality criterion for chronic protection	= 1.0 TUc

$$C_r = \frac{(2.49)\ (7.06)\ +\ (0)\ (23.6)}{(7.06\ +\ 23.6)} = 0.57 \text{ TUa for acute toxicity}$$

$$C_r = \frac{(6.25)\ (7.06)\ +\ (0)\ (70.9)}{(7.06\ +\ 70.9)} = 0.57 \text{ TUc for chronic toxicity}$$

Discussion: Since the downstream concentration (C_r) exceeds the water quality criterion for acute toxicity (0.3 TUa), there is reasonable potential for water quality standards for toxicity to be exceeded.

6.3.3 Determining Reasonable Potential Without Effluent Monitoring Data

If the permit writer so chooses, or if the circumstances dictate, he or she may decide to develop and impose a WQBEL without facility-specific effluent monitoring data. WQBELs can be set for a single parameter or WET based on the available dilution and the water quality criterion or State standard in the absence of facility-specific effluent monitoring data. In justifying a limit, the more information the permit writer can acquire to support the limit, the better will be the regulatory authority's position in defending the limit, if necessary. Types of information that the permit writer may find useful include: type of industry or POTW, existing data on toxic pollutants, history of compliance problems and toxic impact, and type of receiving water and designated use. The permit writer must provide adequate justification for the limit in the permit development rationale or in the permit fact sheet. The permit writer may well find that he or she would benefit from the collection of effluent monitoring data prior to establishing the limit. The TSD[19] provides guidance on collecting monitoring data for establishing WQBELs.

If the permit writer, after evaluating all available information on the effluent, in the absence of effluent monitoring data, is not able to decide whether the discharge causes, has the reasonable potential to cause, or contributes to an excursion above a numeric or narrative criterion for WET or for individual toxicants, the permit writer should require WET or chemical-specific testing to gather further data. In such cases, the permit writer can require the monitoring prior to permit issuance, if sufficient time exists, or may require the testing as a condition of the issued (or reissued) permit. The permit writer could then include a clause in the permit that would allow the permitting authority to reopen the permit and impose an effluent limit if the effluent testing establishes that there is reasonable potential that the discharge will cause or contribute to an excursion above a water quality criterion.

6.4 Exposure Assessment and Wasteload Allocation

Before calculating a WQBEL, the permit writer must first determine the point source's wasteload allocation (WLA). The WLA is the fraction of a total maximum daily load (TMDL) for the water body that is assigned to the point source. This section discusses the concepts of the TMDL and WLA, describes methods for assessing exposure to pollutants in the receiving water, and explains how WLAs for a point source are calculated.

6.4.1 Total Maximum Daily Loads

A TMDL is a determination of the amount of a pollutant, or property of a pollutant, from point, nonpoint, and natural background sources, including a margin of safety, that may be discharged to a water quality-limited water body. Any loading above this capacity risks violating water quality standards. TMDLs can be expressed in terms of chemical mass per unit of time, by toxicity, or by other appropriate measures. **Exhibit 6-3** provides a graphic illustration of allocations under a TMDL.

[19]USEPA (1991). *Technical Support Document for Water Quality-Based Toxics Control*. EPA-505/2-90-001. Office of Water Enforcement and Permits.

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EXHIBIT 6-3
Components of a TMDL

Section 303(d) of the CWA established the TMDL process to provide for more stringent water quality-based controls when technology-based controls are inadequate to achieve State water quality standards. These statutory requirements were codified at 40 CFR §130.7. When implemented accordingly, the TMDL process can broaden the opportunity for public comment, expedite water quality-based NPDES permitting, and lead to technically sound and legally defensible decisions for attaining and maintaining water quality standards. Also, the TMDL process provides a mechanism for integrating point and nonpoint pollutant sources into one evaluation.

Based on the TMDL, point source WLAs and nonpoint source load allocations (LAs) are established so that predicted receiving water concentrations do not exceed water quality criteria. TMDLs, WLAs, and LAs are established at levels necessary to attain and maintain the applicable narrative and numerical water quality standards, with seasonal variations and a margin of safety that account for any lack of knowledge concerning the relationship between point source and nonpoint source loadings and water quality.

In some cases, the waterbody segment under consideration may contain only one point source discharger. In this situation, States typically develop a simple TMDL that considers the point source and background contributions of a pollutant from other sources. For other waterbody segments, a TMDL may not be available at the time the permit must be issued, or a TMDL may not be required at all. In such cases, permitting authorities have historically developed a single WLA for a point source discharging to the waterbody segment. Both simple TMDLs and single WLAs commonly rely on mass balance and simplified water quality models which assume steady-state, or constant conditions for variables such as background pollutant concentrations and stream flow. EPA has encouraged States to develop TMDLs for more difficult water quality problems involving multiple point and nonpoint source pollutant loads. These types of TMDLs require complex water quality models capable of simulating rainfall events and analyzing cumulative chemical fate and transport. Simple, steady-state modeling and more complex, dynamic modeling are discussed in greater detail in Section 6.4.3 below.

EPA is supporting innovative approaches linked to developing and implementing TMDLs, such as watershed-based trading. Trading means that pollution sources can sell or barter their ability to reduce pollution with other sources that are unable to reduce their pollutant loads as economically. TMDLs provide a basis for successful trading because they can be adapted to incorporate trades, and because the data and analyses generated in TMDLs allow water quality managers to better understand and predict the effects of proposed trades. The success of trading will rely on reasonable assurance that a TMDL will be implemented.

Further guidance related to establishing TMDLs can be found in Chapter 4 of EPA's TSD[20] and in the *Guidance for Water Quality-Based Decisions: The TMDL Process*.[21]

6.4.2 Calculating Wasteload Allocations

Before calculating a WQBEL, the permit writer must first know the WLA for the point source involved. As discussed above, the WLA is the fraction of a receiving

[20]USEPA (1991). *Technical Support Document for Water Quality-Based Toxics Control*. EPA-505/2-90-001. Office of Water Enforcement and Permits.

[21]USEPA 1991, *Guidance for Water Quality-Based Decisions: The TMDL Process.* EPA-440/4-91-0001. Office of Water.

water's TMDL that is allocated to one of its existing or future point sources of pollution. The appropriate WLA is determined through an exposure assessment. Water quality models are the primary tools utilized by regulatory agencies in conducting an exposure assessment to determine a WLA. Models establish a quantitative relationship between a waste's load and its impact on water quality. Modeling is usually conducted by a specialized work group within the regulatory agency; however, it is important that the permit writer understand this process. The permit writer will use the end result of the model, a WLA, to derive a WQBEL.

6.4.3 Selecting a Water Quality Model

Determining which model is appropriate for a given discharge and receiving water is based upon whether or not there is rapid and complete mixing of the effluent with the receiving water. If the receiving water does not have rapid and complete mixing, a mixing zone assessment is recommended. If there is rapid and complete mixing near the discharge point, a complete mix assessment involving fate and transport models is recommended.

Mixing Zone Assessment

In incompletely mixed discharge receiving water situations, mixing zone modeling is appropriate. Mixing zones are areas where an effluent undergoes initial dilution and are extended to cover secondary mixing in the ambient water body. A mixing zone is an allocated impact zone in the receiving water where acute and chronic water quality criteria can be exceeded as long as toxic conditions are prevented and the designated use of the water is not impaired as a result of the mixing zone.

The CWA allows mixing zones at the discretion of the State. Individual State policy determines whether or not a mixing zone is allowed. EPA recommends that States make a definitive statement in their water quality standards on whether or not mixing zones are allowed and how they will be defined. EPA provides guidance on when to require a mixing zone and how to determine the boundaries and size of a mixing zone.

In general, there are two stages of mixing: discharge-induced and ambient induced. The first stage is controlled by discharge jet momentum and buoyancy of the effluent. This stage generally covers most of the mixing zone allowed by State water quality standards. Beyond the point of discharge-induced mixing, mixing is controlled by ambient turbulence. Both discharge-induced mixing and ambient-induced mixing models are available for mixing zone analyses. The *Water Quality Standards Handbook*[22] and Chapter 4 of the TSD[23] provide further guidance on mixing zones and how to conduct a mixing zone analysis.

Complete Mix Assessment

If the distance from the outfall to complete mixing is insignificant, then mixing zone modeling is not necessary. For completely mixed discharge receiving water situations, there are two major types of fate and transport water quality models: steady-state and dynamic. Model selection depends on the characteristics of the receiving water, the availability of effluent data, and the level of sophistication desired. The minimum data required for model input include receiving water flow, effluent flow, effluent concentrations, and background pollutant concentrations.

a. Steady-State Modeling

A steady-state model requires single, constant inputs for effluent flow, effluent concentration, background receiving water concentration, receiving water flow, and meteorological conditions (e.g., temperature). If only a few pollutant or effluent toxicity measurements are available or if a daily receiving water flow record is not available, steady-state assessments should be used. Steady-state models calculate WLAs at critical conditions that are usually combinations of worst-case assumptions of receiving water flow, effluent pollutant concentrations, and environmental effects. For example, a steady-state model for ammonia considers the maximum effluent discharge to occur on the day of the lowest river flow, highest upstream concentration, highest pH, and highest temperature. WLAs and permit limits derived from a steady-state model will be

[22] USEPA (1994). *Water Quality Standards Handbook: Second Edition*. EPA 823-B-94-005a. Office of Water.

[23] USEPA (1991). *Technical Support Document for Water Quality-Based Toxics Control*. EPA-505/2-90-001. Office of Water Enforcement and Permits.

protective of water quality standards at the critical conditions and for all environmental conditions less than critical.

Steady-state modeling involves the application of a mass balance equation that allows the analyst to equate the mass of pollutants upstream of a given point (generally at a pollutant discharge, tributary stream or lateral inflow) to the mass of pollutants downstream after complete mixing. The basic formula for the mass balance model was presented as Exhibit 6-2. This model assumes that pollutants are conservative and additive, and considers only dilution as a mitigating factor affecting the pollutant concentration in-stream. The formula can be modified to account for factors such as degradation or sorption of the pollutant (in addition to dilution) where appropriate and feasible. A number of steady-state toxicant fate and transport models that consider factors affecting in-stream pollutant concentrations other than dilution are available and are discussed in Chapter 4 of the TSD[24].

The simple mass balance equation can be rearranged as follows to determine the downstream effect of a particular discharge concentration:

$$Q_d C_d + Q_s C_s = Q_r C_r$$

$$C_r = \frac{Q_d C_d + Q_s C_s}{Q_r}$$

The equation can be further rearranged to determine the WLA necessary to achieve a given in-stream concentration (C_r), such as a water quality criterion:

$$C_d = \frac{C_r Q_r - C_s Q_s}{Q_d}$$

Example:

Assume a stream has a critical design flow of 1.2 cfs and a background zinc concentration of 0.80 mg/l. The State water quality criterion for zinc is 1.0 mg/l or less. The WLA for a discharge of zinc with a flow of 200,000 gpd is [Note: 200,000 gpd = 0.31 cfs]:

$$C_d = [(1.0)(0.31+1.2)-(0.8)(1.2)]/0.31 = (1.51-0.96)/0.31 = 0.55/0.31 = 1.77 \text{ mg/l}$$

[24]USEPA (1991). *Technical Support Document for Water Quality-Based Toxics Control*. EPA-505/2-90-001. Office of Water Enforcement and Permits.

Most States have adopted both acute and chronic numeric criteria for at least some pollutants. As such, steady-state WLA models should be used to calculate the allowable effluent load that will meet criteria at the appropriate design up-stream flow for those criteria. Each State specifies the appropriate design up-stream flow at which its water quality criteria should be applied. EPA recommends a design upstream flow for acute aquatic life criteria at the 1Q10 (1-day low flow over a 10-year period) and for chronic aquatic life criteria at the 7Q10 (7-day low flow over a 10-year period). EPA also recommends that the receiving water harmonic mean flow be used as the design upstream flow for human health protection.

Once a permit writer has a WLA for each applicable criterion, those WLAs must be translated into long term average effluent concentrations and, subsequently, maximum daily and average monthly permit limits. This process is discussed in Section 6.5 - Permit Limit Derivation. Calculating WLAs and the associated long-term average effluent concentrations for each applicable criteria and using the most stringent long-term average effluent concentration to calculate permit limits will ensure that the permit limits are protective of all applicable criteria.

b. Dynamic Modeling

If adequate receiving water flow and effluent concentration data are available to estimate frequency distributions of effluent concentrations, one of the dynamic modeling techniques could be used to develop WLAs. In general, dynamic models account for the daily variations of and relationships between flow, effluent, and environmental conditions, and therefore, directly determine the actual probability that a water quality standard will be exceeded. The three dynamic modeling techniques recommended by EPA include: continuous simulation, Monte Carlo simulation, and lognormal probability modeling.

- **Continuous simulation** is a fate and transport modeling technique that uses time series input data to predict receiving water quality concentrations in the same chronological order as that of the input variables.
- **Monte Carlo simulation** is a modeling technique that involves random selection of sets of input data for use in repetitive model runs in order to predict the probability distributions of receiving water quality concentrations.
- **Lognormal probabilistic dilution** is a modeling technique that calculates the probability distribution of receiving water quality concentrations from the lognormal probability distributions of the input variables.

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These methods calculate a probability distribution for receiving water concentrations rather than a single, worst-case concentration based on critical conditions. Thus, they determine the entire effluent concentration frequency distribution required to produce the desired frequency of criteria compliance.

Chapter 4 of the TSD[25] describes steady-state and dynamic models in detail and includes specific model recommendations for toxicity and individual toxic pollutants for each type of receiving water—rivers, lakes, and estuaries. In addition, EPA has issued detailed guidelines on the use of fate and transport models of individual toxicants. Specific references for these models may be found in the *Watershed Tools Directory - A Collection of Watershed Tools*, available through the Assessment and Watershed Protection Division of the Office of Wetlands, Oceans and Watersheds [available through the internet at http://www.epa.gov]. These manuals describe in detail the transport and transformation processes involved in water quality modeling.

6.5 Permit Limit Derivation

WLAs are the outputs of water quality models, and the requirements of a WLA must be translated into a permit limit. The goal of the permit writer is to derive permit limits that are enforceable, adequately account for effluent variability, consider available receiving water dilution, protect against acute and chronic impacts, account for compliance monitoring sampling frequency, and assure attainment of the WLA and water quality standards. To accomplish these objectives, EPA recommends that permitting authorities use the statistical permit limit derivation procedure discussed in Chapter 5 of the TSD[26] with outputs from either steady-state or dynamic water quality models. EPA believes this procedure will result in the most defensible, enforceable, and protective WQBELs for both specific chemicals and WET.

[25]USEPA (1991). *Technical Support Document for Water Quality-Based Toxics Control*. EPA-505/2-90-001. Office of Water Enforcement and Permits.

[26]ibid.

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6.5.1 Expression of Permit Limits

The NPDES regulations at 40 CFR §122.45(d) require that all permit limits be expressed, unless impracticable, as both average monthly limits (AMLs) and maximum daily limits (MDLs) for all discharges other than POTWs, and as average weekly limits (AWLs) and AMLs for POTWs. The MDL is the highest allowable discharge measured during a calendar day or 24-hour period representing a calendar day. The AML is the highest allowable value for the average of daily discharges obtained over a calendar month. The AWL is the highest allowable value for the average of daily discharges obtained over a calendar week.

Technical Note

In lieu of an AWL for POTWs, EPA recommends establishing an MDL (or a maximum test result for chronic toxicity) for toxic pollutants and pollutant parameters in water quality permitting. This is appropriate for at least two reasons. First, the basis for the 7-day average for POTWs derives from the secondary treatment requirements. This basis is not related to the need for assuring achievement of water quality standards. Second, a 7-day average, which could comprise up to seven or more daily samples, could average out peak toxic concentrations and therefore the discharge's potential for causing acute toxic effects would be missed. A MDL, which is measured by a grab sample, would be toxicologically protective of potential acute toxicity impacts.

The objective is to establish permit limits that result in the effluent meeting the WLA under normal operating conditions virtually all the time. It is not possible to guarantee, through permit limits, that a WLA will never be exceeded. It is possible, however, using the recommended permit limit derivation procedures to account for extreme values and establish low probabilities of exceedance of the WLA in conformance with the duration and frequency requirements of the water quality standards.

Since effluents are variable, and permit limits are developed based on a low probability of exceedance, permit limits should take effluent variability into consideration and ensure that the requisite loading from the WLA is not exceeded under normal conditions. In effect, the limits must force treatment plant performance levels that, after considering acceptable effluent variability, will only have a low statistical probability of exceeding the WLA and will achieve the desired loadings.

6.5.2 Limits Derived from Steady-State Model Outputs

A permit limit derived from a steady-state model output depends on the type of WLA. WLAs based on protecting aquatic life will have two results: acute and chronic requirements because State water quality standards generally provide both acute and chronic protection for aquatic life. In contrast, WLAs based on protecting human health will have only a chronic requirement. In either case, these WLA outputs need to be translated into maximum daily limits and average monthly limits. The acute and chronic WLA can be achieved for either specific chemicals or WET by using the following methodology to derive permit limits:

- Calculate a treatment performance level (frequency distribution described by a long-term average or LTA and a coefficient of variation or CV) that will allow the effluent to meet the WLA requirements modeled (there will be a calculation for the acute WLA requirement and a calculation for the chronic WLA requirement)
- For WET only, convert the acute WLA into an equivalent chronic WLA by multiplying the acute WLA by an acute-to-chronic ratio (ACR) (e.g., 2.0 TUa $\times$ 10 = 20 TUc where ACR = TUc/TUa = 10)
- Derive permit limits directly from whichever performance level is more protective.

EPA has developed tables (see Tables 5-1 and 5-2 in Chapter 5 of the TSD[27]) that permit writers can use to quickly determine the values necessary to translate a WLA into a permit limit. In addition, some permit authorities have developed their own computer programs to compute WQBELs from the appropriate inputs.

Some State water quality criteria and the corresponding WLAs are reported as a single value from which to define an acceptable level of effluent quality. An example of such a requirement is “copper concentration must not exceed 0.75 milligrams per liter (mg/l) in stream.” Steady state analyses assume that the effluent is constant and that the WLA value will never be exceeded. This assumption presents a problem in deriving permit limits because permit limits need to consider effluent variability. Where there is only one water quality criterion and only one WLA, permit limits can be developed using the following procedure:

- Consider the single WLA to be the chronic WLA

[27]USEPA (1991). *Technical Support Document for Water Quality-Based Toxics Control*. EPA-505/2-90-001. Office of Water Enforcement and Permits.

- Calculate a treatment performance level (an LTA and CV) that will allow the effluent to meet the WLA requirement modeled
- Derive maximum daily and average monthly permit limits based on the calculated LTA and CV.

6.5.3 Limits Derived from Dynamic Model Outputs

The least ambiguous and most exact way that a WLA for specific chemicals or whole effluent toxicity can be specified is through the use of dynamic modeling from which the wasteload allocation is expressed as a required effluent performance in terms of the LTA and CV of the daily values. When a WLA is expressed as such, there is no confusion about assumptions used and the translation to permit limits. A permit writer can readily design permit limits to achieve the WLA objectives. Once the WLA and corresponding LTA and CV are determined, the permit limit derivation procedure found in Chapter 5 of the TSD[28] may be used to develop effluent limits both for specific chemicals and for whole effluent toxicity.

6.5.4 Special Considerations Permits Protecting Human Health

Developing permit limits for pollutants affecting human health is somewhat different from setting limits for other pollutants because the exposure period is generally longer than one month, and can be up to 70 years, and the average exposure rather than the maximum exposure is usually of concern. Because compliance with permit limits is normally determined on a daily or monthly basis, it is necessary to set human health permit limits that meet a given WLA for every month. If the procedures for aquatic life protection were used for developing permit limits for human health pollutants, both the MDL and AML would exceed the WLA necessary to meet the required criteria concentrations. In addition, the statistical derivation procedure is not applicable to exposure periods over 30 days. Therefore, the recommended approach for setting WQBELs for human health protection is to set the average monthly limit equal to the WLA and calculate the maximum daily limit based on effluent variability and the number of samples per month using the statistical procedures described in Chapter 5 of the TSD[29].

[28]USEPA (1991). *Technical Support Document for Water Quality-Based Toxics Control*. EPA-505/2-90-001. Office of Water Enforcement and Permits.

[29]ibid.

Appendix A. Acronyms, Abbreviations and Glossary

This appendix contains two tables for permit writers to more easily navigate through the acronyms and the terms that are mentioned throughout this manual. The first table, *Acronyms and Abbreviations*, provides the full text of the acronyms and abbreviations used throughout and indicates whether they are defined in the *Glossary* (the second table), which provides definitions of terms used in the Clean Water Act and NPDES permit program. It provides a reference to the source of the definitions, where available.

A.1 Acronyms and Abbreviations

Exhibit A-1 presents the abbreviations used in the *NPDES Permit Writers' Manual*.

Exhibit A-1 Acronyms and abbreviations

Acronym or abbreviation	Full phrase	Glossary
1Q10	1-day, 10-year Low Flow	
7Q10	7-day, 10-year Low Flow	
4AAP	4-Aminoantipyrine (used for detecting phenolic compounds colorimetrically)	
ACHP	Advisory Council on Historic Preservation	
ACR	Acute-to-Chronic Ratio	
AFO	Animal Feeding Operation	x
AML	Average Monthly Limitation	x
ASR	Alternative State Requirement	
AWL	Average Weekly Limitation	x
BA	Biological Assessment	
BAT	Best Available Technology Economically Achievable	x
BCT	Best Conventional Pollutant Control Technology	x
BE	Biological Evaluation	
BMP	Best Management Practice	x
BOD	Biochemical Oxygen Demand	x
BOD_5	5-day Biochemical Oxygen Demand	
BPJ	Best Professional Judgment	x
BPT	Best Practicable Control Technology Currently Available	x
CAAP	Concentrated Aquatic Animal Production	
CAFO	Concentrated Animal Feeding Operation	x
CBOD	Carbonaceous Biochemical Oxygen Demand	x
$CBOD_5$	5-day Carbonaceous Biochemical Oxygen Demand	
CEQ	Council on Environmental Quality	
CERCLA	Comprehensive Environmental Response, Compensation and Liabilities Act	
CFR	*Code of Federal Regulations*	x
cfs	Cubic Feet per Second	
CGP	Construction General Permit	
CMOM	Capacity, Management, Operation and Maintenance	
COD	Chemical Oxygen Demand	x

Exhibit A-1 Acronyms and abbreviations

Acronym or abbreviation	Full phrase	Glossary
CSO	Combined Sewer Overflow	x
CSS	Combined Sewer System	x
CV	Coefficient of Variation	
CWA	Clean Water Act	x
CWIS	Cooling Water Intake Structure	
CZMA	Coastal Zone Management Act	
DMR	Discharge Monitoring Report	x
DWO	Dry Weather Overflow	
EA	Environmental Assessment	
EAB	Environmental Appeals Board	
EC	Effect Concentration	
EFH	Essential Fish Habitat	
EIS	Environmental Impact Statement	
ELG	Effluent Limitations Guidelines or Effluent Guidelines	x
EMS	Enforcement Management System	
eNOI	Electronic Notice of Intent	
EPA	U.S. Environmental Protection Agency	
ESA	Endangered Species Act	
FDF	Fundamentally Different Factors	x
FR	*Federal Register*	
FWCA	Fish and Wildlife Coordination Act	
FWPCA	Federal Water Pollution Control Act	
FWS	U.S. Fish and Wildlife Service	
GC/MS	Gas Chromatography/Mass Spectroscopy	
gpd	Gallons per Day	
HEM	Hexane Extractable Material	
IC	Inhibition Concentration	
ICIS	Integrated Compliance Information System	
I/I	Infiltration/Inflow	
LA	Load Allocation	
lbs/day	Pounds per Day	
LC_{50}	Lethal Concentration to 50% of test organisms	
LOEC	Lowest Observed Effect Concentration	
LTA	Long-Term Average	
LTCP	Long-Term Control Plan	
MDL	Method Detection Limit	x
MDL	Maximum Daily Effluent Limitation	x
MEP	Maximum Extent Practicable	
µg/L	Micrograms per Liter	
mg/L	Milligrams per Liter	
mgd	Million Gallons per Day	x
ML	Minimum Level	x
MOA	Memorandum of Agreement	

Exhibit A-1 Acronyms and abbreviations

Acronym or abbreviation	Full phrase	Glossary
MS4	Municipal Separate Storm Sewer System	x
MSA	Magnuson-Stevens Act	
MSGP	Multi-Sector General Permit	
N/A	Not Applicable	
NAICS	North American Industrial Classification System	x
NEMI	National Environmental Methods Index	
NEPA	National Environmental Policy Act	
NHPA	National Historic Preservation Act	
NMC	Nine Minimum CSO Controls	
NMFS	National Marine Fisheries Service	
NMP	Nutrient Management Plan	
NOAA	National Oceanic and Atmospheric Administration	
NOEC	No Observable Effect Concentration	
NOI	Notice of Intent	
NOV	Notice of Violation	
NPDES	National Pollutant Discharge Elimination System	x
NRDC	Natural Resources Defense Council	
NSCEP	National Service Center for Environmental Publications	
NSPS	New Source Performance Standards	
NTIS	National Technical Information Service	
O&G	Oil and Grease	
OCPSF	Organic Chemicals, Plastics, and Synthetic Fibers Point Source Category	
OECA	EPA Office of Enforcement and Compliance Assurance	
ONRW	Outstanding National Resources Waters	
OTIS	Online Tracking Information System	
OW	Office of Water	
OWRC	Office of Water Resource Center	
PCS	Permit Compliance System	
POTW	Publicly Owned Treatment Works	x
PSD	Prevention of Significant Deterioration	
PSES	Pretreatment Standards for Existing Sources	
PSNS	Pretreatment Standards for New Sources	
QNCR	Quarterly Noncompliance Report	
RAPP	Refuse Act Permit Program	
RCRA	Resource Conservation and Recovery Act	
RNC	Reportable Noncompliance	
SIC	Standard Industrial Classification	x
SIU	Significant Industrial User	x
SNC	Significant Noncompliance	
SOP	Standard Operating Procedure	
SPCC	Spill Prevention Control and Countermeasure	x
SS	Suspended Solids	x
SSO	Sanitary Sewer Overflow	x

Exhibit A-1 Acronyms and abbreviations

Acronym or abbreviation	Full phrase	Glossary
STORET	EPA Storage and Retrieval Database	x
SWPPP	Stormwater Pollution Prevention Plan	
TBEL	Technology-Based Effluent Limit(s)	x
TCDF	Tetrachlorodibenzofuran	
TEC	Transportation Equipment Cleaning Point Source Category	
THC	Total Hydrocarbons	
TIE	Toxicity Identification Evaluation	
TMDL	Total Maximum Daily Load	x
TOC	Total Organic Carbon	x
TRC	Technical Review Criteria	
TRE	Toxicity Reduction Evaluation	x
TRI	Toxic Release Inventory	
TSD	Technical Support Document [for Water Quality-based Toxics Control]	
TSS	Total Suspended Solids	x
TTO	Total Toxic Organics	
TU	Toxic Units	
TUa	Toxic Units – Acute	
TUc	Toxic Units – Chronic	
TWTDS	Treatment Works Treating Domestic Sewage	x
UAA	Use Attainability Analysis	
UIC	Underground Injection Control	
U.S.C.	*United States Code*	
WET	Whole Effluent Toxicity	x
VGP	Vessel General Permit	
WLA	Waste Load Allocation	x
WPD	EPA Water Permits Division	
WQA	Water Quality Act of 1987	
WQBEL	Water Quality-Based Effluent Limit(s)	x
WQS	Water Quality Standard(s)	x
WSRA	Wild and Scenic Rivers Act	

A.2 Glossary

Exhibit A-2 includes definitions of terms used in the *NPDES Permit Writers' Manual*. For terms that have a definition in the federal regulations, that definition is included with an appropriate citation. The citations also indicate where this guidance manual has paraphrased or modified the regulatory definitions for consistency with the format of the glossary. For terms that do not have a regulatory definition, but that are defined in another published EPA document, the citation to the relevant EPA document is provided.

Note that the definitions provided in the Glossary do not constitute EPA's official use of terms and phrases for regulatory purposes, and nothing in this document should be construed to alter or supplant any other federal document. Official terminology is in the laws and related regulations as published in such sources as the Congressional Record, *Federal Register*, and elsewhere.

Exhibit A-2 Glossary

Term	Definition	Citation
401(a) Certification	A requirement of CWA section 401(a) that all federally issued permits be certified by the state in which the discharge occurs. The state certifies that the proposed permit will comply with state water quality standards and other state requirements.	1996 U.S. EPA NPDES Permit Writers' Manual (1996 PWM) <www.epa.gov/npdes/pubs/owm0243.pdf>
Acute Effect	The effect of a stimulus severe enough to rapidly induce an effect; in aquatic toxicity tests, an effect generally observed in 96 hours or less is typically considered acute. When referring to aquatic toxicology or human health, an acute effect is not always measured in terms of lethality.	1996 PWM
Animal Feeding Operation (AFO)	Lot or facility (other than an aquatic animal production facility) where the following conditions are met: • Animals (other than aquatic animals) have been, are, or will be stabled or confined and fed or maintained for a total of 45 days or more in any 12-month period. • Crops, vegetation, forage growth, or post-harvest residues are not sustained in the normal growing season over any portion of the lot or facility.	§ 122.23(b)(1)
Anti-backsliding	In general, a statutory provision that prohibits the renewal, reissuance, or modification of an existing NPDES permit that contains effluent limitations, permit conditions, or standards that are less stringent than those established in the previous permit. For more information on anti-backsliding, see Chapter 7 of this manual.	CWA section 402(o)
Antidegradation	A policy developed and adopted as part of a state's water quality standards that ensures protection of existing uses and maintains the existing level of water quality where that water quality exceeds levels necessary to protect fish and wildlife propagation and recreation on and in the water. This policy also includes special protection of water designated as Outstanding National Resource Waters.	Adapted from 1996 PWM
Authorized Program or Authorized State	A state, territorial, tribal, or interstate NPDES program that has been approved or authorized by EPA under Part 123.	1996 PWM
Average Monthly Discharge Limitation	The highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during that month divided by the number of daily discharges measured during that month.	§ 122.2
Average Weekly Discharge Limitation	The highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week.	§ 122.2
Best Available Technology Economically Achievable (BAT)	Technology standard established by the CWA as the most appropriate means available on a national basis for controlling the direct discharge of toxic and nonconventional pollutants to navigable waters. BAT limitations in effluent guidelines, in general, represent the best existing performance of treatment technologies that are economically achievable within an industrial point source category or subcategory.	Adapted from 1996 PWM

Exhibit A-2 Glossary

Term	Definition	Citation
Best Conventional Pollutant Control Technology (BCT)	Technology-based standard for the discharge from existing industrial point sources of conventional pollutants including BOD, TSS, fecal coliform, pH, oil and grease. The BCT is established in light of a two-part cost reasonableness test, which compares the cost for an industry to reduce its pollutant discharge with the cost to a POTW for similar levels of reduction of a pollutant loading. The second test examines the cost-effectiveness of additional industrial treatment beyond BPT. EPA must find limits which are reasonable under both tests before establishing them as BCT.	1996 PWM
Best Management Practice (BMP)	Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of *waters of the United States*. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.	§ 122.2
Best Practicable Control Technology Currently Available (BPT)	The first level of technology standards established by the CWA to control pollutants discharged to waters of the U.S. BPT limitations in effluent guidelines are generally based on the average of the best existing performance by plants within an industrial category or subcategory.	Adapted from 1996 PWM
Best Professional Judgment (BPJ)	The method used by permit writers to develop technology-based NPDES permit conditions on a case-by-case basis using all reasonably available and relevant data.	1996 PWM
Bioassay	A test used to evaluate the relative potency of a chemical or a mixture of chemicals by comparing its effect on a living organism with the effect of a standard preparation on the same type of organism.	1996 PWM
Biochemical Oxygen Demand (BOD)	A measurement of the amount of oxygen used by the decomposition of organic material, over a specified time (usually 5 days) in a wastewater sample; it is used as a measurement of the readily decomposable organic content of a wastewater.	1996 PWM
Biosolids	See *Sewage Sludge*.	--
Bypass	The intentional diversion of waste streams from any portion of a treatment facility. This definition applies to both direct and indirect discharges.	§ 122.41(m)(1)(i) and § 403.17
Carbonaceous Biochemical Oxygen Demand (CBOD)	The biochemical oxygen demand of carbonaceous sources. This differs from BOD in that BOD measures both nitrogenous and carbonaceous sources, whereas CBOD excludes nitrogenous sources (e.g., nitrifying bacteria) from determination through the addition of a nitrification inhibitor.	--
Categorical Industrial User (CIU)	An industrial user subject to national categorical pretreatment standards.	1996 PWM
Categorical Pretreatment Standards	National pretreatment standards , expressed as Pretreatment Standards for Existing Sources (PSES) or Pretreatment Standards for New Sources (PSNS), specifying quantities or concentrations of pollutants or pollutant properties that may be discharged to a POTW by existing or new industrial users in specific industrial subcategories established as separate regulations under the appropriate subpart of 40 CFR chapter I, subchapter N.	Adapted from § 403.6

Exhibit A-2 Glossary

Term	Definition	Citation
Chemical Oxygen Demand (COD)	A measure of the oxygen-consuming capacity of inorganic and organic matter present in wastewater. COD is expressed as the amount of oxygen consumed in mg/L. Results do not necessarily correlate to the biochemical oxygen demand (BOD) because the chemical oxidant can react with substances that bacteria do not stabilize.	Adapted from 1996 PWM
Chronic Effect	The effect of a stimulus that lingers or continues for a relatively long period, often one-tenth of the life span or more. The measurement of a chronic effect can be reduced growth, reduced reproduction, and such, in addition to lethality.	1996 PWM
Clean Water Act (CWA)	The Clean Water Act is a statute passed by the U.S. Congress to control water pollution. It was formerly referred to as the Federal Water Pollution Control Act of 1972 or Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500), 33 U.S.C. 1251 *et seq.*, as amended by: Public Law 96-483; Public Law 97-117; Public Laws 95-217, 97-117, 97-440, and 100-04.	1996 PWM
Code of Federal Regulations (CFR)	A codification of the final rules published daily in the *Federal Register*. Title 40 of the CFR contains regulations for the protection of the environment.	1996 PWM
Combined Sewer Overflow (CSO)	A discharge of untreated wastewater from a combined sewer system at a point before the headworks of a publicly owned treatment works. CSOs generally occur during wet weather (rainfall or snowmelt). During periods of wet weather, these systems become overloaded, bypass treatment works, and discharge directly to receiving waters at designed overflow points.	1996 PWM
Combined Sewer System (CSS)	A wastewater collection system that conveys sanitary wastewaters (domestic, commercial and industrial wastewaters) and stormwater through a single pipe to a publicly owned treatment works for treatment before discharge to surface waters.	1996 PWM
Compliance Schedule (or Schedule of Compliance)	A schedule of remedial measures included in a permit, including an enforceable sequence of interim requirements (for example, actions, operations, or milestone events) leading to compliance with the CWA and regulations.	§ 122.2
Composite Sample	Sample composed of two or more discrete aliquots (samples). The aggregate sample will reflect the average water quality of the compositing or sample period.	--
Conventional Pollutants	Pollutants typical of municipal sewage, and for which publicly owned treatment works typically are designed to remove; defined by Federal Regulation (§ 401.16) as BOD, TSS, fecal coliform bacteria, oil and grease, and pH.	1996 PWM
Daily Discharge	The *discharge of a pollutant* measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the daily discharge is calculated as the average measurement of the pollutant over the day.	§ 122.2

Exhibit A-2 Glossary

Term	Definition	Citation
Designated Uses	Those uses specified in water quality standards for each waterbody or segment whether they are being attained (§ 131.3). Examples of designated uses include cold and warm water fisheries, public water supply, and irrigation.	Adapted from EPA. Terms of Environment: Glossary, Abbreviations, Acronyms. <www.epa.gov/OCEPAterms/dterms.html>
Development Document	A report prepared during development of an effluent guideline by EPA that provides the data and methodology used to develop effluent guidelines and categorical pretreatment standards for an industrial category.	Adapted from 1996 PWM
Director	The Regional Administrator or the State Director, as the context requires, or an authorized representative. When there is no *approved state program*, and there is an EPA-administered program, *Director* means the Regional Administrator. When there is an approved state program, Director normally means the State Director. In some circumstances, however, EPA retains the authority to take certain actions even when there is an approved state program. (For example, when EPA has issued an NPDES permit before the approval of a state program, EPA may retain jurisdiction over that permit after program approval, see § 123.1.) In such cases, Director means the Regional Administrator and not the State Director.	§ 122.2
Discharge Monitoring Report (DMR)	The EPA uniform national form, including any subsequent additions, revisions, or modifications for the reporting of self-monitoring results by permittees. DMRs must be used by *approved states* as well as by EPA. EPA will supply DMRs to any approved state upon request. The EPA national forms may be modified to substitute the state agency name, address, logo, and other similar information, as appropriate, in place of EPA's.	§ 122.2
Draft Permit	A document prepared under § 124.6 indicating the Director's tentative decision to issue, deny, modify, revoke and reissue, terminate, or reissue a *permit.* A notice of intent to terminate a permit, and a notice of intent to deny a permit, as discussed in § 124.5, are types of *draft permits*. A denial of a request for modification, revocation and reissuance, or termination, as discussed in § 124.5, is not a draft permit. A *proposed permit* is not a draft permit.	§ 122.2
Effluent Limitation	Any restriction imposed by the Director on quantities, discharge rates, and concentrations of *pollutants* which are *discharged* from *point sources* into waters of the United States, the waters of the *contiguous zone*, or the ocean.	§ 122.2
Effluent Limitations Guidelines (Effluent Guidelines or ELG)	A regulation published by the Administrator under CWA section 304(b) to adopt or revise *effluent limitations*.	§ 122.2
Existing Uses	Those uses actually attained in the waterbody on or after November 28, 1975, whether they are included in the water quality standards.	§ 131.3

Exhibit A-2 Glossary

Term	Definition	Citation
Fact Sheet	A document that must be prepared for all draft individual permits for NPDES major dischargers, NPDES general permits, NPDES permits that contain variances, NPDES permits that contain sewage sludge land application plans and several other classes of dischargers. The document summarizes the principal facts and the significant factual, legal, methodological and policy questions considered in preparing the draft permit and explains how the public may comment (§§ 124.8 and 124.56). Where a fact sheet is not required, a statement of basis must be prepared (§ 124.7).	1996 PWM
Fundamentally Different Factors (FDF)	Those components of a petitioner's facility that are determined to be so unlike those components considered by EPA during the effluent guidelines and pretreatment standards rulemaking that the facility is worthy of a variance from the effluent guidelines or categorical pretreatment standards that would otherwise apply.	Adapted from 1996 PWM
General Permit	An NPDES permit issued under § 122.28 that authorizes a category of discharges under the CWA within a geographical area. A general permit is not specifically tailored for an individual discharger.	1996 PWM
Grab Sample	A sample taken from a wastestream on a one-time basis without consideration of the flow rate of the wastestream and without consideration of time.	Adapted from 1996 PWM
Hazardous Substance	Any substance—as designated under Part 116 pursuant to CWA section 311—that presents an imminent and substantial danger to the public health or welfare, including fish, shellfish, wildlife, shorelines, and beaches, upon discharge to navigable waters of the United States.	Adapted from § 122.2 and CWA section 311(b)(2)(A)
Indirect Discharger	A nondomestic discharger introducing *pollutants* to a publicly owned treatment works.	40 CFR 122.2
Instantaneous Maximum Limit	The maximum allowable concentration or other measure of a pollutant determined from the analysis of any discrete or composite sample collected, independent of the flow rate and the duration of the sampling event.	1996 PWM
Instantaneous Minimum Limit	The minimum allowable concentration or other measure of a pollutant determined from the analysis of any discrete or composite sample collected, independent of the flow rate and the duration of the sampling event.	--
Load Allocation	The portion of a receiving water's loading capacity that is attributed either to one of its existing or future nonpoint sources of pollution or to natural background sources. Load allocations are best estimates of the loading, which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading. Wherever possible, natural and nonpoint source loads should be distinguished.	§ 130.2
Local Limits	Where specific prohibitions or limits on pollutants or pollutant parameters are developed by a POTW in accordance with § 403.4(c), such limits must be deemed Pretreatment Standards for the purposes of CWA section 307(d).	Adapted from § 403.4(d)

Exhibit A-2 Glossary

Term	Definition	Citation
Major Facility	Any NPDES facility or activity classified as such by the Regional Administrator, or in the case of approved state programs, the Regional Administrator in conjunction with the State Director (§ 122.2). Major municipal dischargers include all facilities with design flows of greater than one million gallons per day and facilities with EPA/state approved industrial pretreatment programs. Major industrial facilities are determined based on specific ratings criteria developed by EPA or are classified as such by EPA in conjunction with the state.	1996 PWM
Method Detection Limit (MDL)	The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.	§ 136 - Appendix B
Maximum Daily Effluent Limitation (MDL)	The highest allowable daily discharge of a pollutant. (Chapter 6)	--
Million Gallons per Day (or mgd)	A unit of flow commonly used for wastewater discharges. One million gallon per day is equivalent to 1.547 cubic feet per second.	1996 PWM
Minimum Level (ML)	The level at which the entire analytical system must give a recognizable signal and acceptable calibration point. It is equivalent to the concentration of the lowest calibration standard, assuming that all method-specified sample weights, volumes, and cleanup procedures have been employed.	§ 136 - Appendix A
Mixing Zone	An area where an effluent discharge undergoes initial dilution and is extended to cover the secondary mixing in the ambient waterbody. A mixing zone is an allocated impact zone where water quality criteria can be exceeded as long as acutely toxic conditions are prevented.	Technical Support Document for Water Quality-based Toxics Control <www.epa.gov/npdes/pubs/owm0264.pdf>
Municipal Separate Storm Sewer System (MS4)	A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains): a. Owned or operated by a state, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to state law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under state law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under CWA section 208 that discharges to waters of the United States. b. Designed or used for collecting or conveying stormwater. c. [That] is not a combined sewer. d. [That] is not part of a Publicly Owned Treatment Works (POTW) as defined at § 122.2.	§ 122.26(b)(8)
Municipal Sludge	See *Sewage Sludge*.	--

Exhibit A-2 Glossary

Term	Definition	Citation
National Pollutant Discharge Elimination System (NPDES)	The national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under CWA sections 307, 318, 402, and 405. The term includes *approved program*. NPDES permits regulate discharges of pollutants from point sources to waters of the United States. Such discharges are illegal unless authorized by an NPDES permit.	Adapted from § 122.2
National Pretreatment Standard or Pretreatment Standard	Any regulation promulgated by EPA in accordance with CWA sections 307(b) and 307(c) that applies to a specific category of industrial users and provides limitations on the introduction of pollutants into publicly owned treatment works. The term includes the prohibited discharge standards under § 403.5.	Adapted from § 403.3(l)
New Discharger	Any building, structure, facility, or installation: a. From which there is or may be a discharge of pollutants. b. That did not begin the discharge of pollutants at that site before August 13, 1979. c. That is not a new source. d. That has never received a finally effective NPDES permit for discharges at that site. This definition includes an *indirect discharger* that begins discharging into waters of the United States after August 13, 1979. It also includes any existing mobile point source (other than an offshore or coastal oil and gas exploratory drilling rig or a coastal oil and gas developmental drilling rig) such as a seafood processing rig, seafood processing vessel, or aggregate plant, that begins discharging at a *site* for which it does not have a permit; and any offshore or coastal mobile oil and gas exploratory drilling rig or coastal mobile oil and gas developmental drilling rig that commences the discharge of pollutants after August 13, 1979, at a site under EPA's permitting jurisdiction for which it is not covered by an individual or general permit and which is in an area determined by the Regional Administrator in the issuance of a final permit to be an area or biological concern. In determining whether an area is an area of biological concern, the Regional Administrator must consider the factors specified in §§ 125.122(a)(1) - 125.122(a)(10). An offshore or coastal mobile exploratory drilling rig or coastal mobile developmental drilling rig will be considered a *new discharger* only for the duration of its discharge in an area of biological concern.	Adapted from § 122.2

Exhibit A-2 Glossary

Term	Definition	Citation
New Source	Any building, structure, facility, or installation from which there is or could be a discharge of pollutants, the construction of which commenced: a. After promulgation of standards of performance under CWA section 306, which are applicable to such source; or b. After proposal of standards of performance in accordance with CWA section 306, which are applicable to such source but only if the standards are promulgated in accordance with CWA section 306 within 120 days of their proposal. Additional Criteria: Except as otherwise provided in an applicable new source performance standard, a source is a *new source* if it meets the definition in § 122.2; and i. It is constructed at a site at which no other source is located; or ii. It totally replaces the process or production equipment that causes the discharge of pollutants at an existing source; or iii. Its processes are substantially independent of an existing source at the same site. In determining whether these processes are substantially independent, the Director shall consider such factors as the extent to which the new facility is integrated with the existing plant; and the extent to which the new facility is engaged in the same general type of activity as the existing source.	Adapted from § 122.2 and § 122.29(b)(1)
New Source Performance Standards (NSPS)	Technology standards for facilities that qualify as new sources under § 122.2 and § 122.29. Standards consider that the new source facility has an opportunity to design operations to more effectively control pollutant discharges.	1996 PWM
Nonconventional Pollutants	All pollutants that are not included in the list of conventional or toxic pollutants in Part 401. Includes pollutants such as chemical oxygen demand (COD), total organic carbon (TOC), nitrogen, and phosphorus.	1996 PWM
Nonpoint Source	Diffuse pollution sources (i.e., without a single point of origin or not introduced into a receiving stream from a specific outlet). The pollutants are generally carried off the land by stormwater. Atmospheric deposition and hydromodification are also sources of nonpoint source pollution.	--
North American Industrial Classification System (NAICS)	The North American Industry Classification System (NAICS) is the standard used by federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy.	Retrieved from <www.census.gov/epcd/www/naics.html>
Nutrients	Chemical elements and compounds found in the environment that plants and animals need to grow and survive. Nutrients include compounds of nitrogen (nitrate, nitrite, ammonia, organic nitrogen) and phosphorus (orthophosphate and others), both natural and man-made.	--

Exhibit A-2 Glossary

Term	Definition	Citation
Permitting Authority	The agency authorized to issue and enforce specific requirements of the NPDES permit program. The permitting authority may be EPA, or a state, territorial, or tribal agency that has been authorized under CWA section 402(b) to administer the NPDES program within its jurisdiction.	--
pH	A measure of the hydrogen ion concentration of water or wastewater; expressed as the negative log of the hydrogen ion concentration in mg/L. A pH of 7 is neutral. A pH less than 7 is acidic, and a pH greater than 7 is basic.	1996 PWM
Point Source	Any discernible, confined, and discrete conveyance, including any pipe, ditch, channel, tunnel, conduit, well, discrete fixture, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged. The term does not include return flows from irrigated agriculture or agricultural stormwater runoff.	Adapted from § 122.2
Pollutant	Dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials (except those regulated under the Atomic Energy Act of 1954, as amended [42 U.S.C. 2011 *et seq.*)], heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water. It does not mean a. Sewage from vessels. b. Water, gas, or other material that is injected into a well to facilitate production of oil or gas, or water derived in association with oil and gas production and disposed of in a well, if the well used either to facilitate production or for disposal purposes is approved by authority of the state in which the well is located, and if the state determines that the injection or disposal will not result in the degradation of ground or surface water resources.	§ 122.2
Pollutant, Conservative	Pollutants that do not readily degrade in the environment and that are mitigated primarily by dilution after entering receiving waters (e.g., metals, total suspended solids).	Adapted from 1996 PWM
Pollutant, Non-Conservative	Pollutants that are mitigated by natural biodegradation or other environmental decay or removal processes in the receiving water after mixing and dilution have occurred (e.g., biochemical oxygen demand, pH, volatile organic compounds).	Adapted from 1996 PWM
Pretreatment	The reduction of the amount of pollutants, the elimination of pollutants, or the alteration of the nature of pollutant properties in wastewater prior to or in lieu of discharging or otherwise introducing such pollutants into a POTW.	§ 403.3(s)
Primary Industry Category	Any industry category listed in the NRDC settlement agreement (*Natural Resources Defense Council et al. v. Train,* 8 E.R.C. 2120 [D.D.C. 1976], modified 12 E.R.C. 1833 [D.D.C. 1979]); also listed in Appendix A of Part 122.	§ 122.2
Primary Treatment	The practice of removing some portion of the suspended solids and organic matter in wastewater through sedimentation. Common usage of this term also includes preliminary treatment to remove wastewater constituents that may cause maintenance or operational problems in the system (i.e., grit removal, screening for rags and debris, oil and grease removal, etc.).	1996 PWM

Exhibit A-2 Glossary

Term	Definition	Citation
Priority Pollutants	Those pollutants considered to be of principal importance for control under the CWA based on the NRDC Consent Decree (*NRDC et al. v. Train,* 8 E.R.C. 2120 [D.D.C. 1976], modified 12 E.R.C. 1833 [D.D.C. 1979]); a list of the pollutants is provided as Appendix A to 40 CFR Part 423.	1996 PWM
Process Wastewater	Any water [that], during manufacturing or processing, comes into direct contact with, or results from the production or use of any raw material, intermediate product, finished product, by-product, or waste product.	§ 122.2
Production-Based Standard	A discharge standard expressed in terms of pollutant mass allowed per unit of product manufactured or some other measure of production.	1996 PWM
Proposed Permit	A state NPDES *permit* prepared after the close of the public comment period (and when applicable, any public hearing and administrative appeals) [that] is sent to EPA for review before final issuance by the state. A *proposed permit* is not a *draft permit*.	§ 122.2
Publicly Owned Treatment Works (POTW)	A treatment works as defined by CWA section 212, which is owned by a state or municipality [as defined by CWA section 502(4)]. This definition includes any devices and systems used in the storage, treatment, recycling, and reclamation of municipal sewage or industrial wastes of a liquid nature. It also includes sewers, pipes, and other conveyances only if they convey wastewater to a POTW. The term also means the municipality as defined in CWA section 502(4), which has jurisdiction over the indirect discharges to and the discharges from such a treatment works.	§ 403.3(q)
Sanitary Sewer	A pipe or conduit (sewer) intended to carry wastewater or water-borne wastes from homes, businesses, and industries to the POTW.	1996 PWM
Sanitary Sewer Overflows (SSO)	Untreated or partially treated sewage overflows from a sanitary sewer collection system.	1996 PWM
Secondary Industry Category	Any industry category, which is not a *primary industry category*.	§ 122.2
Secondary Treatment	Technology-based requirements for direct discharging POTWs. Standard is based on the expected performance of a combination of physical and biological processes typical for the treatment of pollutants in municipal sewage. Standards are expressed as a minimum level of effluent quality in terms of: BOD_5, total suspended solids (TSS), and pH (except as provided by treatment equivalent to secondary treatment and other special considerations).	Adapted from 1996 PWM
Section 304(a) Criteria	Developed by EPA under authority of CWA section 304(a) based on the latest scientific information on the relationship that the effect of a constituent concentration has on particular aquatic species and/or human health. This information is issued periodically to the states as guidance for use in developing criteria.	§ 131.3(c)
Self-Monitoring	Sampling and analyses performed by a facility to determine compliance with effluent limitations or other regulatory requirements.	1996 PWM

Exhibit A-2 Glossary

Term	Definition	Citation
Sewage Sludge	Any solid, semi-solid, or liquid residue removed during the treatment of municipal waste water or domestic sewage. Sewage sludge includes solids removed during primary, secondary, or advanced wastewater treatment, scum, septage, portable toilet pumpings, type III marine sanitation device pumpings (33 CFR Part 159), and sewage sludge products. Sewage sludge does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screenings generated during preliminary treatment of domestic sewage in a treatment works.	Adapted from § 122.2 and Part 503
Significant Industrial User (SIU)	An indirect discharger that is the focus of control efforts under the National Pretreatment Program. SIUs include [with exceptions provided under § 403.3(v)]: i. All Industrial Users subject to Categorical Pretreatment Standards under § 403.6 and Chapter 1, Subchapter N. ii. Any other Industrial User that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling and boiler blowdown wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW; or is designated as such by the Control Authority on the basis that the Industrial User has a reasonable potential for adversely affecting the POTW's operation or for violating any Pretreatment Standard or requirement [in accordance with § 403.8(f)(6)].	Adapted from § 403.3(v)
Spill Prevention Control and Countermeasure Plan (SPCC)	A plan prepared by a facility to minimize the likelihood of a spill and to expedite control and cleanup activities if a spill occurs. Such plans are required for certain facilities under the Oil Pollution Prevention Regulations at 40 CFR Part 112.	Adapted from 1996 PWM
Standard Industrial Classification (SIC) Code	A code number system used to identify various types of industries. A particular industry may have more than one SIC code if it conducts several types of commercial or manufacturing activities onsite. An online version of the 1987 SIC Manual <www.osha.gov/pls/imis/sic_manual.html> is available courtesy of the Occupational Safety & Health Administration (OSHA).	Adapted from 1996 PWM
Statement of Basis	A document prepared for every draft NPDES permit for which a fact sheet is not required. A statement of basis briefly describes how permit conditions were derived and the reasons the conditions are necessary for the permit.	1996 PWM
STORET	EPA's computerized STOrage and RETrieval water quality data base that includes physical, chemical, and biological data measured in waterbodies throughout the United States.	1996 PWM
Storm Water (or Stormwater)	Stormwater runoff, snow melt runoff, and surface runoff and drainage.	§ 122.26(b)(13)

Exhibit A-2 Glossary

Term	Definition	Citation
Technology-Based Effluent Limitation (TBEL)	An effluent limit for a pollutant that is based on the capability of a treatment method to reduce the pollutant to a certain concentration or mass loading level. TBELs for POTWs are derived from the secondary treatment regulations in Part 133 or state treatment standards. TBELs for non-POTWs are derived from effluent guidelines, state treatment standards, or by the permit writer on a case-by-case basis using best professional judgment.	Adapted from 1996 PWM
Tiered Permit Limits	Permit limits that apply to the discharge only when a certain threshold (e.g., production level), specific circumstance (e.g., batch discharge), or time frame (e.g., after 6 months, during the months of May through October) triggers their use.	Adapted from 1996 PWM
Total Maximum Daily Load (TMDL)	The sum of the individual wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background. If a receiving water has only one point source discharger, the TMDL is the sum of that point source WLA plus the LAs for any nonpoint sources of pollution and natural background sources, tributaries, or adjacent segments. TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure. If best management practices (BMPs) or other nonpoint source pollution controls make more stringent load allocations practicable, then wasteload allocations can be made less stringent. Thus, the TMDL process provides for nonpoint source control tradeoffs.	40 CFR § 130.2(i)
Total Suspended Solids (TSS)	A measure of the filterable solids present in a sample, as determined by the method specified in Part 136.	1996 PWM
Toxic Pollutant	Any pollutant listed as toxic under CWA section 307(a)(1) or, in the case of *sludge use or disposal practices*, any pollutant identified in regulations implementing CWA section 405(d).	§ 122.2
Toxicity Reduction Evaluation (TRE)	A site-specific study conducted in a step-wise process designed to identify the causative agent(s) of effluent toxicity, isolate the sources of toxicity, evaluate the effectiveness of toxicity control options, and then confirm the reduction in effluent toxicity.	1996 PWM
Toxicity Test	A procedure to determine the toxicity of a chemical or an effluent using living organisms. A toxicity test measures the degree of effect on exposed test organisms of a specific chemical or effluent.	1996 PWM
Trading (or Water Quality Trading)	An innovative approach to achieve water quality goals more efficiently. Trading is based on the fact that sources in a watershed can face very different costs to control the same pollutant. Trading programs allow facilities facing higher pollution control costs to meet their regulatory obligations by purchasing environmentally equivalent (or superior) pollution reductions from another source at lower cost, thus achieving the same water quality improvement at lower overall cost.	Water Quality Trading Fact Sheet: <www.epa.gov/owow/watershed/trading/handbook/factsheet.html>
Treatability Manual	Five-set library of EPA guidance manuals that contain information related to the treatability of many pollutants. The manual may be used in developing effluent limitations for facilities and pollutants, which, at the time of permit issuance, are not subject to industry-specific effluent guidelines. The five volumes that comprise this series consist of Vol. I – Treatability Data (EPA-600/8-80-042a); Vol. II – Industrial Descriptions (EPA-600/8-80-042b); Vol. III – Technologies (EPA-600/8-80-042c); Vol. IV – Cost Estimating (EPA-600/8-80-042d); and Vol. V – Summary (EPA-600/8-80-042e).	1996 PWM

Exhibit A-2 Glossary

Term	Definition	Citation
Treatment Works Treating Domestic Sewage (TWTDS)	A POTW or any other sewage sludge or waste water treatment devices or systems, regardless of ownership (including federal facilities), used in the storage, treatment, recycling, and reclamation of municipal or domestic sewage, including land dedicated for the disposal of sewage sludge. This definition does not include septic tanks or similar devices. For purposes of this definition, *domestic sewage* includes waste and waste water from humans or household operations that are discharged to or otherwise enter a treatment works.	Adapted from § 122.2
Upset	An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.	§ 122.41(n)
Use Attainability Analysis	A structured scientific assessment of the factors affecting the attainment of the use that [can] include physical, chemical, biological, and economic factors as described in § 131.10(g).	§ 131.3
Variance	Any mechanism or provision under CWA sections 301 or 316 or under 40 CFR Part 125, or in the applicable *effluent limitations guidelines*, which allows modification to or waiver of the generally applicable effluent limitation requirements or time deadlines of the CWA. This includes provisions, [that] allow the establishment of alternative limitations based on fundamentally different factors or on CWA sections 301(c), 301(g), 301(h), 301(i), or 316(a).	§ 122.2
Wasteload Allocation (WLA)	The portion of a receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution.	Adapted from § 130.2(h)
Water Quality Criteria	Elements of state water quality standards, expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports a particular use. When criteria are met, water quality will generally protect the designated use.	§ 131.3(b)
Water Quality Limited Segment	Any segment where it is known that water quality does not meet applicable water quality standards, and/or is not expected to meet applicable water quality standards, even after the application of the technology-based effluent limitations required by CWA sections 301(b) and 306.	§ 131.3
Water Quality Standards (WQS)	Provisions of state or federal law that consist of a designated use or uses for the waters of the United States and water quality criteria for such waters based on such uses. Water quality standards are to protect the public health or welfare, enhance the quality of water, and serve the purposes of the CWA.	Adapted from §131.3
Water Quality-Based Effluent Limitation (WQBEL)	An effluent limitation determined by selecting the most stringent of the effluent limits calculated using all applicable water quality criteria (e.g., aquatic life, human health, wildlife, translation of narrative criteria) for a specific point source to a specific receiving water.	Adapted from 1996 PWM

Exhibit A-2 Glossary

Term	Definition	Citation
Waters of the United States	Means a. All waters [that] are currently used, were used in the past, or [could] be susceptible to use in interstate or foreign commerce, including all waters [that] are subject to the ebb and flow of the tide. b. All interstate waters, including interstate *wetlands*. c. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, *wetlands*, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters 1. [That] are or could be used by interstate or foreign travelers for recreational or other purposes. 2. From which fish or shellfish are or could be taken and sold in interstate or foreign commerce or 3. [That] are used or could be used for industrial purposes by industries in interstate commerce. d. All impoundments of waters otherwise defined as waters of the United States under this definition. e. Tributaries of waters identified in paragraphs (a) through (d) of this definition. f. The territorial sea and g. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a) through (f) of this definition. [see additional notes in § 122.2]	§ 122.2
Whole Effluent Toxicity (WET)	The aggregate toxic effect of an effluent measured directly by a toxicity test.	§ 122.2

RB-AR24951

State of California

Memorandum

To : Archie Matthews
Division of Water Quality

Date: FEB 11 1993

Elizabeth M. Jennings

Elizabeth Miller Jennings
Senior Staff Counsel
OFFICE OF THE CHIEF COUNSEL

From : STATE WATER RESOURCES CONTROL BOARD
901 P Street, Sacramento, CA 95814
Mail Code: G-8

Subject: DEFINITION OF "MAXIMUM EXTENT PRACTICABLE"

ISSUE

What is the meaning of the standard "maximum extent practicable" (MEP) as used in the Clean Water Act's storm water provisions, and how can this standard be communicated to the regulated community? How can this concept be included in the draft BMP manual?

CONCLUSION

The standard "maximum extent practicable" is not specifically defined for use in the storm water program. It has been defined in other rules, however, to require taking all actions which are technically feasible. I have included draft language for the manual.

DISCUSSION

Section 402(p) of the Clean Water Act (33 U.S.C. § 1342(p)) provides that permits issued for discharges from municipal separate storm sewers must require controls to reduce the discharge of pollutants "to the maximum extent practicable". The statutory language provides that municipal permits:

> "Shall require controls to reduce the discharge of pollutants to the maximum extent practicable, including management practices, control techniques and system, design and engineering methods, and such other

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> provisions as the [EPA] Administrator or the State determines appropriate for the control of such pollutants." Clean Water Act Section 402(p)(3)(B)(iii); 33 U.S.C. § 1342(p)(3)(B)(iii).

Neither Congress nor the U.S. Environmental Protection- Agency (EPA) has defined the term "maximum extent practicable", and yet this is the critical standard which municipal dischargers must attain in order to comply with their permits. (The State could have spelled out the specific controls which the municipalities were required to undertake. However, such an approach would have relinquished the municipal dischargers of any flexibility in implementing their storm water programs.)

On its face, it is possible to discern some outline of the intent of Congress in establishing the MEP standard. First, the requirement is to <u>reduce</u> the discharge of pollutants, rather than totally prohibit such discharge. Presumably, the reason for this standard (and the difference from the more stringent standard applied to industrial dischargers in Section 402(p)(3)(A)), is the knowledge that it is not possible for municipal dischargers to prevent the discharge of all pollutants in storm water. The second point which is clearly encompassed in the standard is that it is the permitting agency, and not the. discharger, which is the ultimate arbiter on whether there has been sufficient reduction of pollutants.

The most difficult issue is determining how much pollutants must be reduced, or, in other words, which best management practices (BMPs) must be employed in order to comply with the MEP standard. While the term is not defined in the Clean Water Act or the EPA regulations, the same term does appear in other federal laws and regulations, and there are some definitions or interpretations which may be useful to the storm water program.

In the Uranium Mill Tailings Radiation Control Act of 1978 (42 U.S.C. § 7901, et seq.), the Department of Energy was required to designate within one year of the Act's adoption "to the maximum extent practicable" contaminated areas within the vicinity of uranium processing sites. In addressing a lawsuit brought after the Department designated very few of the "vicinity properties", the federal court declared that MEP means "a substantial majority of the locations" should have been designated within the year. <u>Sierra Club v. Edwards</u> (D.C.D.C. 1983) 19 ERC 1357. Where a NEPA regulation required that "to the maximum extent practicable" environmental clearance was required for uncompleted projects which had never undergone NEPA review, a court held that the regulation "mandates a meaningful

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environmental review" rather than a "perfunctory evaluation". Save the Courthouse Committee v. Lynn (S.D.N.Y. 1975) 408 F.Supp. 1323.

In an interim final regulation recently promulgated by the Department of Transportation, MEP is defined, where operators of onshore oil pipelines must have resources "to the maximum extent practicable" to remove and to mitigate or prevent worst case discharges. 49 CFR Part 194. MEP is defined to mean:

> "The limits of available technology and the practical and technical limits on an individual pipeline operator in planning the response resources required to provide the on-water recovery capability and the shoreline protection and cleanup capability to conduct response activities . . .."

Finally, the term MEP is used in the Superfund legislation, wherein permanent solutions and alternative treatment technologies must be selected "to the maximum extent practicable". CERCLA, Section 121(b). The legislative'history of the language indicates that the relevant factors in determining whether MEP is met include technical feasibility, cost, and state and public acceptance. 132 Cong. Rec. H 9561 (Oct. 8, 1986).

While each of the above interpretations and definitions varies, they do follow a pattern. The pattern that emerges is that there must be a serious attempt to comply, and that practical solutions may not be lightly rejected. If a municipality reviews a lengthy menu of BMPs, and chooses to select only a few of the least expensive, it is likely that MEP has not been met. On the other hand, if a municipal discharger employs all applicable BMPs except those where it can show that they are not technically feasible in the locality, or whose cost would exceed any benefit to be derived, it would have met the standard. In any case, the burden would be on the municipal discharger to show compliance.

The definitions contained in the pipeline regulation and the Superfund leg-islative history are most analogous to storm water regulation. The major emphasis in both of these rules are technical feasibility. Similarly, the municipal dischargers should be required to employ whatever BMPs are feasible, i.e., are likely to be effective and are not cost prohibitive. Thus, where a choice may be made between two BMPs which should provide generally comparative effectiveness, the discharger may choose the least expensive alternative and exclude the more expensive BMP. However, it would not be acceptable either to reject all BMPS which would address a pollutant source or to pick a BMP based solely on cost, which would be clearly less effective.

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As you know, the BMP Guidance manual is being published by the Task Force, which is made up of dischargers, rather than by the State Water Board. As far as I know, there is no intention for the State Water Board to adopt the manual as its own guidance document. Therefore, it is important to stress in the manual, both in the section on MEP and in the front of the manual, that this manual is not a publication of the State or the Regional Water Boards, and that these Boards have not specifically endorsed the contents. Rather, the manual was assembled by a group of dischargers in the interest of assisting themselves and others to comply with the storm water permits. In the section on MEP, it should be stated that the final determination regarding whether a discharger was reduced pollutants to the maximum extent practicable can only be made by the Regional or State Water Boards, but that selection and implementation of BMPs through consideration of the listed factors should assist dischargers in achieving compliance.

The following language is suggested in order to clarify that the manual is not the product of the State Water Board:

> "This Manual was produced and published by the Storm Water Task Force, an advisory body of municipal agencies regulated by the storm water program. This Manual is not a publication of the State Water Resources Control Board or any Regional Water Quality Control Board, and none of these Boards has specifically endorsed the contents thereof. The purpose of this manual is to assist the members of the Task Force and other dischargers subject to storm water permits, ,in attaining compliance with such permits."

The following language is recommended in place of Insert A in the manual for municipal dischargers:

> "Although MEP is not defined by the federal regulations, use of this manual in selecting BMPs should assist municipalities in achieving MEP. In selecting BMPs which will achieve MEP, it is important to remember that municipalities will be responsible to reduce the discharge of pollutants in storm water to <u>the maximum extent practicable</u>. This means choosing effective BMPs, and rejecting applicable BMPs only where other effective BMPs will serve the same purpose, the BMPs would not be technically feasible, or the cost would be prohibitive. The following factors may be useful to consider:
>
> "1. Effectiveness: Will the BMP address a pollutant of concern?

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"2. Regulatory Compliance: Is the BMP in compliance with storm water regulations as well as other environmental regulations?

"3. Public acceptance: Does the BMP have public support?

"4. cost: Will the cost of implementing the BMP have a reasonable relationship to the pollution control benefits to be achieved?

"5. Technical Feasibility: Is the BMP technically feasible considering soils, geography, water resources, etc.?

"After selecting a menu of BMPs, it is of course the responsibility of the discharger to insure that all BMPs are implemented."

State of California

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Memorandum

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Division of Water Quality

Date: OCT 3 1995

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From : OFFICE OF THE CHIEF COUNSEL
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Subject: MUNICIPAL STORM WATER PERMITS: COMPLIANCE WITH WATER QUALITY OBJECTIVES

ISSUE

Must storm water permits for municipal separate storm sewer systems (MS4s) include requirements necessary to achieve water quality objectives?

CONCLUSION

Storm water permits issued to MS4s must include requirements necessary to achieve water quality objectives.

DISCUSSION

Section 301 of the Clean Water Act prohibits the discharge of any pollutant unless pursuant to a National Pollutant Discharge Elimination System (NPDES) permit. Section 301 also requires compliance with effluent limitations necessary to achieve compliance with technology-based standards (e.g., best practicable control technology currently available or secondary treatment). Finally, Section 301 requires compliance with any more stringent effluent limitation which are necessary to protect water quality standards.

Section 402(p) of the Clean Water Act includes a technology-based standard for storm water permits issued to MS4s. Such permits must require:

> "controls to reduce the discharge of pollutants to the maximum extent practicable, including management practices, control techniques and system, design and engineering methods ...."

Section 402(p) does not discuss water quality-based standards. A question is therefore raised whether permits issued to MS4s must include only effluent limitations to meet the technology-based standard of "maximum extent practicable" (MEP), or whether they must also include water quality-based effluent limitations.

This question has already been answered by the SWRCB in Order No.WQ 91-03. The answer is that permits issued to MS4s must include effluent limitations which will achieve the MEP standard, and will also achieve compliance with water quality objectives. The SWRCB stated:

> We therefore conclude that permits for municipal separate storm sewer systems issued pursuant to Clean Water Act Section 402(p) must contain effluent limitations based on water quality standards. Order No. WQ 91-03, at slip op. 36.

The specific language in effluent limitations or other permit conditions is left to the discretion of the agency issuing the permit. Thus, for storm water permits for MS4s, it is appropriate to include "best management practices" (BMPs) instead of numeric effluent limitations. See, Order No. WQ 91-03, at slip op. 37-38. These BMPs may be adequate as both technology-based limitations and water quality-based limitations. *Id.* Section 301(b)(1)(C) of the Clean Water Act broadly requires compliance with "any more stringent limitation, including those necessary to meet water quality standards". The legal requirements for determining effluent limitations in permits are listed in 40 Code of Federal Regulations (CFR) Section 122.44. The SWRCB interpreted these provisions in Order No. WQ 91-03, and concluded permits for MS4s may include BMPs as effluent limitations.

In Order No. WQ 91-04, the SWRCB considered a storm water permit issued to a MS4 that included BMPs as effluent limitations, and did not specifically require compliance with water quality objectives. The SWRCB stated that even where a permit does not specifically reference violation of water quality standards, it should be read "so as to require the implementation of practices which will achieve compliance with applicable standards". Slip op. at 15.

In conclusion, the SWRCB has determined storm water permits for MS4s must include requirements necessary to achieve compliance with both MEP and water quality standards. The SWRCB has allowed RWQCBs to determine the specific requirements to place in permits. The SWRCB has approved permits for MS4s which include BMPs rather than numeric effluent limitations. The SWRCB has also approved a permit that did not specifically

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prohibit violation of water quality objectives. The permit was approved because it contained BMPs adequate to meet water quality objectives.