WATER QUALITY ANTI-DEGRADATION IMPLEMENTATION GUIDANCE

COMMONWEALTH OF PENNSYLVANIA
Department of Environmental Protection
Tom Ridge, *Governor* • David E. Hess, *Acting Secretary*
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DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER SUPPLY AND WASTEWATER MANAGEMENT

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TITLE: Water Quality Anti-degradation Guidance Manual

EFFECTIVE DATE:

AUTHORITY: Pennsylvania Clean Streams Law (35 P.S. §691.1 *et seq*.) and regulations at 25 Pa. Code Title 25, including Chapters 91, 92, 93, 95, 96, 102 and 105.

POLICY: It is the policy of the Department of Environmental Protection (DEP) to protect the existing uses of all surface waters, and the existing quality of High Quality (HQ) and Exceptional Value Waters (EV). Existing uses are protected when the Department makes a final decision on any permit or approval for an activity that may affect a protected use. Existing uses are protected based upon the Department's evaluation of the best available information (which satisfies Department protocols and Quality Assurance/Quality Control (QA/QC) procedures) that indicates the protected use of the water body. For a new, additional or increased point source discharge to a HQ or EV water, the person proposing the discharge is required to utilize a nondischarge alternative that is cost-effective and environmentally sound when compared with the cost of the proposed discharge. If a nondischarge alternative is not cost-effective and environmentally sound, the person must use the best available combination of treatment, pollution prevention, and wastewater reuse technologies and assure that any discharge is non-degrading, unless (in the case of HQ waters), the Department finds, after satisfaction of intergovernmental coordination and public participation requirements, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In addition, the Department will assure that cost-effective and reasonable best management practices for nonpoint source control in HQ and EV waters are achieved.

PURPOSE: The purpose of this document is to provide guidance to Department staff and aid the regulated community and the public in understanding the implementation of the anti-degradation program in Pennsylvania.

APPLICABILITY: This guidance applies to all persons conducting or planning to conduct activities which may impact surface waters in the Commonwealth.

DISCLAIMER: This proposed guidance will be subject to public participation, including public review and comment. Upon the review and incorporation of public input, final guidance will be prepared by the Department. Upon finalization as Department guidance, this guidance provides an aid to the implementation of existing regulatory requirements for anti-degradation. Nothing in the policies or procedures set forth herein shall create, or be construed to create, any additional regulatory requirements. The policies and procedures herein are not an adjudication or regulation, and merely announce how the Department intends to implement the anti-degradation program in Pennsylvania. This document sets forth the framework within which DEP will exercise its administrative discretion. The guidance and procedures give guidance on how DEP will administer and implement the anti-degradation program in the Commonwealth. DEP reserves the discretion to deviate from the guidance and procedures in this document if circumstances warrant.

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DEFINITIONS: See 25 Pa. Code, Chapter 93

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CHAPTER 1

GENERAL OVERVIEW

1. Background

Anti-degradation is a concept and policy created by the Department of the Interior in 1968 and was included in EPA's first water quality standards regulation in 1975. The federal basis for the program is contained in the federal Clean Water Act, and is set forth in regulations at 40 CFR § 131.12, which is a part of the overall EPA water quality standards regulation promulgated in 1983, and 40 CFR § 131.32, which was promulgated by EPA for the Commonwealth in 1996. States are required to adopt an anti-degradation policy meeting minimum requirements and must include this policy as a required element of their surface water quality standards programs in order to gain federal approval of the standards.

The basic concept of anti-degradation is to promote the maintenance and protection of existing water quality for High Quality and Exceptional Value Waters, and protection of existing uses for all surface waters because it recognizes that existing water quality and uses have inherent value worthy of protection and preservation. As a required element of a state's water quality standards, the anti-degradation program introduces levels of protection for deserving water bodies above the basic standards.

"Water quality standards" for any surface water body are the combination of "water uses" and the in-stream "water quality criteria" necessary to protect and maintain those uses. The uses of a waterbody are determined by considering the values a waterbody has for such things as water supply, propagation of fish and wildlife, recreation in and on the water, and other uses. The adopted water quality criteria are the numerical and descriptive chemical, biological or physical stream conditions which must be maintained to support the uses. Uses may be either "designated uses," that is, water uses specifically contained for each waterbody in 25 Pa Code Sections 93.9a-93.9z, or "existing uses". Existing water uses are those actually attained by the water body whether or not they are listed in §§ 93.9a-93.9z as designated uses. These distinctions are further explained later in this section.

Water quality standards govern the degree of degradation a waterbody may incur without causing the loss of a use. They provide a base level of protection-maintenance of designated water uses. The anti-degradation concept adds an additional level of protection by providing for protection of existing uses of all surface waters and, for selected waterbodies that represent significant aquatic resources, the maintenance of existing water quality.

Anti-degradation requirements in Pennsylvania are designed to provide this protection in discrete levels or tiers, as explained in the next section. These levels of protection are appropriately matched to categories of waterbodies, based on their existing uses, level of water quality and environmental characteristics.

2. Discussion

Protected Uses/Existing Uses

As stated in § 93.4a(b), ***"existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected ".*** At this level of protection, which is applicable to all surface waters, water quality may not be degraded below levels which would jeopardize the existing uses. Existing uses are defined in § 93.1 as ***"those uses actually attained in the water body on or after November 28, 1975, whether or not those uses have been included in the water quality standards."***

In Pennsylvania's anti-degradation regulations, this level of protection is prescribed in § 93.4c(a), "*Existing use protection.*" This section of the regulation contains important elements regarding how the Department will act when, upon evaluation of data, it determines that a water body is attaining or has attained an existing use.

For all surface waters, the existing uses of the water must be protected when an activity, which may affect a surface water which requires a Department permit or approval, is proposed. Existing use protection also includes the protection of threatened and endangered species.

High Quality Waters (HQ)

The regulations specifying how a water body may qualify as HQ waters provides that such qualification may occur by demonstration of suitable chemical or biological conditions.

Under the chemical test, a surface water is HQ if long-term water quality data (at least 1 year of data) for 12 chemical parameters exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in or on the water. Under the biological test, a water is HQ if it meets either of the following: (a) In comparison to a reference stream, the water shows a macroinvertebrate community score of 83% or greater using a protocol based on EPA's Rapid Bioassessment Protocol (RBP); or (b) the water is a Class A wild trout stream designated by the Pennsylvania Fish and Boat Commission (PFBC) following public notice and comment.

Exceptional Value Waters (EV)

This highest level of protection requires that "*water quality … shall be maintained and protected.*" As in the federal regulation, Pennsylvania's program includes "Outstanding National Resource Waters." In addition, outstanding state, regional and local waters are also protected at this level. At this highest level, no lowering of water quality is allowed. Consequently, only discharges that produce a nondegrading effluent can be allowed in EV waters.

EPA has expressed concern that waters in National and State parks are not explicitly included in EV waters in the Pennsylvania regulation. The Pennsylvania Anti-degradation regulation provides multiple routes for these waters to qualify for EV protection. These pathways to qualifying as EV waters are discussed below and in detail in Chapter 5.

A water qualifies for EV if it is an HQ water which meets one or more of the following attributes: (1) it flows in a National wildlife refuge or a State game propagation and protection area; (2) it flows in a designated State park natural area, State forest natural area, National natural landmark, Federal or State wild river, Federal wilderness area, or National recreation area; (3) it is an outstanding National, State, regional, or local resource water as defined in Section 93.1 of the Regulation; (4) it is a surface water of exceptional recreational significance as defined in Section 93.1 of the Regulation; (5) the water achieves a biological test score of 92% or greater using the modified RBP; or (6) the water is designated a wilderness trout stream by PFBC following public notice and comment. An additional pathway is available for waters that possess "*exceptional ecological significance*." Water quality better than standards is not needed to qualify as EV waters for surface waters of exceptional ecological significance. These waters include EV wetlands and thermal springs.

Protection of HQ and EV Waters

To satisfy the anti-degradation requirements of DEP water quality standards regulations and Executive Order 1999-1 relating to the coordination of state actions with local land use planning concerns, a special pre-permit analysis is required prior to a proposed discharge to HQ or EV waters. Alternatives to new, additional, or increased point source discharges to surface waters must be employed where they are cost-effective and environmentally sound. This requirement is known as a nondischarge alternative analysis. These alternatives, depending on the nature of the activity, may include land application of wastewater, use of an alternative

discharge location, use of holding facilities coupled with wastewater transport and treatment, and establishment of buffer zones to protect waters from proposed earth disturbance.

If a nondischarge alternative is not cost-effective and environmentally sound, a proposed discharger must utilize the best available combination of cost-effective treatment, land disposal, pollution prevention, and wastewater reuse technologies. This process, known as the anti-degradation best available combination of technologies (ABACT) analysis, establishes a minimum level of performance for dischargers in HQ and EV waters.

If ABACT produces a non-degrading discharge, the discharge can be approved in either HQ or EV waters. If implementation of ABACT would produce a degrading discharge, it cannot be used, without supplemental treatment, to ensure protection of existing quality in EV waters and could only be applied to HQ waters after approval of Social or Economic Justification (SEJ) as described in Chapter 10.

3. Purpose

This implementation guidance has been compiled to define and clarify numerous complex issues surrounding the anti-degradation program. It discusses the criteria used to place waterbodies into the program at the various levels of protection (Chapter 5); implementation issues concerning the protection of existing uses (Chapter 2); the protection of HQ and EV waters from point (Chapter 6) and non-point sources (Chapter 11) through various Department programs**;** and the petition process and methods of waterbody evaluation and assessment (Chapter 4). The role that local and county level government, as well as private citizens, can play in the identification and protection of these waters is also discussed throughout the guidance and summarized in Chapter 12.

Questions concerning this document or suggestions for its improvement should be directed to:

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CHAPTER 2

EXISTING AND DESIGNATED USES

1. Introduction

In addition to the definition of existing use in § 93.1, the existing use protection provisions of the regulations are found in § 93.4a(b) which provides that:

> ***"Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected."***

and in § 93.4c(a)(1) which provides that:

> ***"(i) Existing use protection shall be provided when the Department's evaluation of information (including data gathered at the Department's own initiative, data contained in a petition to change a designated use submitted to the Environmental Quality Board pursuant to §93.4d(a), or data considered in the context of a Department permit or approval action) indicates that a surface water has attained an existing use.***
>
> ***(ii) The Department shall inform persons who apply for a Department permit or approval which could impact a surface water, during the permit or approval application or review process, of the results of the evaluation of information undertaken pursuant to paragraph (1)(i).***
>
> ***(iii) Interested persons may provide the Department with additional information during the permit or approval application process regarding existing use protection for the surface water.***
>
> ***(iv) The Department will make a final determination of existing use protection for the surface water as part of the final approval action."***

and in § 93.4c(a)(2) which provides that:

> ***"If the Department has confirmed the presence, critical habitat, or critical dependence of endangered or threatened federal or Pennsylvania species in or on a surface water, the Department shall ensure protection of such species and critical habitat."***

Existing use protection is referred to as the "Tier 1" protection level in the federal regulations. The basic requirement is that, for any surface water, all *existing* instream water uses and the level of water quality necessary to protect those uses must be maintained and protected. In addition, special existing use provisions apply to the protection of threatened and endangered species. This chapter addresses existing use protection, procedures, and implementation. Provisions relating to the protection of threatened and endangered species are set out in Chapter 3.

2. Discussion

What is an existing use?

An "existing use" is defined in 25 Pa Code Section 93.1 as ***"Those uses actually attained in the water body on or after November 28, 1975, whether or not they are included in the water quality standards."*** The same definition appears in the federal regulations at 40 CFR Part 131.3(e).

What uses are protected as existing uses?

All of the water uses listed in §93.3 are protected as existing uses. These water uses include warm water fishes (WWF), trout stocking (TSF), cold water fishes (CWF), High Quality Waters (HQ), and Exceptional Value

Waters (EV) as well as others designed to protect water supply and recreation. The uses are protected on a waterbody segment when the Department makes a decision to issue or deny a permit or approval request for an activity that may impact the use.

Existing uses are protected in the same manner as designated uses. The Department protects such uses by making decisions to issue or deny requests for Department permits or approvals.

How are existing uses different from designated uses?

Existing uses are different than designated uses in several ways. First, while a designated use is a regulation that is the product of a rulemaking process, an existing use is a DEP classification for a stream based on valid technical information for a surface water that the DEP has reviewed. Existing uses are generally the same as, but in some situations may be more or less protective, than designated uses.

Next, an existing use is the use a waterbody actually attains on or after November 28, 1975. A designated use, on the other hand, may constitute the regulatory goal that the Environmental Quality Board (EQB) promulgates for a surface water, regardless of whether the water has actually attained such a use. For example, all Pennsylvania waters are designated for use as public water supplies although that use may not be actually attained in all waters. If available information indicates that a waterbody attained a use at any time on or after November 28, 1975, and the water has since been degraded, the existing use is the most stringent use attained on or after that date regardless of subsequent degradation.

Another important difference between existing and designated uses is that the regulations provide a mechanism whereby the designated use of a water may be made less stringent by the EQB in certain circumstances. A designated use of a surface water may not be lowered to a use that is less stringent than the existing use for the water. Designated uses are discussed further in Chapter 4.

3. Identification of waterbodies and procedures for existing use

Sources of data

The identification of waterbodies for existing use evaluation occurs as a result of information provided by, for example, (1) DEP staff; (2) the Fish and Boat Commission; (3) interested citizens; (4) a person, organization or agency seeking a Department permit or approval; or (5) a person, organization or agency submitting a complete stream redesignation petition to the EQB.

Requests for existing use evaluations must be supported by information that either establishes the existing use or casts sufficient doubt on the current designated use to warrant further study. These requests can take the form of a report generated by DEP staff, a formal evaluation submitted to DEP by an outside agency, group, or individual, or a petition submitted to the EQB. Submissions may be made at any time, including during Department review of an NPDES permit application or other request for Department approval.

If the Bureau of Water Supply and Wastewater Management receives a formal existing use evaluation submitted by the public or an outside agency or organization, it will review the submission to determine if it is in accordance with applicable protocols. If the submitted information meets all applicable protocols and demonstrates an appropriate existing use classification more stringent than the designated use for a particular waterbody, the results of the evaluation will, after concurrence of the Director of the Bureau of Water Supply and Wastewater Management, be added to the existing use list.

Assessment/evaluation of existing uses

The evaluation of the existing use of a waterbody considers the nature of the data or information presented, the quantity and quality of the data, any existing and readily available data which the Department and others may have gathered, and the Department's own knowledge of the subject water body.

The Department assures that data submitted in support of a petition to the EQB has been collected following recommended protocol and quality assurance and quality control (QA/QC) procedures (the procedures outlined in the DEP Quality Assurance Workplan entitled "Aquatic Life Use Attainability Studies for Flowing and Impounded Water Bodies") before using the data in the review of permit or approval requests. Formal evaluations are intended to be sufficient, stand-alone support for an existing use that differs from the current designated water use. They must also be complete and, at a minimum, contain the information and follow the procedures outlined in the protocols as well as the requirements of Chapter 23, which relates to the EQB policy for processing petitions for redesignation of streams.

The Department's quality assurance review of either document listed above may involve field verification of the data or additional data collection. If the data has been submitted and does not follow recommended protocol or quality assurance and control procedures, or is otherwise incomplete or insufficient, it will be returned to the submitter with an explanation of why it is being returned. Where the Department finds deficiencies in the data submitted by the public or other entities, it will inform the parties who submitted the data what the deficiencies are. Final determination on the existing use protection level will be made by the Department on the basis of the sound data that exist at the time of final permit or approval action.

Existing uses list

The Department maintains a publicly accessible list of surface water segments where data has been evaluated which indicates an existing use classification of a waterbody that is more protective than the designated use (including those segments which are HQ or EV). The list is maintained and updated, by the Bureau of Water Supply and Wastewater Management, on the DEP Website (http://www.dep.state.pa.us directLink "Existing Use"), and will be used by DEP and county conservation district staff with responsibility to protect surface water quality in reviewing requests for permits and approvals. Only an existing use which is more protective than the designated use in §§ 93.9a – 93.9z for a particular waterbody is placed on the existing use list.

The existing use list consists of two primary data sources. First, the list includes the results of all existing use decisions that have been made as part of any Department final action on a request for a permit or approval, with concurrence of the Director of the Bureau of Water Supply and Wastewater Management. Second, the list contains the results of all existing use evaluations which have been completed or reviewed by Department staff and have been concurred with by the Director.

Classification of existing uses is an on-going process driven by the sources of data listed above. Individuals, agencies or organizations outside the Department have the option of providing sufficient data to substantiate their position that the existing use differs from the designated use, or simply providing enough information to establish that the waterbody in question warrants an existing use evaluation.

The list of existing uses includes at least the following information: Stream name, stream segment description, county, designated use, existing use, and date of survey.

Waterbodies on this list are periodically compiled into rulemaking actions taken before the EQB in order to change the designated uses as they appear in Department regulations to match the existing use of the water. These rulemakings are subject to public notice and input opportunities before finalization.

4. Existing uses in Department actions

What is the standard of protection for existing uses?

Section 93.4a(b) provides that ***"existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected"***. The same protection standard appears in the federal anti-degradation regulations at 40 CFR Part 131.12(a)(1).

When is existing use protection provided?

Like designated use protection, existing use protection is provided for a waterbody segment by the Department taking a final action on a permit application or other request to the Department for an approval to conduct an activity which could impact a surface water.

Department review of requests for a permit or approval

The Department will, during the course of permit application or approval review, utilize existing and readily available data on the subject water body in the review of all permit applications and plan/activity approval requests.

A person seeking a permit or approval from the Department to conduct an activity that may impact a surface water must demonstrate to the Department that its activity will protect and maintain the more protective of the designated use or the existing use for the receiving water. To this end, DEP staff who issue permits or approvals for such activities must ensure that the request for permit or approval is reviewed and processed in a manner which ensures that the most protective of the designated use or existing use is protected.

Determining and applying designated and existing uses

The designated use for a surface water is found in DEP regulations at §§ 93.9a –93.9z. Each surface water in the Commonwealth has a designated use, either specifically or by virtue of its location in a watershed. These designated uses have been adopted as a result of Pennsylvania's Water Quality Standards efforts over the last thirty years. They represent actual or potentially attainable water uses for all surface waters of the Commonwealth based upon data collected by the Department, other resource agencies or the public; and consultation with other resource agencies and after receipt of considerable public comment. These uses are continuously evaluated and updated as part of the state's federally mandated water quality standards reviews. The DEP staff person reviewing the request for a permit or approval must determine the applicable designated use by looking in the regulations in §§ 93.9a – 93.9z for the particular stream segment that the proposed activity may impact.

Existing uses are determined based on the best available water quality information on a waterbody. The Department maintains a list of existing uses that are more protective than the designated uses. The staff person reviewing the request for permit or approval must review the list when processing an application or request. If a more protective existing use for a waterbody segment applies, the Department will use it in making the permit or approval decision.

Procedure for existing use decisions as part of Department action on a request for permit or approval

Existing use classifications are implemented in the Department's regional offices, at the level of permit or approval signature authority, as part of the final issuance, approval, or denial decision on a request to conduct an activity that may impact a surface water. The existing use decision which is part of the final action on the permit or approval request occurs after the Director of the Bureau of Water Supply and Wastewater Management concurs in the existing use component of the decision. Concurrence by the Director assures statewide consistency in the review of existing use evaluations. Notification to the permit or approval signature authority of the concurrence will occur as expeditiously as possible to ensure Department compliance with Money Back Guarantee timeframes.

For most NPDES permits (e.g. sewage, industrial wastes, stormwater from construction activity) or other approvals that may impact surface waters, the existing use decision will be implemented by the regional Water Management Program Manager. For NPDES permits associated with mining proposals or oil and gas activities, the decision will be implemented by the District Mining Manager or the regional Oil and Gas Program Manager, respectively.

Review staff for NPDES permit applications or other requests for approval have the responsibility of identifying the existence or submission of data regarding the appropriate existing use for a waterbody. The regional water pollution biologist and/or other professional staff will review the data and confer with staff in the Bureau of Water Supply and Wastewater Management as early as possible in the review process. The regional biologist then prepares a recommendation which is forwarded, to the regional Water Management Program Manager, the District Mining Manager, or the regional Oil and Gas Manager, as applicable, for a decision. Following concurrence of the Director of the Bureau of Water Supply and Wastewater Management, processing of the permit application or approval request will continue on the basis of the existing use evaluation.

Applications or approval requests, such as requests for NPDES general permit coverage (Notice of Intents (NOIs)), may be returned to the applicant if they are incompatible with the results of the existing use evaluation. The person seeking the permit or approval may then amend and resubmit the application or request for approval, submit an individual NPDES application if necessary (as in the case of requests for general NPDES permit coverage in waters with an existing use of HQ or EV), provide additional data to be considered in the Department's existing use determination, or withdraw the application or request for approval.

In conjunction with the Department's final action on any permit or approval that involves the determination of an existing use which differs from the designated use of the waterbody in Chapter 93, the Department will include information on the existing use determination in the *Pennsylvania Bulletin* notice of the final permit or approval action and on the DEP website, if applicable.

Relationship to Money Back Guarantee (MBG)

The Department will at all times be sensitive to the need for prompt decision making and will strive to be timely in its review of existing use data. The Department will consider the nature of the data or information presented, the quantity and quality of the data, and any existing and readily available data which the Department and others may have gathered, in addition to the Department's own knowledge of the subject waterbody in evaluating the existing use. Every effort will be made to maintain permit review schedules under the Department's Money-Back Guarantee and the MBG clock will only be stopped in response to the submission of credible data documenting the need for an existing use evaluation.

Existing use protection for Class A wild trout streams

The Department will review all data submitted to it by the PFBC and others regarding the Class A wild trout stream status of a stream. If, upon Department review, the Department finds that: (1) the waterbody has been designated by the PFBC as a Class A wild trout stream; (2) the PFBC designation has been adequately publicly participated, with provisions for public notice and comment, and (3) the Bureau of Water Supply and Wastewater Management has reviewed the fishery data and the Director concurs with the classification, the Department will place the water on the existing use list with an existing use of High Quality Waters.

Any requests for a Department permit or approval on a stream which meets the above criteria will be processed to protect an HQ existing use, unless a more stringent existing or designated use is identified, in which case the more stringent use shall be used. The final existing use determination occurs at the time of Department action on the permit or approval pursuant to §93.4c(a)(1)(iv).

Relationship of existing use to EQB stream designations

The Department will submit existing use classifications for waterbody segments that are more stringent than the designated uses in §§ 93.9a –93.9z to the EQB as a proposed rulemaking package to seek the redesignation of the designated use to reflect the existing use. This will be accomplished as soon as practicable after the existing use classification is completed.

Federal and Pennsylvania regulations are clear in that, even in the absence of designation, existing uses must be protected. Thus, if the EQB does not promulgate rules that codify existing uses as designated uses, the Department must implement a more protective existing water use. The regulations provide that protection of existing uses and protection of designated uses are separate and independently applicable principles. Thus, if a waterbody has been identified in the Department's review of a request for a permit or other approval as having an existing use more stringent than the designated use for the water, the more stringent existing use must be maintained and protected.

Another possible outcome is that the EQB adopts a higher designated use than the existing use. In such a scenario, the more stringent designated use adopted by the EQB would be utilized by the Department in processing permit applications and requests for approvals of activities on such waters.

5. Public participation opportunities in existing use protection

Several public participation opportunities are provided with regard to existing use protection. Public participation in the existing use context occurs in three situations: (1) When the Department conducts an assessment or evaluation of a stream to determine if it warrants protection as High Quality or Exceptional Value waters, (2) during the Department's review of a request for a permit or approval which may impact a surface water, and (3) during the EQB process for changing the designated use of a water through the regulatory process.

Public Participation during the processing of petitions, evaluations and assessments to change a designated use

The Department will publish, in the *Pennsylvania Bulletin* and local newspapers, notice of: 1) receipt of a complete evaluation accepted by the EQB, or 2) the Department's intent to assess surface waters for the purpose of redesignation as either High Quality or Exceptional Value waters. The notice will request submission of information concerning the water quality of the waters subject to evaluation or assessment and a copy of the notice will be sent to all municipalities containing waters subject to the evaluation or assessment.

As part of its review of an evaluation or assessment, the Department may hold a combined public meeting and fact-finding hearing to discuss the evaluation or assessment and solicit additional information. Upon completion of the assessment or review of a complete evaluation, the Department will submit its recommendation to the EQB for proposed rulemaking where additional opportunity for public involvement occurs as described below in the section titled Public Participation during the EQB regulatory process.

Public participation during permit or approval requests

An applicant for an NPDES permit is required to identify the classification of the receiving water in its notice of complete application. The Department will clearly state the existing use classification supported by existing and readily available data to persons applying for a Department permit or approval that could impact a surface water. The draft NPDES permit containing the classification will be open for a 30-day public comment period, and any data regarding the water segment may be submitted during the permit review process. The Department will consider any valid data submitted during the permit review process (see Assessment/Evaluation of Existing Uses, page 5) in making its final decision on the existing use classification of the waterbody.

Interested persons and applicants are encouraged to submit existing use information on other applications and requests for Department approval that may impact a surface water. In addition to NPDES discharges, these activities may include the sewage facilities planning (Act 537) process; resource extraction activities such as surface and underground mining and oil and gas extraction; landfills; requests for approval of water obstructions, encroachments, and dams; stormwater management planning (Act 167) activities; water withdrawal requests; and other activities which require a Department permit or approval and may impact a surface water.

The final existing use classification occurs as part of the Department's final action on the request for permit or approval.

Public participation during the EQB regulatory process

The Department seeks public input on the appropriate existing use of a surface water outside the context of a request for a permit or approval on many occasions. In response to a petition to redesignate a stream which has been submitted to and accepted by the EQB in accordance with the petition policy at 25 PA Code Chapter 23, or on the Department's own initiative, the Department will publish notice in the *Pennsylvania Bulletin* and in a local newspaper of general circulation of the Department's intent to assess surface waters for "potential redesignation" as HQ or EV waters. In addition, a copy of the notice is sent by the Department to all municipalities containing waters subject to the evaluation, county planning commission and, where applicable, petitioners.

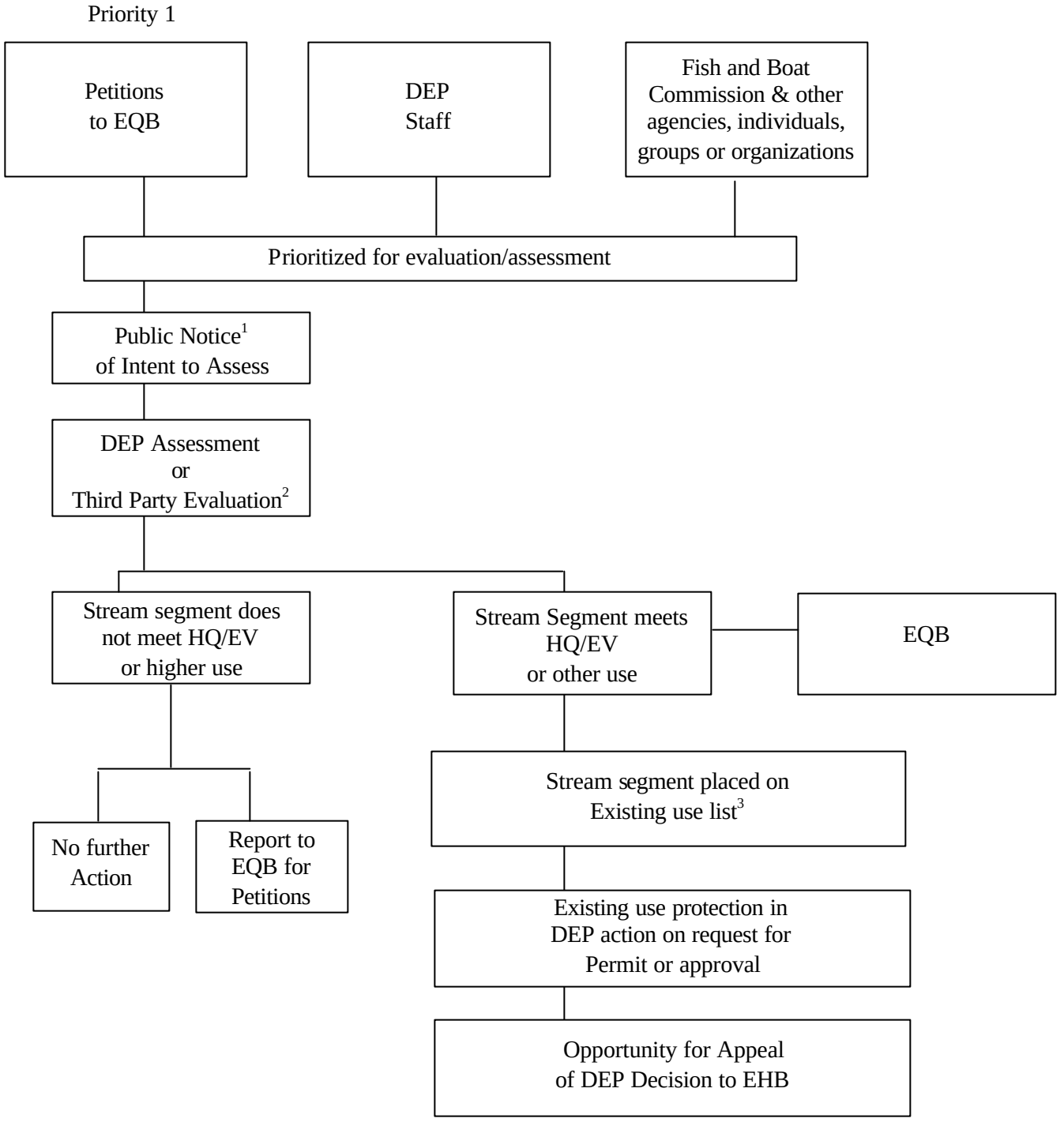
Finally, the same notice will be given by the Department upon the receipt of a complete evaluation that has been accepted by the EQB recommending an HQ or EV redesignation.

All assessments and evaluations which are performed by the Department for the purpose of determining whether the appropriate classification of a water is HQ or EV are subject to these public notice provisions and provide broad opportunities for public input.

6. Appealing existing uses

The implementation of existing use protection for a water can be appealed as part of a challenge to a Department final action on a request for a permit or approval before the Environmental Hearing Board (EHB), under the Environmental Hearing Board Act.

FIGURE 1
EXISTING USE PROTECTION
FLOW CHART



[1] Regions complete the notice for Regional Biologist recommendation or situations arising during permit or approval decisions; all others -- Division of Water Quality Assessment and Standards complete the notice. Only HQ/EV Streams require public notice under 93.4d.

[2] Concurrence by the Bureau of Water Supply and Wastewater Management.

[3] Maintained by the Bureau of Water Supply and Wastewater Management (http://www.dep.state.pa.us directLINK "Existing Use")

CHAPTER 3

THREATENED AND ENDANGERED SPECIES

1. Background

The anti-degradation regulation recognizes the significance of the presence of threatened and endangered (T&E) species as well as the existence of critical habitat, or a critical dependence of those species on a waterbody and offers protection of the species and its requirements, wherever they occur. This section addresses implementation measures to provide that protection.

The regulation at 25 PA Code § 93.4c(a)(2) states the following:

> ***Endangered or Threatened Species. If the Department has confirmed the presence, critical habitat, or critical dependence of endangered or threatened Federal or Pennsylvania species in or on a surface water, the Department will ensure protection of the species and critical habitat.***

2. Terms

Important terms used in the regulation are explained below.

Endangered species: Any species in danger of extinction throughout all or a significant portion of its range (other than an insect determined by the Secretary (of the Department of Interior or Commerce) to constitute a pest whose protection under the provisions of the Act would present an overwhelming and overriding risk to man). This definition is taken from the federal Endangered Species Act of 1973. For purposes of these Pennsylvania regulations, the species range is limited to within Pennsylvania borders. Endangered species are established and listed by both federal and state resource agencies.

Threatened species: Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

"Presence, critical habitat, or critical dependence": Circumstances that, when confirmed by the Department, require protection of endangered or threatened species. Because anti-degradation is a water quality program, these terms are meant to limit the protected areas to surface waters of the Commonwealth. Presence connotes physically inhabiting the water; critical habitat means that certain physical, chemical or biological features in the water environment are essential to the conservation of the species; and critical dependence is used to provide protection to species that do not inhabit the water environment, but require a specific surface water for support of one or more life stages.

3. Responsibilities of Resource Agencies

A listing of the responsible resource agencies and the statutory or regulatory citations for their jurisdiction follows:

United States Government:
Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) which is jointly administered by:
Department of Commerce, National Marine Fisheries Service -- (shortnose sturgeon)
Department of the Interior, Fish and Wildlife Service (USFWS) -- (all other federally-listed T&E fish and wildlife species)

Pennsylvania:

Fish & Boat Commission (PF&BC)-- Fish and Boat Code: 58 PA Code §75.1 (fish, other aquatic organisms, reptiles and amphibians)

Game Commission -- Game and Wildlife Code: 58 PA Code Chapter 133 (birds and mammals)

Department of Conservation and Natural Resources (DCNR) -- Wild Resources Conservation Act: 17 PA Code Chapter 45 (native wild plants)

DCNR maintains and periodically updates the Pennsylvania Natural Diversity Inventory (PNDI), which includes all of the resource agencies' lists of T&E species. The USFWS and PF&BC provide DEP with listings of species and habitat ranges that supplement the PNDI by providing information not yet available on the PNDI for use in decision-making relating to DEP approvals or permits. The lists document areas where the species, critical habitats and areas of critical dependence are known to occur. It is the responsibility of the agency submitting the listing to be specific enough to provide meaningful information for DEP to utilize its decision-making. This specificity provides attention to and assures protection of T&E species while also minimizing delays in permit processing.

4. Scope of Protection and Regulated Activities

Threatened and endangered species are protected for any activity requiring a Department permit or approval when the Department confirms the presence, physical habitat, or a condition of critical dependence of a threatened or endangered species in or on a surface water.

The following describes the process for determining the presence or absence of a federal or Pennsylvania listed species, its critical habitat or critical dependence. The process is dependent upon coordination with the state and federal natural resource agencies with the statutory jurisdiction for the species (listed above), the applicant and the Department.

- Prior to making a formal application, the applicant will notify the Department of his or her intent to construct a facility or conduct an activity which needs a new or expanded permit or approval action. This notification will be in the form of a pre-application meeting or other appropriate mechanism, such as the submission of a postcard application mailer for sewage planning approval or the submission of a PNDI search request for Chapter 105 permits. If a county conservation district or other agency acts for the Department in a permit or approval action, the district or agency will coordinate with the DEP regional office.

- The Department will conduct a screening search of the PNDI database and other lists made available by the natural resource agencies to determine the potential presence of listed threatened or endangered species in the vicinity of the proposed location of the facility or activity.

- The Department will report the search results to the applicant and provide information on contacts at appropriate natural resource agencies.

- The applicant will coordinate with the appropriate natural resource agencies with jurisdiction for the protection and management of the threatened or endangered species. In practice, this means that, if the resource agency confirms the potential for impact by the proposed activity, the parties will work out the measures necessary to avoid the impact and protect the T&E species by modifying the project or devising other ways to protect the species and critical habitat. Measures taken will be project-specific depending on factors such as a critical life stage that may be impacted (timing of construction of project); or extent of critical habitat (limiting of criteria compliance time), etc. If the applicant disagrees with the natural resource agency's determination of presence of T&E species, site-specific information may be gathered to support that position.

- The Department may be asked to participate in the coordination process by either party.

- Following resolution of a T&E issue, the natural resource agency will issue a letter to the applicant providing documentation of the coordination process. The applicant will then provide the letter to the Department with the application for permit or approval so that it can be preserved within the normal time frames of the MBG process. If the PNDI and/or other list searches are negative, i.e. no potential T&E species encountered, the applicant shall include that information with the application.

- The Department confirms the presence, critical habitat, or critical dependence of the species and issues the draft permit or approval that protects threatened or endangered species, as appropriate.

- Draft permits are made available for public participation, at which time T&E issues not previously considered may be brought to the Department's attention for consideration.

5. T&E Species Protection Measures

The Department will ensure that all water quality-related activities it permits or approves will not impair a T&E species, its critical aquatic habitats, or any surface water upon which it critically depends.

Critical habitat or dependence issues must be adequately documented by the natural resource agency so that protective provisions to be included in the permit or approval may be determined.

Special attention shall be given to ensuring that criteria compliance times are designed to protect the presence of all T&E species and critical habitat. Criteria compliance times may be modified by either limiting or eliminating the mixing area of a discharge to ensure that the water quality criteria are met to maintain the presence, critical habitat or critical dependence of T&E species.

Documentation and notification by a natural resource agency or other person to the Department and discussion with the natural resource agencies should begin as soon as possible in the public participation process so that issues may be resolved in time to meet the money back guarantee permit review (MBG) program. The MGB defines the time from receipt of an application by the Department until it is issued in final form. It demonstrates the Department's commitment to timely decisions without sacrificing public review. Details on the MGB are available on the DEP website (directLINK "Public Participation") page.

If no resolution satisfactory to the applicant and natural resource agency can be reached, the Department will evaluate the information and either deny the permit or approval or issue a draft permit or approval. If a draft permit does not satisfy the concerns of the natural resource agency, the agency may raise the issue with the Department or EPA during the public comment period.

CHAPTER 4

PROCESSING OF PETITIONS, EVALUATIONS AND ASSESSMENTS TO CHANGE A DESIGNATED USE

1. Background

The anti-degradation regulation describes the process for public notice and public participation on requests to change the designated use of waterbodies (CWF, TSF, WWF) as well as redesignate them as High Quality or Exceptional Value waters. The designated use for a surface water is found in DEP regulations at §§ 93.9a – 93.9z. Every surface water in the Commonwealth has a designated use. These designated uses have been adopted as a result of Pennsylvania's Water Quality Standards efforts over the last thirty years. They represent actual or potentially attainable water uses for all surface waters of the Commonwealth based upon data collected by the Department, other resource agencies or the public, consultation with other resource agencies, and public comment. Existing uses, on the other hand, are the uses actually attained on or after November 28, 1975 (see Chapter 2), and may differ from designated uses. If a person or organization has reason to believe that the designated use is inappropriate, the process described below is available to request a redesignation. If the evaluation of data indicates a more protective existing use is appropriate, the existing use must be maintained and protected. The petition process for requesting a change to the designated use of a surface water is described in Chapter 23, the Environmental Quality Board Policy for Processing Petitions – Statement of Policy. The Policy was amended on December 20, 2000 to reflect changes to the anti-degradation regulations with respect to redesignating streams. Chapter 23 is attached as Appendix G.

The purpose of this chapter is to provide guidance to persons who wish to submit petitions or complete evaluation reports for stream redesignations and to provide additional detail on the Department's public participation activities in this regard.

Section 93.4d states the following:

Processing of petitions, evaluations and assessments to change a designated use.

(a) Public notice of receipt of evaluation, or assessment of waters, for High Quality or Exceptional Value Waters redesignation. The Department will publish in the Pennsylvania Bulletin and in a local newspaper of general circulation notice of receipt of a complete evaluation which has been accepted by the EQB recommending a High Quality or Exceptional Value Waters redesignation, or notice of the Department's intent to assess surface waters for potential redesignation as High Quality or Exceptional Value Waters. The assessments may be undertaken in response to a petition or on the Department's own initiative. The notice will request submission of information concerning the water quality of the waters subject to the evaluation, or to be assessed, for use by the Department to supplement any studies which have been performed. The Department will send a copy of the notice to all municipalities containing waters subject to the evaluation or assessment.

(b) Combined public meeting and fact-finding hearing. As part of its review of an evaluation or performance of an assessment, the Department may hold a combined public meeting and fact finding hearing to discuss the evaluation or assessment, including the methodology for the evaluation or assessment, and may solicit information, including technical data, to be considered in the Department's evaluation or assessment.

(c) Submission to EQB to alter designated use. Upon the completion of its assessment or review of a complete evaluation, and the satisfaction of the other applicable requirements of this section, the Department will submit the results of its assessment or review to the EQB for proposed rulemaking following review and comment by the petitioner, if applicable, in accordance with

Chapter 23 (relating to Environmental Quality Board policy for processing petitions—statement of policy).

2. Petitions/Evaluations

A. Stream redesignation evaluations can be initiated in three ways:

1) A person, watershed group, organization, or government agency may submit a petition for redesignation to the Secretary in the format described in Chapter 23.

2) In lieu of a petition, persons may submit a complete evaluation of a watershed or stream segment. The evaluation report must fully document the existing use of the water and meet the Department's criteria for completeness and quality assurance.

3) The Department may initiate actions leading to redesignation on its own or in response to requests from another agency or person.

B. A petition requesting redesignation of a stream must include the following elements, as specified in Chapter 23.

- A clear delineation of the watershed or stream segment to be redesignated, both in narrative form and on a map.
- The current designated use(s) of the water from the applicable Drainage List in Chapter 93.
- The requested designated use(s) of the water.
- Available technical data for water chemistry, the aquatic community and instream habitat. If data are not available, the petition must explain the reasons for the data gaps and describe the sources consulted such as educational institutions, watershed groups and state and federal agencies.
- Descriptions of existing point and nonpoint source discharges and their impact(s) on water quality and the aquatic community. The names, locations and permit numbers of existing point source discharges and a description of the types and locations of nonpoint source discharges should be included. eFACTS (the Department's web-based Environmental, Facility, Application, Compliance Tracking System) or the appropriate DEP Regional Office have information on point source discharges. The Department, watershed groups and county conservation districts may have information on nonpoint sources.
- Information regarding any of the qualifiers for designation as High Quality (HQ) or Exceptional Value (EV) Waters. Section 93.4b lists the ways a watershed or segment may qualify for HQ or EV designation. These qualifiers are explained in more detail in Chapter 2 of this guidance. The petition should include information on how the watershed satisfies these qualifiers.
- A general description of the land use and development patterns in the watershed. The amount or percentage of public lands and the owners thereof, and the various land use types (including residential, commercial, industrial, agricultural, and others) should be included in this part. This type of data is most readily available from county or local planning agencies.
- The names of all municipalities through which the watershed or stream segment flows, including an official contact name and address.
- One or more maps that graphically show the information listed above.

Petitions not containing the above information will not be accepted for consideration until all data gaps are filled. In order to provide clear support for a stream redesignation, the petitioner should provide complete information for each of the categories.

C. Following receipt of a redesignation petition, the Department will do the following:

- review the petition for completeness,
- within 30 days, notify the petitioner whether the petition is complete, and
- post receipt of the petition on the Public Participation Center of the DEP website

If a petition is incomplete, the Department will return it to the petitioner, who will have 30 days to revise and resubmit the petition.

Approximately two weeks prior to a regularly scheduled EQB meeting, the agenda and handouts are made available to the public on the DEP website. At the EQB meeting, the Department makes a recommendation to accept or deny the petition and the petitioner is granted 5 minutes to make an oral presentation to the Board. (All EQB meetings are open to the public.)

If accepted by the Board, a Notice of Acceptance is published in the *Pennsylvania Bulletin* within 30 days of acceptance.

D. Section 93.4d allows persons outside the Department to prepare and submit a complete evaluation of a watershed or stream segment recommending HQ or EV designation. Evaluation reports must contain the same information as a rulemaking petition (see B above), and also address, in detail, the specific qualifier(s) from Section 93.4b being used as the basis for the recommended designation.

Persons wishing to perform an evaluation should contact the Division of Water Quality Assessment and Standards to ensure that the methods used for chemical, biological and habitat assessment follow the appropriate Department protocols and quality assurance guidelines. These methods are discussed in Chapter 5 of this guidance. Evaluation reports should follow, to the extent possible, the format of Department reports. Examples of that format can be found in the status of stream evaluations section of the Division of Water Quality Assessment and Standards web page. For more information, visit the DEP Website at (http://www.dep.state.pa.us directLINK "Water Quality Assessment and Standards").

3. Public Notification/Public Participation Opportunities

The Department provides the following public notification steps for all redesignation evaluations.

A) In accordance with § 93.4d(a), the Department publishes a notice of intent before assessing petitioned or other waters or to acknowledge receipt of a complete evaluation. This notice, which solicits technical data on water quality, instream habitat or the biological condition of the stream, is placed in the *Pennsylvania Bulletin* and in a local newspaper and is sent to all municipalities in the watershed, county planning commissions and, where applicable, petitioners.

The Department may hold public meetings or fact-finding hearings to share information and solicit more data. Notice of these meetings and hearings is also published in the *Pennsylvania Bulletin* and in a local newspaper.

In response to the notice, persons are encouraged to submit data to the Department for consideration in the evaluation of a water body.

B) Following evaluation of all data, the Department prepares a draft evaluation report. DEP sends this report to all affected municipalities and, if applicable, to the petitioner providing 30 days to comment. The draft report is also put on the DEP website for public review and comment.

Interested persons may submit written comments on the draft stream report.

C) The Department considers all comments submitted during the public comment period and, within 6 months, prepares a revised report and recommendations for EQB consideration. If any changes are made to the draft report, the revised report is sent to the petitioner and local municipalities, and is placed on the DEP website.

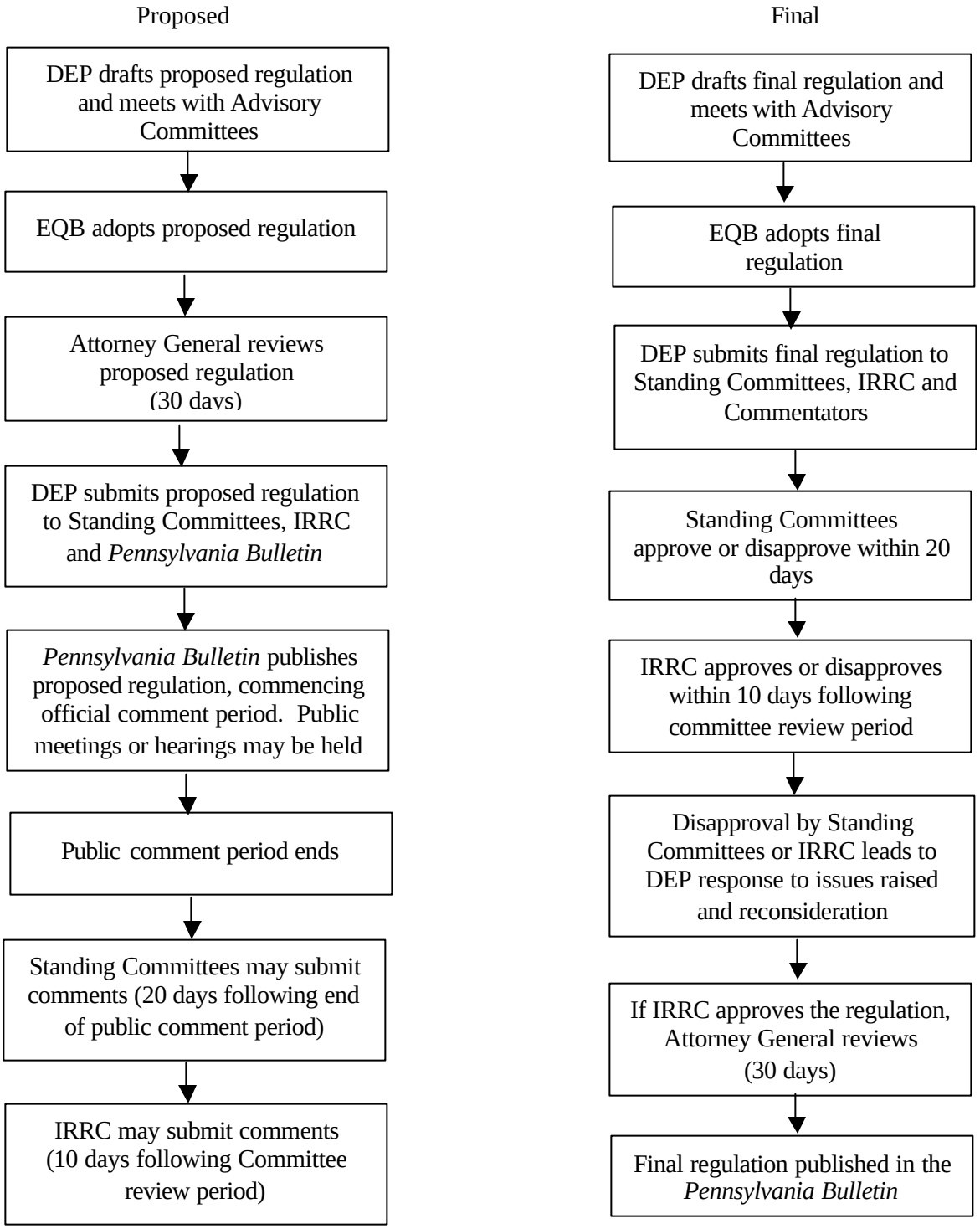
Alternatively, if the Department's recommendation is to retain the current designation, DEP presents its recommendation at the next EQB meeting scheduled at least 15 days after close of the petitioner's comment period.

4. Regulatory Process

The process for redesignation of a water then follows the standard EQB regulatory process, which is summarized in Figure 2.

NOTE: DEP is currently piloting a supplemental public notification procedure to further enhance public participation opportunities. This procedure involves notifying landowners whose properties border streams or stream segments being considered for HQ or EV status.

FIGURE 2
THE REGULATORY PROCESS



EQB – Environmental Quality Board, a 20-member board responsible for promulgating DEP's rules and regulations
IRRC – Independent Regulatory Review Commission, a 5-member commission responsible for providing independent oversight and review of agency regulations
Standing Committees – Senate and House Environmental Resources and Energy Committees

CHAPTER 5

QUALIFYING AS HIGH QUALITY OR EXCEPTIONAL VALUE WATERS

Pennsylvania's anti-degradation regulation specifically addresses the issue of qualification requirements for both High Quality (HQ) and Exceptional Value (EV) waters in § 93.4b. This Chapter provides additional detail on methods used to determine if a waterbody meets those requirements, first for High Quality waters, and then for Exceptional Value waters.

1. Qualifying as High Quality Waters (Chemistry)

Section 93.4b of the anti-degradation regulation provides both chemical and biological mechanisms for waterbodies to qualify as High Quality waters. The regulation at paragraph (a) (1) states that a surface water that meets the following condition is a High Quality water according to the chemical test:

> ***"(i) The water has long-term water quality, based on at least one year of data which exceeds levels necessary to support the propagation of fish, shellfish, and wildlife and recreation in and on the water by being better than the water quality criteria in § 93.7, Table 3 (relating to specific water quality criteria) or otherwise authorized by § 93.8a(b) (relating to toxic substances), at least 99% of the time for the following parameters:***
>
> | | |
> |---|---|
> | ***dissolved oxygen*** | ***aluminum*** |
> | ***iron*** | ***dissolved nickel*** |
> | ***dissolved copper*** | ***dissolved cadmium*** |
> | ***temperature*** | ***pH*** |
> | ***dissolved arsenic*** | ***ammonia nitrogen*** |
> | ***dissolved lead*** | ***dissolved zinc*** |
>
> ***(ii) The Department may consider additional chemical and toxicity information, which characterizes or indicates the quality of a water, in making its determination."***

A. Data needs

In general, enough data must exist or be collected on an HQ candidate stream to fully develop the long-term average concentration and statistical characteristics of those concentrations for the parameters listed in the regulation. The regulation specifies that the data used should cover at least one year. This will normally be sufficient, unless, during the year chosen, there were extreme weather events, unusual flows or atypical upstream discharges, in which case additional data collection is necessary. Data collected over multiple years may also be used, if it is in sufficient quantity and is representative of current conditions.

Sampling considerations. To obtain meaningful long-term averages and statistical functions for these water quality parameters, at least 24 samples should be collected at intervals that have been evenly timed over the flow year. Additional samples almost always provide better characterization of a waterbody and should be included if available.

Time of day. Some samples should ideally be collected at specific times of day. Under natural conditions, instream metals and ammonia nitrogen concentrations show only slight diurnal variation. These samples can be collected as grab samples at any time of day, using accepted stream sampling techniques to ensure representative sampling and, where specified, using the dissolved metals procedures. If upstream discharges exist with variable discharge rates or pollutant loads in significant amounts and proximity to cause diurnal fluctuations on the candidate stream segment, it may be necessary to collect 24-hour composite samples for each sampling event.

Stream temperature, pH, and dissolved oxygen show marked diurnal variations due to solar radiation, daily changes in ambient air temperature, and photosynthetic activity of algae and rooted aquatic vegetation. Random grab samples for these parameters, unless they exist in great numbers, may not accurately characterize the average daily condition of the stream or show compliance with the criteria. Since a true "mixed composite" sampling technique cannot be used, sample events for these parameters would best be performed as daily multiple grab events designed to cover 24 hours. Alternatively, sampling could be designed to represent worst-case daily conditions for each parameter. Accordingly, temperature readings would be taken around mid-afternoon when they are typically highest, dissolved oxygen readings would have to be taken pre-dawn when it is at its lowest point during peak plant respiration, and pH should be taken at the highest and lowest points caused by photosynthesis/respiration. These considerations increase the representative nature of the sample and are recommended.

Hardness. Another consideration in a sampling plan involves stream hardness. The acute and chronic water quality criteria for five of the eight metals in § 93.4b(a)(1)(i) are exponentially dependent upon stream hardness, as listed in Chapter 16, the Water Quality Management Toxics Management Strategy – Statement of Policy. Small changes in stream hardness can have a significant effect on the numerical criteria against which the candidate stream chemistry will be compared. Also, stream hardness is known to be dependent on flow conditions, varying with the relative contribution of ground water base flow and runoff. To provide accurate results, stream sampling and analysis plans must consider hardness and be designed so that the relationship of hardness to flow can be characterized.

Duration. Chapters 16 and 93 list the specific numerical water quality criteria for each of the parameters listed in the anti-degradation portion of the regulation. Metals, ammonia nitrogen, and other criteria for aquatic life protection have both an acute (or short-term exposure) component and a chronic (or longer-term exposure) component. The duration or exposure periods associated with each of the components vary depending upon the parameter, but the acute criterion exposure period is generally one hour, and the chronic, 4 days.

For example, for dissolved lead, the acute criterion is 65 ug/L for a stream with a hardness of 100 mg/L; and the chronic criterion is 2.5 ug/L. Together, these criteria protect aquatic organisms throughout all life stages. A water must be better than all the relevant criteria 99% of the time to qualify for High Quality Waters.

Quality Assurance. Data used to demonstrate that the candidate stream is better than the water quality criteria should account for all of the above considerations. All sampling protocols submitted to the Department must include sample collection design and analytical methods that meet both the data needs and quality assurance protocols established by the Department. The submittal should include a description of data quality control procedures along with an analysis that verifies the accuracy of the information provided. The Department will provide more specific guidance upon request. Quality assurance standards and sampling protocol for format for the chemical qualification process are available from the Department.

B. Demonstrating water quality is better than criteria 99% of the time.

The instream data are usually grab sample results. These data must be adjusted in a way to allow for comparison to the acute and chronic criteria. The data are evaluated using statistically based formulas to determine whether the sampling data show that the quality of the water is better than the acute and chronic criteria 99% of the time.

The following illustrates the process. The equations and multipliers shown in Table 1 are taken from the EPA Technical Support Document (TSD) for Water Quality Based Toxics Control (EPA/505/2-90-001 dated March 1991). The multipliers, which are computed from the equations in the headers of the table,

may be read directly from the table. The multipliers are dependent on the coefficient of variation (CV), which is the ratio of the standard deviation to the mean of the data and must be determined for the sample set.

To qualify for High Quality waters based on the chemical test, the mean of the data times the acute or chronic multiplier must be less than the acute or chronic criterion. The difference is measured to two significant figures. For example, following the above example for lead, the mean of the instream data multiplied by the acute multiplier must be 64 ug/L or lower (note: the acute criterion is 65 ug/L) and the mean of the data multiplied by the chronic multiplier must be 2.4 ug/L or lower (the chronic criterion is 2.5 ug/L) to qualify the water for HQ based on this parameter.

[**NOTE:** acute and chronic multipliers are selected based on CV of dataset used to calculate mean values].

TABLE 1

TSD EQUATIONS

Coefficient of Variation (CV)	99% Multiplier $_{Acute}$	99% Multiplier $_{Chronic}$
$CV = \frac{Standard\ Deviation}{Mean}$	$Multiplier_{acute} = e^{(0.5s^2 - zs)}$ z = 2.326 $s^2 = In[CV^2 + 1]$	$Multiplier_{chronic} = e(0.5s_4^2 - zs_4)$ z = 2.326 $s_4^2 = In[CV^2/4 + 1]$
0.1	0.797	0.891
0.2	0.643	0.797
0.3	0.527	0.715
0.4	0.440	0.643
0.5	0.373	0.581
0.6	0.321	0.527
0.7	0.281	0.481
0.8	0.249	0.440
0.9	0.224	0.404
1.0	0.204	0.373
1.1	0.187	0.345
1.2	0.174	0.321
1.3	0.162	0.300
1.4	0.153	0.281
1.5	0.144	0.264
1.6	0.137	0.249
1.7	0.131	0.236
1.8	0.126	0.224
1.9	0.121	0.214
2.0	0.117	0.204

The evaluation is conducted for all chemical parameters of concern and, if all parameters satisfy the test, the water qualifies for a High Quality designation by means of the chemical qualifier test.

C. Consideration of additional chemical and toxicity information

Determinations concerning the chemical qualification of a water body for HQ need to consider the complete chemical characterization of the candidate water. To be considered for High Quality Waters, concentrations of other substances known to be present in the water in addition to those listed in the regulation have to be better than water quality standards 99% of the time.

Examples include the presence of non-naturally occurring substances or other toxics like synthetic organics or metals which have been identified as present in the candidate water to the extent that the water does not support uses. Chemicals that exert human health impacts must be considered in protecting recreation and potable water supply, which are protected uses in all waters, with a few site-specific exceptions listed in §§93.9a-93.9z.

2. Qualifying as High Quality Waters (Biology)

Section 93.4b(a)(2)(i)(A) of the anti-degradation regulation states that a surface water that meets the following conditions qualifies as High Quality waters under provisions of the *Biological assessment qualifier.*

The surface water supports a high quality aquatic community based upon information gathered using peer-reviewed biological assessment procedures that consider physical habitat, benthic macroinvertebrates or fishes as described in Rapid Bioassessment Protocols for Use in Streams and Rivers: Benthic Macroinvertebrates and Fish, Plafkin, et al., (EPA/444/4-89-001), as updated and amended. The surface water is compared to a reference stream or watershed, and an integrated benthic macroinvertebrate score of at least 83% shall be attained by the referenced stream or watershed.

The regulation at § 93.4b(a)(2)(i)(B) also allows for the use of other "*widely accepted and published peer-reviewed biological assessment procedures that the Department may approve to determine the condition of the aquatic community*" and in (C) gives the Department the latitude to "*consider additional biological information which characterizes or indicates the quality of a water in making its determination.*"

Bioassessment techniques involve the collection of field data on benthic macroinvertebrate and fish communities in a water body to determine its overall aquatic health. These techniques have been used in various formats for many years to evaluate the impacts of pollution sources, assess the attainment of water uses, and classify streams. The underlying concept in bioassessment is that the physical/chemical conditions of the aquatic environment will, in the long-term, cause selection of an aquatic biological community that reflects these conditions. Because of this, the biological community, when identified and then ranked as to its tolerance for pollution and adverse conditions, becomes an excellent indicator of the long-term environmental quality of the water body.

The biological sampling procedures employed in the anti-degradation program ("PaDEP-RBP" methods) were adapted from EPA's "Rapid Bioassessment Protocols For Use in Wadeable Streams and Rivers - Periphyton, Benthic Macroinvertebrates and Fish" Second Edition (Plafkin, et al; EPA 841-B-99-002; July 1999). The primary purpose of EPA's document is to provide practical technical guidance to the states for conducting cost-effective biological assessments of streams and rivers. This guidance offers biological and habitat assessment techniques, field-tested methods, and options for states to choose, modify, and adapt to their existing water quality assessment programs.

In trying to standardize and improve its biological stream assessments for the anti-degradation program, the Department began, in 1990, to investigate modifications to EPA's RBP, using a sound scientific basis that was supported by Pennsylvania data. The basis for Pennsylvania's Rapid Bioassessment Protocol is EPA's third macroinvertebrate protocol (EPA-RBP III).

Anti-degradation Survey Protocol.

The following section outlines the DEP biological anti-degradation survey protocol. Appendix A provides the details of the methods in the outline.

A. Using 1/24,000 scale USGS topographic maps:

1) Determine basin location and stream order.

2) Place tentative sampling station locations. These locations may need to be adjusted once the biologist is on-site depending on the presence of riffles, access to the water, landowner permission or other factors. Generally, stations are placed at the following areas.

- mouth of the main stem or endpoint of the stream segment under study
- mouth of major tributaries (in addition, chemical grab samples but not macroinvertebrates are collected in the minor tributaries to verify that the mouth of the major tributary is a representative sampling location for all upstream conditions).
- along the main stem every 2-3 stream miles, or at closer intervals if there is a noticeable change in stream flow, instream habitat or riparian land use/land cover.
- bracketing population centers, reservoirs, nonpoint sources, point sources, land use changes, etc.

3) A prime consideration in selecting the final site location is the condition of the macroinvertebrate riffle/run or pool/glide habitat within a stream reach. Riffle/run habitat is used in high to moderate gradient streams and pool/glides in low gradient streams. These two habitats are targeted because they are widely accepted as representing the most productive macroinvertebrate conditions found in their respective streams. Targeting these productive habitats is suggested for several reasons. First, focusing on the most productive habitat is sound science and good policy because it reflects optimal biological conditions of the streams. Second, in sampling these highly productive habitat types, the biologist gains the most macronvertebrate information possible per sampling effort. Lastly, these productive riffle/run or pool/glide habitats are relatively easy to identify for an experienced biologist after evaluation of stream flow and substrate. The critical factor in the biologist's final site selection is that the targeted habitat should typify the most productive habitat in the stream.

Sometimes the best available habitat at the candidate site may not be as good as that found at the reference site, but comparison to the reference is still made. The biologist must match the natural conditions of a candidate with a reference. For example, a low gradient, soft substrate candidate stream should be matched with a similar reference, and not, for example, to a steep gradient, rocky substrate reference.

B. Matching reference sites with candidate sites:

1) The candidate and reference site must possess similar gradient and alkalinity and be of equal or similar stream orders.

2) The reference site should be the geographically-closest site available to the candidate.

All aspects of the anti-degradation biological sampling discussed in this guidance are important, but the single, most critical issue is the selection of reference sites. Care must be taken in selecting reference sites that have the same, or very similar, natural conditions as the candidate sites. Matching candidate and reference sites generally uses the stream characterization system described below.

There are four general types of streams in Pennsylvania:

1) Freestone
2) Limestone
3) Tidal tributaries to the Delaware Bay
4) Streams draining directly to Lake Erie

Sub-categories of these four types are created using the following criteria.

1) Stream order

2) Alkalinity

3) Gradient

Presently, two types of gradients are recognized: low gradient glide/pool streams with few to no riffles, and moderate to high gradient riffle/run streams.

A measure of pH as a surrogate for alkalinity is often more practical because the biologists carry calibrated field pH meters. The pH of the reference and candidate stream should be within one pH unit. The stream order of the candidate and reference should be equal or very similar. Evaluations of this variable in Pennsylvania indicate that first, second and third orders streams are similar. Fourth order streams match best with fourth or third order waters while fifth order and larger streams should be compared with nothing smaller than fifth order.

A biologist must use watersheds with a designated or existing use of EV as references in evaluating waters proposed as HQ or EV using the biological assessment qualifier. Since some streams are classified as EV based upon the presence of endangered species or their status as a wilderness trout stream, it must first be determined if the macroinvertebrates in the EV watershed represent the best attainable biological communities. If the watershed does not represent the best attainable biological community, it should not be used as a benchmark, against which other candidate waters are judged.

The results of RBP samples for many EV watersheds have been input to the DEP biological database where they can be used to determine if the macroinvertebrates are representative of best attainable conditions. To supplement these data, the Department will make an effort to collect invertebrate samples in EV watersheds that have not been sampled (ie; they were designated for reasons other than their macroinvertebrate composition) to determine whether or not these waters also represent best attainable conditions. Waters not listed with a designated use of EV in Chapter 93 but that have an existing use of EV, based upon their macroinvertebrate metrics, qualify the waters for use as references in future candidate to reference comparisons. These waters must have attained this existing use (see Chapter 2) by achieving a score of 92% or better when compared to an appropriate EV reference stream.

To avoid "dilution" of the reference condition, DEP will not: 1) use EV waters that attained the minimal qualifying score as reference stations or, 2) select sampling sites on an acceptable EV reference stream that are not representative of the most productive riffle or glide habitat.

To address the first issue, a distribution analysis of the metric scores in DEP's RBP III database will be conducted as follows.

1. Select all EV stream samples
2. Group the samples by gradient (ridge vs. valley) stream order (<4 vs. >4), and alkalinity (freestone, transitional, limestone).
3. Compute the upstream land use.
4. Check the habitat scores and eliminate stations with low scores.
5. Score the remaining stations and delete those in the lower quartile of the distribution

This last step insures that the lower biological scores are screened from the data set. Since the data has already had the stations with unacceptable habitat and land use removed, these remaining

results represent the lowest acceptable EV reference scores for each class of streams. If a biologist samples a new reference station and it scores less than this established minimum reference score for its stream class, then the reference sample is not acceptable for use in evaluating the candidate.

To ensure that the most productive habitat is selected for sampling, the biologist evaluates a set of twelve habitat parameters during the RBP III field collection at reference sites. Five of the 12 parameters correlate well with good macroinvertebrate communities in riffle/run streams.

1. Epifaunal Substrate – Mix of riffle and run and type of substrate.
2. Embeddedness – Measure of sediment mixed in the gravel and cobble substrate.
3. Channel Alteration – Amount of channelization.
4. Sediment Deposition – Measure of sediment deposited on the substrate.
5. Grazing or Other Disruptive Pressure – Vegetation disturbance on lands adjacent to the sampling site.

All habitat metrics are scored on a scale of one to twenty. To qualify as a reference station, a sampling station should achieve optimal scores (16-20) for the above five metrics. However, natural systems vary and there may be times when the reference habitat, although very biologically productive, may have one or more of the above five habitat metrics in the good (11 to 15) rather than optimal range. As a result, the biologist, while making every effort to find habitat that is optimal relative to the five habitat metrics, may sample in areas that are slightly less than optimal if the site selection is justified by high biological productivity. The biologist must also take into consideration the other seven habitat metrics and, if they score poorly (<10), disqualify the station as a reference, regardless of its biology.

The 12 habitat metrics discussed above are intended for use in riffle/run streams. They do not apply to limestone waters or low gradient, pool/glide streams. Other criteria, currently under development, must be used to define optimal habitat in these streams.

Land use is another major consideration in selecting reference stations. The best reference sites most commonly have large contiguous, vegetated riparian zones. There should be no upstream point sources, minimal non-point sources, and the stream should not be subject to unnatural rapid or frequent flow changes. The biologist should avoid areas downstream from bridge crossings or roads (especially dirt roads) paralleling the stream. However, the instream habitat and biological scores discussed above must be used as the determining factors in selecting references.

The above habitat and land use considerations will help prevent the dilution effect. Proposed reference stations not meeting these requirements should be disqualified.

The vast majority of EV streams are small, freestone streams that are inappropriate for use as reference sites for large, limestone, or low gradient streams. The best current source of potential reference sites for these streams is the Water Quality Network (WQN) reference network. This fixed station, statewide, monitoring network provides chemical samples taken every other month (monthly until 1998) and RBP samples taken spring, summer, and fall (only summer until 1997). The majority of these sites are not now designated as EV waters, but the Department is evaluating them for possible reclassification.

C. Sampling the candidate site(s):

1) Benthic samples – Three samples per station consisting of a composite of 2 D-frame kicks each, preserved in ethanol in half gallon bottles (See Appendix A for details)

2) Habitat evaluation (See Appendix A for details)

3) Water chemistry – DEP Standard Analysis Code 018 laboratory samples and a bacteria sample (See Table 2 for a parameter list)

4) Field chemistry: measure temperature, pH, DO, conductivity

5) Electrofishing: approximately 50-100 meter reach gathering all specimens for development of a total species list and relative abundance

TABLE 2
CHEMICAL PARAMETERS INCLUDED IN DEP ANTI-DEGRADATION WATER SAMPLING
(STANDARD ANALYSIS CODE 018)

Test	**Parameter**	**Units**
Field Chemistry		
	Temperature	Centigrade
	Specific Conductance	umhos/cm
	Dissolved Oxygen	mg/L
	pH	units
Laboratory Chemistry		
00403	pH	units
00410	Alkalinity	mg/L
00515	Residue Dissolved/105	mg/L
00530	Residue, total nonfilterable	mg/L
00610A	Ammonia-N, total	mg/L
00615A	Nitrite, total	mg/L
00620A	Nitrate, total	mg/L
00665A	Phosphorous, total	mg/L
00900A	Hardness, total as CaCO3	mg/L
00916A	Calcium, total	mg/L
00927A	Magnesium, total	mg/L
00940A	Chloride, total	mg/L
00945A	Sulfate, total	mg/L
01000H	Arsenic, dissolved	ug/L
01002H	Arsenic, total	ug/L
01025H	Cadmium, dissolved	ug/L
01027H	Cadmium, total	ug/L
01032	Chromium, hexavalent	ug/L
01034A	Chromium, total	ug/L
01040H	Copper, dissolved	ug/L
01042H	Copper, total	ug/L
01045A	Iron, total	ug/L
01049H	Lead, dissolved	ug/L
01051H	Lead, total	ug/L
01055A	Manganese, total	ug/L
01065H	Nickel, dissolved	ug/L
01067H	Nickel, total	ug/L
01090H	Zinc, dissolved	ug/L
01092H	Zinc, total	ug/L
01105H	Aluminium, total	ug/L
70508	Hot acidity	mg/L

Timing of Samples: Sampling time frames and conditions to avoid when doing anti-degradation biological sampling are also issues to be considered. The recommended months to sample are mid-October through April. The insect instars are generally large, making them easier to collect and identify, and most major taxa are still present in-stream because they have yet to emerge as adults. The months of July through early October should generally be avoided. During these months the insects are present as eggs or are newly hatched making them difficult to collect. In addition, some major taxa are missing because they have emerged.

The months of May and June are a special case because most important insect taxa emerge then. The biologist must consider the effect emergent taxa might have on the results. Because aquatic insects emerge with greater frequency in May and June, it is important that reference and candidate sites be sampled within a day of each other during this period, to reflect similar phases of emergent activities on both waterbodies.

Samples should be collected under as normal weather conditions as possible. This means avoiding times of drought and floods. These unusual events can severely impact the macroinvertebrates and it may take an entire life cycle for them to recover. As a result, the biologist must know when the last flooding or drought occurred in the area. Again, it is always important to sample candidate and reference sites within a day of each other so unusual weather events do not complicate the results.

Number of Samples: Generally, three samples are collected at each station (see Appendix A). Each station is comprised of a stream reach one hundred meters in length. Each sample consists of the composite of two D-frame kicks - one collected from a riffle and the other from a run habitat. Each kick consists of a 1 x 0.3 meters (0.3 meters is the width of the D-frame net) disturbed area immediately upstream from the net. This approach results in 3 samples representing 1.8 square meters of substrate from the three best riffle/run habitats in a representative one hundred meter stream reach. Collection starts with a reconnaissance of the stream to locate good riffle/run areas. Then, starting at the downstream end of the reach, the biologist moves upstream through the reach collecting the three composite samples.

The larger the stream the greater the potential differences in habitat and distribution of macroinvertebrates. In large streams, the collector may wish to take more than a single set of three samples to characterize the macroinvertebrate community at a station. The use of multiple assemblages as indicators such as both fish and macroinvertebrates also becomes more important as stream size increases.

Glide/Pool Samples: The Department's development of biological methods has concentrated on riffle/run type streams. This is because, with rare exceptions, these are the types of streams petitioned for HQ or EV status. The Department does realize the need for a glide/pool sampling protocol, not only in the anti-degradation program but also for routine stream assessments. There is a method adaptable to glide/pools described on page 7-5 of "Rapid Bioassessment Protocols For Use in Wadeable Streams and Rivers - Periphyton, Benthic Macroinvertebrates, and Fish" Second Edition (Barbour et al.); EPA 841-B-99-002; July, 1999. The method calls for a composite of 20 jabs using a D-frame dip net to proportionally sample all habitat types. The Department will test this method and also continue to develop a second alternative based upon fish populations. The Department is looking into the feasibility of using fish metrics in cooperation with the Pennsylvania Fish and Boat Commission.

D. Sampling reference sites.

1) Benthic samples – Three samples per station consisting of a composite of 2 D-frame kicks preserved in ethanol in half gallon bottles.

2) Habitat evaluation.

3) Field chemistry

Biological sampling at reference sites follows the same procedure used at the candidates with the exception that no sample is collected for chemical analysis in the laboratory. The biologist must collect field chemistry at the reference site to confirm the appropriate match of pH (alkalinity) to the candidate stream.

E. Determine the status of candidate sites in relation to the paired reference sites:

1) Calculate the candidate/reference percent comparison and compare it to the 83 & 92% criteria (see Appendix A for details).

2) Write a report summarizing the findings and recommendations. (The grab chemistry and habitat information are not used in the use designation determination, but are used to support the biological findings in the report's narrative.)

Appendix A also provides a detailed discussion and example of the metric scoring. Small freestone streams are the most frequently petitioned streams so they provided the largest pool of data when the scoring development was done. These metrics were developed for small freestone streams and should not be applied to other types of streams until the Department completes the evaluation of the metrics described in this Appendix for each additional type of stream. The Department is currently working on the development of appropriate metrics for use in limestone streams, streams dominated by glide/pool habitat, and non-wadeable waters.

3. Qualifying as High Quality Waters (Other)

One additional, biology related criterion, is applied to the evaluation of candidate waters for High Quality status. Section 93.4b(a)(2)(ii) provides that a water ***body "…that has been designated a Class A wild trout stream by the Fish and Boat Commission following public notice and comment."*** is a High Quality Water. This criterion is designed to recognize waters supporting a high biomass of stream-bred trout and, therefore, considers both biological and recreational attributes of the candidate water.

Conflicts between chemical and/or biological stream characterizations.

All data received in support of requests to redesignate waters as HQ or EV is evaluated by DEP staff for quality control purposes. It is possible that, in some cases, both chemical and biological information characterizing a stream will be available. It is also possible that in these situations the data may conflict. This is not expected to occur often, because, as a rule, stream biology is a very close reflection of stream chemistry. Nevertheless, for various reasons, including misrepresentative sampling (e.g. time, location), the special chemical nature of some streams (such as limestone streams or acid precipitation impacted streams, or streams with marginal habitat), conflicts could occur. The Department will view conflicting chemical and biological data as cause for further investigation of the data and/or stream characteristics to determine the reason for the conflict.

In general, when the Department becomes aware of conflicting data, it will first re-evaluate the chemical and biological stream characterization information to verify its accuracy. The verification process will be conducted to ensure that the samples are not misrepresentative, improperly collected, inaccurate, and that the sampling was designed to account for special stream conditions and characteristics. The Department may seek additional data or conduct further stream studies on its own. The Department will always apply good science in making verification, and will make evaluations based on the best professional judgement, experience, and expertise of its staff to validate existing data and any additional data gathered during the verification process. After verification, if the Department's review indicates that either the stream chemistry data or the stream biology data meets the respective qualification criteria, the stream will qualify as High Quality Waters, as established in §93.4b(a).

The procedures for resolving conflicting characterizations of a stream are the same whether the conflicting data are chemical/biological, chemical/chemical, or biological/biological. In all cases, the Department will verify all data. The Department will verify the biological data to ensure that it was collected properly and compared to the reference stream in the proper manner. The data will be carefully checked for possible errors in metric calculations or procedures. If the biology results showed a water did not qualify for special protection, additional stream investigation might be performed to identify problems with physical habitat or riparian buffer. On the other hand, additional stream studies might be conducted by the Department to confirm the presence of qualifying biological conditions. The chemical data will be examined to determine accuracy, conditions under which the stream was sampled, quality assurance, and the degree to which the data did not meet the criteria. The chemical data could be investigated, for example, to determine whether sampling procedures may have missed possible periodic occurrences of chemical degradation from pre-existing sources or natural processes, or if any potential pollutants could cause non-qualifying biological quality. After verification, if the Department's evaluation indicates that either the stream chemistry data or the stream biology data meets the respective qualification criteria, the stream will qualify as High Quality.

4. Qualifying as Exceptional Value waters

Section 93.4b(b) of the regulation states the following:

"(b) A surface water that meets one or more of the following is an Exceptional Value Water.

(1) The water meets the requirements of subsection (a) and one or more of the following:"

This indicates that Exceptional Value waters must first be High Quality waters in accordance with the requirements of subsection (a). The subsequent listing of factors in the regulation requires that the water also possess one or more of the following:

1. Location in a National wildlife refuge or State game propagation and protection area
2. Location in a designated State park natural area or State forest natural area, National natural landmark, Federal or State wild river, Federal wilderness area or National recreation area
3. Qualification as an outstanding National, State, regional or local resource water
4. Exceptional recreational significance
5. A score of at least 92% (or its equivalent) using the biological assessment qualifier described in subsection 93.4b(a)(2)(i)(A) or (B)
6. Qualification as a Wilderness Trout Stream

Items 1 and 2 above are straightforward in that the waters mentioned are easily identified by virtue of their location on a state or federal tract of land clearly defined and set aside for a specific use as described in law or regulation. Outstanding resource waters (#3 above) are defined in the anti-degradation regulation as waters for which a National or State government agency has adopted water quality protective measures in a resource management plan or regional or local governments have adopted coordinated water quality protective measures along a watershed corridor.

Coordinated water quality protective measures as defined in §93.1, include legally binding, sound land use, water quality protective measures coupled with an interest in real estate which expressly provide long-term water quality protection of a watershed corridor. Sound land use water quality protective measures include: surface or groundwater source protection zones, enhanced stormwater management measures, wetland protection zones, or other measures which provide extraordinary water quality protection. Real estate interests include: fee interests, conservation easements, government owned riparian parks or natural areas, and other interests in land which enhance water quality in a watershed corridor area.

A surface water of Exceptional Recreational Significance (Item #4) is defined in § 93.1 as "A surface water which provides a water-based, water quality-dependent recreational opportunity (such as fishing for species with limited distribution) because there are only a limited number of naturally occurring areas and waterbodies across the State where the activity is available or feasible." The Department interprets "limited number" to be generally less than ten, thus making the recreational opportunity offered not readily available. Species with limited distribution, such as Coho salmon and Steelhead trout, include those whose range has been restricted by natural or man-made barriers or management programs.

Item #5 defines the criterion for attaining a water use of Exceptional Value when evaluating the water body using the biological assessment. All procedures outlined under High Quality waters also apply to the evaluation of Exceptional Value waters using this approach.

Wilderness Trout Stream designations (Item #6) are conferred by the Pennsylvania Fish and Boat Commission, following public notice and comment. This designation is an effort to protect and promote native trout fisheries and maintain and enhance the wilderness aesthetics and ecological requirements necessary for natural reproduction of trout. The use as a criterion for Exceptional Value Waters recognizes both the biological/ecological and recreational significance of these waterbodies. The Department will evaluate and confirm the Fish and Boat Commission's rationale for the designation, and inclusion of appropriate public involvement prior to providing EV status under this criterion.

One additional criterion for Exceptional Value waters selection is included in § 93.4b(b)(2) of the regulation:

"The water is a surface water of exceptional ecological significance."

Unlike the previous six criteria, surface waters of exceptional ecological significance need not possess the attributes of a High Quality water. As defined in § 93.1, these are waters that are ***"…important, unique or sensitive ecologically, but whose water quality, as measured by traditional parameters (for example, chemical, physical or biological) may not be particularly high, or whose character cannot be adequately described by these parameters..."*** These are non-traditional aquatic systems which include waters such as thermal springs and Exceptional Value wetlands. Generally, such aquatic systems may be considered "important" if they occupy a position or perform a function critical to an ecosystem, "unique" if they represent the only example or one of a very few examples of a particular type of aquatic system in the state, and "sensitive" because they may be intolerant of chemical, physical, or hydraulic changes imposed by man. Their status as Exceptional Value waters acknowledges the significance of the ecosystems they represent.

All of these pathways for qualifying as EV waters are applicable in National and State park waters, as well as all other surface waters of the Commonwealth that meet the criteria.

CHAPTER 6

PROTECTION OF HIGH QUALITY AND EXCEPTIONAL VALUE WATERS

1. Introduction

The purpose of anti-degradation is to protect the existing quality of High Quality (HQ) and Exceptional Value (EV) waters, and the existing uses of all surface waters. Pennsylvania has implemented an effective anti-degradation program since the late 1960s. The methods and processes for implementing anti-degradation requirements have been continuously refined over the years based on this extensive experience.

The current Pennsylvania anti-degradation regulations, finalized on July 17, 1999, were the result of extensive public input into how the Commonwealth should implement an anti-degradation program to protect its best waters, and represent a careful balancing of the needs of Pennsylvania citizens and the regulated community in assuring the protection of the Commonwealth's waters. This implementation chapter details how the Commonwealth intends to implement this important program.

For all surface waters, the existing uses of the water must be maintained and protected when an activity which may affect a surface water and requires a Department permit or approval is proposed. These activities include point source discharges, certain water withdrawals, resource extraction activities, landfills, and other activities which may impact a surface water. Existing use protection also includes the protection of threatened and endangered species.

With regard to HQ and EV waters, the Department strongly recommends a pre-permit analysis prior to DEP authorizing a proposed discharge. Alternatives to new, additional, or increased point source discharges to surface waters must be used where they are cost-effective and environmentally sound, as described in Section 7 of this guidance. This is known as nondischarge alternative analysis. These alternatives, depending on the nature of the activity, may include land application of wastewater, an alternative discharge location, the use of holding facilities and wastewater hauling, and buffer zones for proposed earth disturbance.

If a nondischarge alternative is not cost-effective and environmentally sound, a proposed discharger must utilize the best available combination of cost-effective treatment, land disposal, pollution prevention, and wastewater reuse technologies. This process is known as the anti-degradation best available combination of technologies (ABACT) analysis (see Chapter 9 of this guidance). The discharger must demonstrate that any discharge will maintain and protect the existing quality of the receiving water and will result in no degradation. The ABACT technologies and methods must be used to ensure that no degradation results from the discharge.

Proposed discharges to HQ waters for which no cost-effective and environmentally sound nondischarge alternatives exist, must utilize technologies or methods resulting from ABACT analysis, but need not ensure that no degradation results from the discharge if the proposed discharger can demonstrate a social or economic justification (SEJ), as described in Chapter 10, for the proposed discharge.

2. Generalized Review Process

Flowcharts illustrating the generalized review process for projects to satisfy the anti-degradation requirements are shown as Figures 1 and 2 in this Section. For activities proposed in HQ and EV waters, the applicant or project sponsor and his or her consultant must be well versed with the anti-degradation requirements in order to provide the Department with an adequate proposal for consideration. Lack of information or understanding of the program or failure to submit necessary documentation to satisfy the regulatory requirements of the program may lead to delays in obtaining permits or approvals in HQ or EV waters. The Department has instituted a program (Money Back Guarantee) where decisions must be made within set timeframes. If an applicant fails to include all of the required anti-degradation submissions, an application may be returned, delaying consideration of the project. The Department strongly recommends early consultation with potential project

applicants or sponsors so that the requirements and review process are understood and addressed before any formal submissions.

In the case of sewerage projects, this consultation will normally occur during the Act 537 planning process. For other types of projects, the Department encourages project sponsors to attend a pre-application meeting with appropriate regional office, county conservation district and/or district mining office staff when it is first known that an activity is being proposed in an HQ or EV watershed. These meetings should include, when possible, both the applicant and/or project sponsor, and his or her consultant.

A number of topics can be covered and objectives accomplished at this meeting. First, the anti-degradation regulation will be described in detail, with emphasis on the various 'tests' to be satisfied. The flowcharts shown as Figures 1 and 2 will be used to outline the process by which these tests are evaluated. The applicant describes its project, including the volumes and expected constituents of the various wastewater streams that the project would generate, as well as the technology and/or BMPs that are contemplated to be utilized. The existing and/or designated use of the proposed receiving stream will be reviewed to ensure that the applicant knows the use of the waterbody, and the connection between that use and applicable regulatory requirements.

Once this information is exchanged, more detailed discussion of the applicability of the regulations to the specific project being proposed can be pursued. Since the first step in the process will always be the evaluation of nondischarge alternatives, and because this must necessarily be satisfied before proceeding to the next step, this will be a large component of the discussion. Department staff will discuss the scope of the preliminary alternatives that they would like evaluated for the project at hand. Alternatives that are clearly not practicable, technically implementable or cost-effective should not be examined further. This dialogue with the applicant will define the content of the nondischarge alternative analysis to be submitted with the permit application. The Department will also encourage the applicant to seek input from the affected public, local government, watershed groups, or other interested parties, relating to what alternatives are most likely to be successfully supported by the public in the future public comment periods associated with the formal application process. The importance of early and meaningful public involvement cannot be overstated (see Chapter 12).

If a total nondischarge alternative is not viable, based on the analysis described above, the next area to be considered involves the treatment itself. The proposed treatment technology will be reviewed from the standpoint of whether it can produce an effluent which will meet anti-degradation best available combination of technologies (ABACT) (Chapter 9). Along those same lines, the proposed discharge will be examined as to whether it will meet the test for non-degradation (Chapter 8).

Finally, if the proposed discharge is to HQ waters, the SEJ process should be reviewed with the applicant. The critical importance of involving the public and local government in identifying and determining the appropriate significance of the various SEJ factors to be considered for a particular proposal will be emphasized with the applicant (Chapter 10).

Proponents of these discharges, as well as other activities covered by the anti-degradation regulation, must also take into account the effect of the activity on the physical, chemical and biological characteristics of a surface water ecosystem. For projects subject to a Department permit or approval that may affect an Exceptional Value or High Quality surface water but do not involve a discharge, there is a somewhat different review process. This process evaluates the effect of the proposed activity on surface water and requires that the use of the surface water be maintained and protected. For example, for water withdrawals which require a Department permit or approval, the applicant should meet with the Department as early as possible to discuss the project. The person seeking the permit or approval must demonstrate that its proposed withdrawal will not adversely impact any designated or existing uses in the surface water ecosystem. Particular attention should be paid to any wetlands in the vicinity of the withdrawal, threatened and endangered flora and fauna, and any other attributes of the ecosystem that are sensitive to a dimunition in flow. There are several methods available for ascertaining the impact of a water withdrawal on water resources. One tool available to the applicant and the Department to evaluate the potential impacts of a water withdrawal on aquatic resources is the Screening Procedure for Water Quality/Quantity Impacts of Drinking Water Permits. The screening procedure allows

applicants and the Department to focus on situations where additional review or assessment is needed to evaluate the magnitude and likelihood of potential impacts. An initial assessment of the magnitude of the impact is made based upon the 7 day, 10 year low flow (Q7-10) at the point of impact. The policy specifies water withdrawals which would not be considered significant on streams, springs and wetlands. Another tool available to ascertain stream impacts from a proposed withdrawal, if a water withdrawal is proposed on a stream which supports a cold water fishery, is the Department's Incremental Flow Instream Methodology (IFIM) which is currently under development. The IFIM specifies the percentage of habitat that a water withdrawal may impact without impacting the designated or existing use of the surface water. The applicant should consult with the Department as early as possible to discuss the use of the above tools, as well as other available methods and resources.

Other topics that should be covered in a pre-application type meeting include, but are not limited to, threatened and endangered species (Chapter 3), identification of other Department or federal permits or approvals that the project would likely require, and the Department's permit coordination process.

The applicant and his or her consultant are encouraged to request additional meetings with Department staff to discuss any aspects of the anti-degradation program about which they have questions. As stated earlier, emphasis will be placed on early and frequent communication between the applicant, the local community and the Department. In some cases, preliminary discussions would be useful **before** a particular property is purchased and the owner makes plans to develop of the parcel.

The Department will make final, formal decisions on the various anti-degradation program elements within the context of its normal review processes. For sewerage cases, this will occur during Act 537 sewage facilities planning. For all other permit types, this will generally occur during the context of DEP review of an NDPES application or other request for approval. For applications first handled by delegated county conservation districts, close coordination between the district and the appropriate Regional Office will be necessary to ensure that the anti-degradation requirements are addressed during the review process.

FIGURE 3
GENERALIZED PERMIT REVIEW PROCESS
FOR
PROPOSED DISCHARGES TO
HIGH QUALITY WATERS

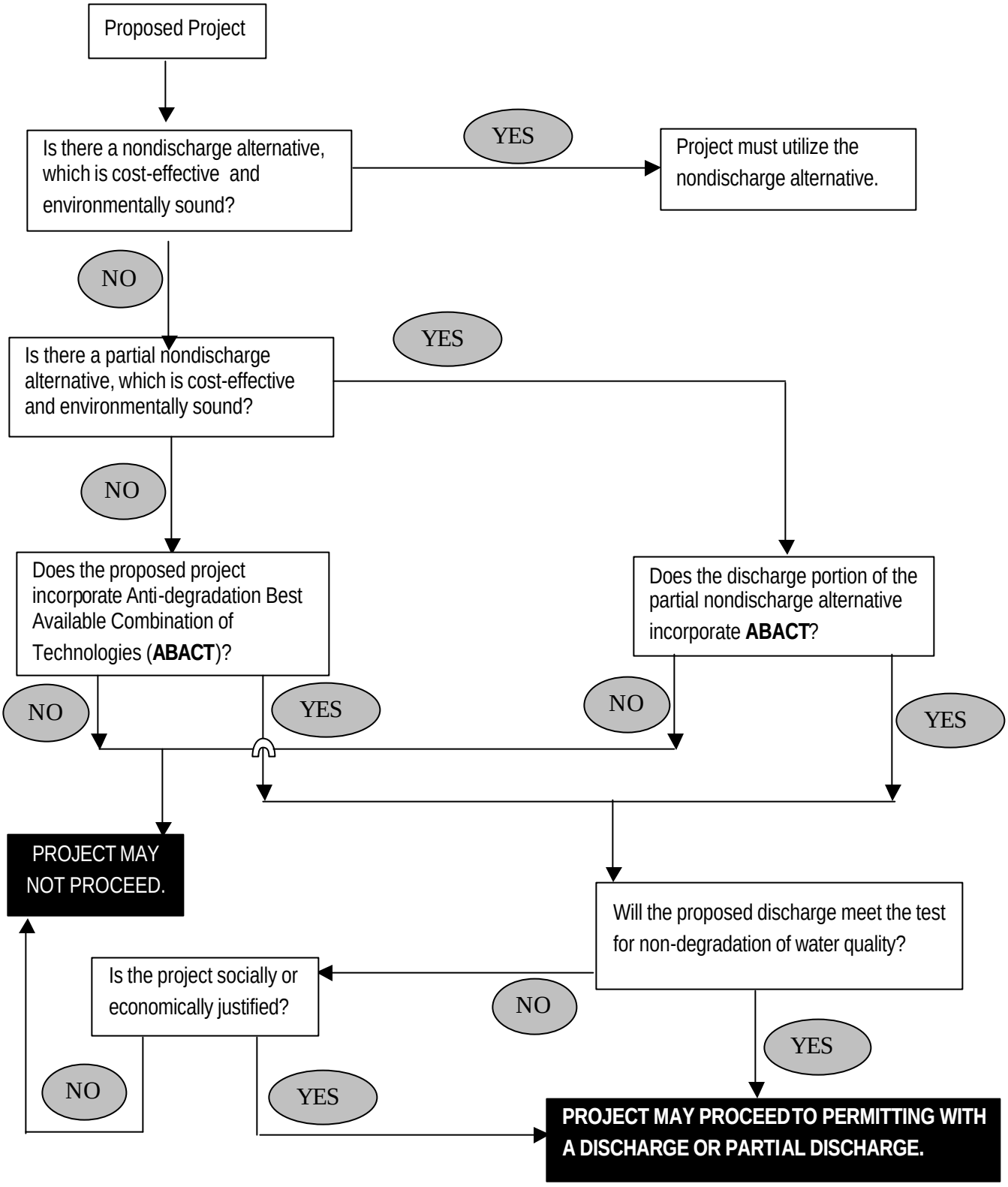
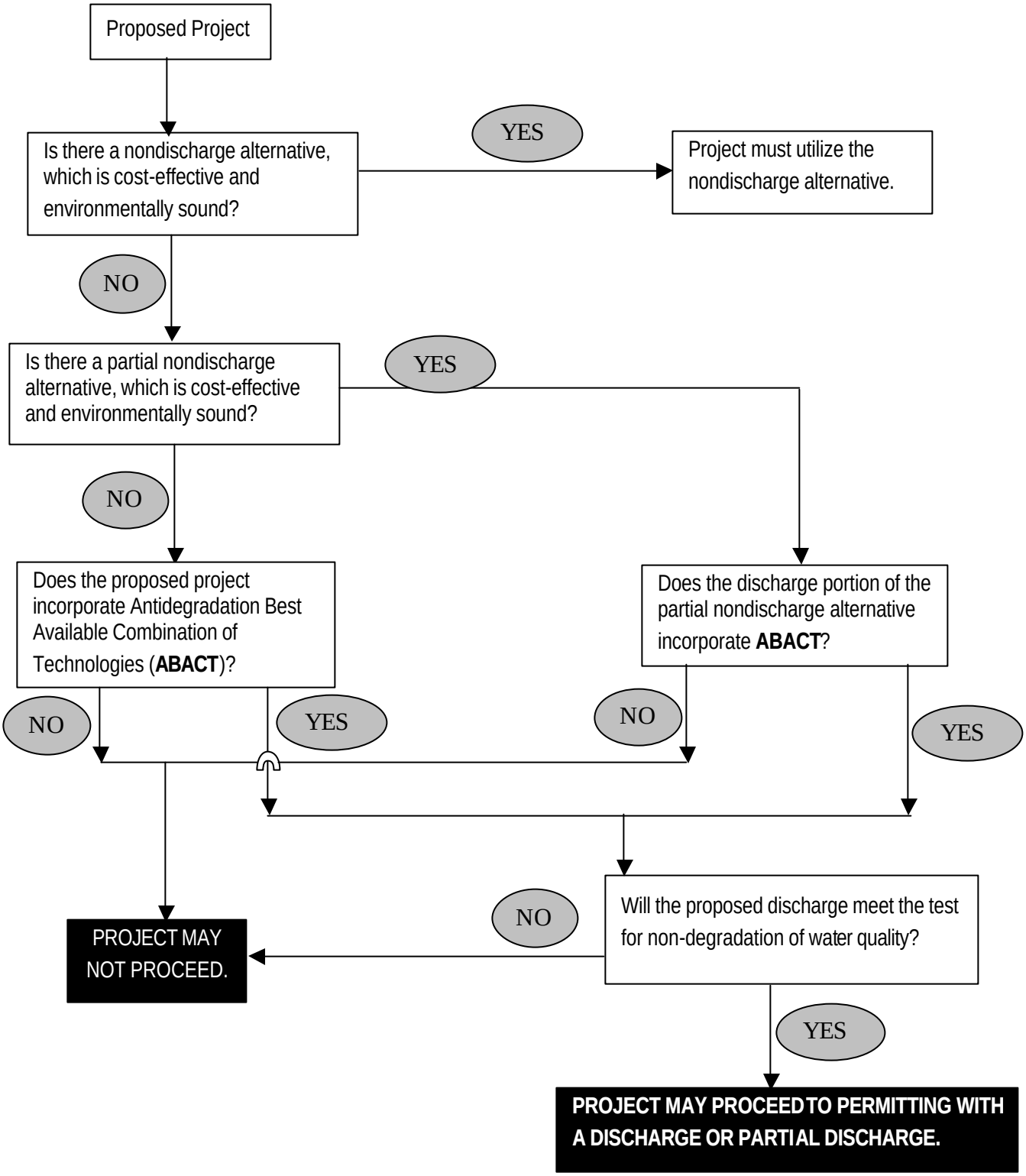


FIGURE 4
GENERALIZED PERMIT REVIEW PROCESS
FOR
PROPOSED DISCHARGES TO
EXCEPTIONAL VALUE WATERS



CHAPTER 7

NON-DISCHARGE ALTERNATIVES

1. Background

An important component of the anti-degradation program requires the use of nondischarge alternatives for projects and activities in HQ or EV waters when such alternatives are cost-effective and environmentally sound. When wastewater management or disposal is feasible in an environmentally acceptable manner, without creating a direct discharge to a waterbody, or when direct discharge can be minimized, degradation of water quality is prevented or minimized. The potential threat of accidental harmful releases through the discharge pathway is also minimized. Use of non-discharge alternatives, such as land application of wastewater or treatment/recycle, is very effective in preventing water quality degradation and localized aesthetic impacts to the water.

The regulation at §93.4c(b)(1)(i) states the following:

(b) Protection of High Quality and Exceptional Value Waters.

1) Point Source Discharges – The following apply to point source discharges to High Quality or Exceptional Value Waters.

(i) Nondischarge alternatives/use of best technologies.

(A) A person proposing a new, additional or increased discharge to High Quality or Exceptional Value Waters shall evaluate nondischarge alternatives to the proposed discharge and use an alternative that is environmentally sound and cost-effective when compared to the cost of the proposed discharge. If a nondischarge alternative is not environmentally sound and cost-effective, a new, additional or increased discharge shall use the best available combination of cost-effective treatment, land disposal, pollution prevention and wastewater reuse technologies.

(B) A person proposing new, additional or increased discharge to High Quality or Exceptional Value Waters, who has demonstrated that no environmentally sound and cost-effective nondischarge alternative exist under clause (A), shall demonstrate that the discharge will maintain and protect the existing quality of receiving surface waters, except as provided in subparagraph(iii).

[note – subparagraph (iii) allows degradation on High Quality waters where social or economic justification exists]

2. Discussion

The requirement to consider nondischarge alternatives applies to both High Quality and Exceptional Value Waters regardless of the degree of degradation or the social or economic benefit associated with a proposed discharge. The requirement to evaluate and use nondischarge alternatives, when they are cost-effective and environmentally sound, is a critical test and must be met by any activity or project having a wastewater disposal need in HQ or EV waters. In High Quality waters, the tests for nondegradation of water quality by a proposed discharge and for social or economic justification of a project (see Sections 4 and 6 of this Chapter) are usually applied at the same time as the evaluation of nondischarge alternatives because they help define the baseline for cost comparison of the alternatives. The Department will not approve a new or increased discharge in such waters unless it has been determined that there are no feasible alternatives to a direct discharge.

The regulation also provides that, if a discharge cannot be avoided, the applicant must find and use the best available combination of discharge and nondischarge treatment and management alternatives, which is cost-effective. Anti-degradation best available combination of technologies (ABACT) for various types of discharges in HQ and EV Waters are addressed in Chapter 9.

Traditional wastewater disposal science and technology has generally focused on direct discharge and on treatment methods designed to achieve levels of effluent quality acceptable for discharge. This may be an acceptable strategy to abate pollution and protect water uses where stream assimilative capacities are available in waters not classified as HQ or EV. However, the anti-degradation regulation makes clear that environmentally sound nondischarge alternatives must be considered and used, where cost-effective, in HQ and EV waters.

A growing environmental consciousness and emerging technology for nondischarge wastewater management alternatives has evolved for a number of reasons. In areas where water supplies are severely limited, direct discharge of wastewater may not be prudent. Recycle of wastewater for re-use, wastewater minimization by changing industrial processes, or return of wastewater to the ground water supply aquifers by land application have emerged as strategies to respond to this need. In other instances, limited stream assimilative capacities and stringent effluent limitations and management conditions imposed on toxic and conventional pollutants have fostered pollution prevention in process design and wastewater recycle as an economic, as well as environmental, strategy. Nondischarge practices constitute good environmental management in HQ and EV waters, and are imperative considerations.

Many nondischarge alternatives employ low-level technologies, which, with adequate management, can be more reliable than discharges that rely on higher technology. Good examples are land application of sewage effluent and constructed treatment wetlands.

A. Nondischarge as an Alternative

Traditional sewage disposal systems sometimes develop into sprawling sewer systems with numerous extensions, connected to large central sewage treatment plants downstream. These traditional collection and central treatment systems have been a logical and sound solution for sewage disposal in urban or heavily developed areas and will continue to fulfill an important role in providing for wastewater disposal into the foreseeable future. However, without carefully developed land use planning, these disposal strategies contribute to the problems of urban sprawl and unplanned development (Report of the Pennsylvania 21st Century Environment Commission, September 1998). In an effort to promote coordinated planning, the Municipalities Planning Code as amended by Acts 67 and 68 of 2000 in conjunction with the application of the Governor's Executive Order 1999-1, require the DEP to consider local planning and zoning ordinances in its decision making .

Nondischarge disposal alternatives for sewage are generally dependent upon the availability of land sufficient to treat the quantity of sewage effluent generated. The most effective use of these methods de-emphasizes centralization of sewerage facilities and local management systems.

Decentralized sewage disposal schemes, which rely on less intensive technology like land application, small-scale treatment systems, and at-site disposal or re-use of effluent, can discourage sprawl and prevent or disperse the large adverse impacts that a central discharge can create. Also, because these approaches typically involve land application of wastewater to local ground water aquifers, or employ re-use practices that can reduce the local water supply demand, they may help sustain the base flow of groundwater into local headwater streams. This decentralization is an alternative that must be considered to ensure maintenance of existing quality in HQ and EV waters. These systems are effective when they match desired land use, and where management and oversight systems provide local maintenance and operation.

B. Environmentally-Sound Nondischarge Alternatives

Listed below are some nondischarge alternative management and disposal options, and the general environmental criteria applied to their use. The list of alternatives is not an exclusive nor exhaustive description of the environmental considerations of alternatives, but is meant to be a starting point for the

evaluation of options. The project proponent can expand this list through research and/or experience with different technologies. Determination of applicability of a particular non-discharge alternative must be made on a case-by-case basis, by the project proponent, taking into account site-specific environmental and local factors.

Pollution prevention and process changes - Pollution prevention should be one of the first nondischarge alternatives considered. Pollution prevention can involve the substitution of raw materials, the segregation of wastewater flows, and/or the redesign of industrial processes to use less water, eliminate objectionable chemicals, and produce less wastewater. Pennsylvania is a leader among states in environmental programs which are designed to foster this emerging science and educate the regulated community. In anti-degradation waters, all appropriate pollution prevention and wastewater minimization measures for any proposed discharge shall be considered, and shall be used where they are cost-effective and environmentally sound, when compared to discharge options.

Land application of wastewater – This nondischarge alternative treats sewage or wastewater to some prescribed level with conventional unit processes, and then applies it to land by spray irrigation or through direct in-ground infiltration systems. Some treatment systems, such as constructed wetlands, can be designed to function with this type of disposal. It should be noted that some wastewater, including many industrial wastewaters are not suitable for land application.

A good example of this nondischarge alternative is land application of sewage effluent. Generally, where adequate soils and conditions exist for spray irrigation or direct in-ground infiltration of effluent, sewage may be pretreated only to secondary treatment levels before land application. Removal of organics, solids, and nutrients is accomplished naturally by biota in the soil, rather than by technology intensive processes. Because there is no direct discharge pathway to the receiving stream, accidental releases of acute toxics like chlorine or short-term adverse aesthetic problems caused by turbidity or color in the effluent are prevented.

In these situations, ultimate discharge of the wastewater is to the ground water in the land application area, after percolation through the soil mantle. Therefore, adherence to DEP land application design criteria is critical to protection of the ground water resource. This method is widely used throughout Pennsylvania for sewage disposal and food processing wastewaters, because of the ability of the soil and associated vegetation to take up nutrients and other wastewater pollutants which would be problematic in a direct discharge to surface waters. This category could include systems as small as individual and small community residential on-lot sewage systems or as large as public works or industrial facilities disposing of several million gallons per day, depending on site-specific conditions.

Environmental considerations for this method include:

- availability of soil types, depths, and slopes to accommodate the types of pollutants left in the wastewater after pre-treatment and which can adequately receive and treat the quantity of wastewater produced,
- availability of land which is sufficiently isolated from the public,
- sensitivity of local groundwater quality and uses,
- seasonality of systems which rely on vegetative uptake for additional wastewater renovation.

In general, these environmental factors become less critical with an increasing level of pre-treatment.

Recycle/reuse of wastewater - Treatment and recycle of wastewater for reuse at industrial facilities is frequently used and is an economical nondischarge alternative. The recycle of highly treated water for reuse can be feasible and cost-effective where water supplies are limited or costly, or where effluent must be treated to high levels of quality for discharge to surface waters. The degree of treatment

necessary to produce a reusable water depends upon the sensitivity of the process in which the water is used, but in most cases, well-developed technologies can meet the necessary quality.

Recycle and reuse of sewage effluent is emerging in some states, including Pennsylvania, on both small and large scales. Tertiary effluent can be recycled back to toilet facilities for flush water and other non-sensitive uses with only minimal additional treatment. Other non-potable water reuses, such as vehicle washing or irrigation, can become possible with the addition of newer membrane filtration technologies.

A project in central Pennsylvania, currently in the planning and pilot phase, will provide for the treatment, transport, and recycle of approximately 3 million gallons per day of sewage effluent for a variety of non-potable reuses throughout an urban and suburban area. At this time, the project appears to be economically feasible and will result in less strain on regional groundwater supplies and in other improvements to the aquatic environment.

Alternative discharge locations - This alternative involves transport of effluent, via pipeline, generally out of the HQ or EV waters. The alternative is most feasible when the project is located on a small HQ or EV water, tributary to some larger non-HQ/EV waterbody. In this case, effluent, requiring a less stringent degree of treatment adequate for the non-HQ/EV stream, may be transported downstream for discharge. Economics and environmental constraints are dictated by the relative size and assimilative capacity of the downstream water and by its proximity to the project. This may not be an environmentally sound option in cases where the project will generate a reliably high quality effluent and where low-flow augmentation would be beneficial to the HQ or EV water.

Another version of this alternative is connection of the proposed discharge to an existing permitted sewage conveyance system and treatment facility. If the treatment system discharge is located outside the HQ or EV water, the environmental review should compare the benefit of eliminating the discharge to the HQ or EV water to the potential environmental consequences of development and construction along the sewer line connection and any hydrologic impacts which might occur with the transference of ground water baseflow to the downstream location. If the treatment system discharge is located on an HQ or EV water, connection of a new source of sewage flow will qualify as a nondischarge alternative only if the connection will not cause exceedance of the permitted capacity of the existing treatment plant. Connection of a proposed industrial source, however, is considered a new discharge of pollutants and would not generally meet the definition of a nondischarge alternative even if the added wastewater volume does not cause the treatment facility to exceed its permitted capacity.

In all cases involving proposed transport of wastewater out of the immediate watershed, nondischarge alternatives which utilize localized land disposal or groundwater discharge methods shall be considered in the alternative evaluation process, because of the benefit they offer in helping to preserve groundwater supplies and base flow to streams.

Holding facilities and wastewater hauling - The use of properly designed holding tanks for sewage and holding tanks or impoundments for industrial and other wastewaters can be a feasible nondischarge alternative, especially, for short-term disposal of wastewater. Holding facilities are most effective when wastewater volumes are small, and a central treatment facility (usually a publicly owned sewage treatment plant) is close. The potential for environmental harm from holding facilities stems from neglect and overflow, creating localized health hazards or pollution. Planning for effective financial management and operation are necessary to ensure the environmental soundness of this alternative. Accidental discharge during transport may also cause environmental harm. However, with proper design, operation and management, and the use of alarm systems, holding facilities and wastewater transport can be simple and effective alternatives to stream discharge.

Constructed treatment wetlands – The construction of treatment wetlands that use natural biological processes and the nutrient uptake characteristics of planted wetland vegetation to treat wastes is an effective nondischarge alternative. When employed as a non-discharge alternative, typical wetland

treatment designs include multiple lined treatment cells, followed by multiple un-lined infiltration cells. The infiltration cells are designed and located to allow and facilitate the percolation of the naturally treated effluent through the soil mantle and into the groundwater. The treatment and infiltration cells are sized based on both hydraulics and the organic/nutrient load requiring treatment, so land availability is a factor. Because of their passive technology and relative ease of operation, however, constructed wetland systems can be a viable alternative in many rural situations.

Nondischarge Alternatives to Earth Disturbance – Nondischarge alternatives which are to be considered by persons proposing an earth disturbance activity which requires an NPDES permit include: alternative siting of the project, limiting the extent of earth disturbance, and the maintenance and/or installation of riparian buffers.

C. Evaluation of Cost-Effectiveness of Nondischarge Alternatives

Economic criteria are needed both to guide an applicant in the preparation of information relative to the evaluation of nondischarge alternatives and to guide the Department in making its determinations. The following describe methods of determining cost-effectiveness.

1) Direct cost comparison of alternatives

The most direct method of evaluating the cost effectiveness of a nondischarge alternative is to compare its cost to the cost of the discharge alternative which would otherwise be approvable on the waterbody.

For proposed discharges on Exceptional Value waters, the only approvable discharge is one which meets the test for non-degradation of water quality. Thus, the level of technology and control which would be necessary to produce effluent quality meeting non-degradation standards set the basis for the cost estimate of the discharge alternative. This cost estimate is compared to that of each of the environmentally sound non-discharge alternatives, including combinations of seasonal discharge and other non-discharge wastewater management approaches.

For proposed discharges on High Quality waters, the selection of the discharge alternative upon which to base the cost comparison is dependent on other factors. If social or economic justification for the project has not been demonstrated, the only approvable discharge would be a non-degrading discharge. The associated treatment and control at that level sets the basis for the cost of the discharge system. If, however, the project proponent has successfully demonstrated his or her project is socially or economically justified, discharge at some level of degradation would be approvable by meeting criteria for social or economic justification, the estimated cost of the discharge system would be based on treatment and control expenditures at that lower level. As a practical matter, for proposals in HQ waters, unless there is a low-cost non-discharge alternative which the project sponsor is willing to implement, the dependence of the cost comparison upon the outcome of the social/economic review process means that a final determination on the cost-effectiveness cannot be made until the social/economic justification has defined the approvable level of treatment technology (see Chapter 10).

The actual cost comparisons are typically performed on the basis of present worth calculations (or calculations of uniform annual cost, if the useful life of each alternative is different), using an applicable interest (discount) rate. The present worth calculation is a well-established method for integrating the up-front capital costs (and associated indebtedness) of a project with its ongoing annual costs of operation, and transforming the integrated costs to one equivalent value. The calculation yields the total equivalent dollars which would have to be invested at the beginning of a project in order to finance it for the life of the facility. The monetary costs considered in the calculations include the total value of the resources which are attributable to the wastewater treatment, control, and management systems and the component parts. To determine these values,

all monies necessary for capital construction costs, operational costs, and maintenance costs should be identified.

Capital construction costs used in cost comparison analysis consist of estimates of the construction costs, including overhead and profit; costs of land (including land purchased for the treatment works site and land used as part of the treatment process or for ultimate disposal of residues), relocation expenses, and right-of-way and easement acquisitions; costs of design engineering, field exploration, and engineering services during construction; costs of administrative and legal services (including cost of bond sales); start-up costs such as operator training; financing costs and interest during construction; and the costs of any other site-related environmental controls, such as erosion and sediment control practices.

Operational and maintenance costs are usually considered on an annual basis and include operational staff salaries, cost of energy and fuels, cost of treatment chemicals, cost of routine replacement of equipment and equipment parts, and other expenditures necessary to ensure effective and dependable operation over the life of the facility. Annual operation and maintenance costs should be averaged to account for variations which might occur year-to-year due to varying production or wastewater volume.

The salvage value of equipment, tankage, and materials from the treatment works is part of the present worth calculation. Salvage value is estimated using straight-line depreciation during the useful life of the project, and can generally only be claimed for equipment where it can be clearly demonstrated that a specific market or re-use opportunity will exist. Salvage value estimation should also take into account the costs of any restoration or decommissioning of treatment units and final disposal costs. It is possible in some cases that these costs may be high enough that the net salvage value will be negative.

Land purchased for the treatment works site is also assumed to have a salvage value at the end of the project useful life equal to its market value at the end of the analysis period. The local inflation rate for land in the use area should be used to project the market value at the end of the analysis period.

It is also important to evaluate any opportunity cost associated with different alternatives. Opportunity costs should not be considered for speculative growth or production increases claimed by an applicant. Any costs claimed should be clearly associated with integral portions of projects which are realistically available, and are otherwise locally approvable.

The discount rate used in the present worth or uniform annual cost calculation for public sewerage projects should be that rate published by the Department and associated funding agencies for the planning review and evaluation of water resource projects. The rate is published on an annual basis and is available from the Department's Bureau of Water Supply and Wastewater Management, Division of Municipal Financial Assistance. For private sector projects, the interest rate utilized should be that rate at which the applicant can borrow funds. Since the present worth calculation is being performed more to compare alternatives rather than to obtain a very accurate estimation of actual costs, the fact that the same interest rate assumption be utilized for each alternative is more important than the actual interest rate selected.

Cost estimates have an associated level of precision. The cost estimates prepared by the project sponsor should include an estimate of the error for each alternative. The applicant is responsible for documenting and defending all cost estimates used in the analysis.

Cost estimate equations: The equations below are the basic expressions of the present worth and equivalent annualized cost concepts. Additional mathematical factors and apportionment of costs are incorporated into the equations where appropriate.

I. The basic present worth calculation should be performed in accordance with the following equation:

$$P = C + O + [A * (P/A,d,n)] - S - L$$

where,
- P = present worth
- C = capital cost
- A = annual operating costs
- (P/A,d,n) = equal series present worth factor $[(1 + d)^n - 1] / [d (1 + d)^n]$
- d = discount rate
- n = useful life in years
- S = present worth of salvage value of facilities
- L = present worth of salvage value of land
- O = opportunity costs (if any)

A gradient factor may be added into the equations to account for inflation of annual operating costs, as opposed to using an average value throughout the project life, by simply adding the additional following term onto the right hand side of the above equation :

$$[G*(P/G,d,n)]$$

where,
- G = uniform increase in annual costs
- (P/G,d,n) = present worth factor for a gradient = $[(1- nd)[(1 + d)^n - 1] / [d^2 * (1 + d)^n]$.

II. If the nondischarge alternative and the discharge alternative have different useful lives, the cost comparison may be performed using the Equivalent Uniform Annual Cost Method. The equation for this method is:

$$EUA = (C + O) * (A/P,d,n) + A - [(S + L) * (A/F,d,n)]$$

where,
- EUA = equivalent uniform annual cost
- (A/P,d,n) = capital recovery factor $[(1+d)^n - 1] / [d (1 + d)^n]$
- (A/F,d,n) = uniform series sinking fund factor $d / [(1 + d)^n - 1)]$

To add a gradient factor, the following additional term is simply added to the right hand side of the above equation:

$$[G*(A/G,d,n)]$$

where,
- (A/G,d,n) = EUA factor for a gradient = $[(1+d)^n - 1 - nd] / d * [(1 + d)^n - 1]$.

Additional cost factors : Opportunity costs, while presented above as one-time present losses, may also have an annual lost revenue component, which could be accounted for by apportioning the costs as both up-front and annual costs.

In general, it is the responsibility of the applicant for a permit or approval to prepare detailed cost estimates for all appropriate and approvable discharge, nondischarge, and combination

discharge/nondischarge alternatives. The cost estimates may be prepared by a licensed professional engineer, accountant, an economist or other professional qualified in the field but they must be submitted under a professional engineer seal as part of the permit application.

The sources and rationale for all data and assumptions must be clearly indicated. The Department will review the cost estimates for completeness, accuracy, and validity of assumptions. Where deficiencies are discovered, the Department will either request additional information or clarification from the applic ant within the context of the permit application review process, or obtain the information on its own, or both. For sewage projects, this process generally occurs in the Act 537 planning review. Following the review process, the Department will advise the project sponsor on which nondischarge alternatives (or combination discharge/nondischarge alternatives) are cost-effective, and processing of a 537 plan review or permit application will proceed on that basis.

2) Other factors

While the basic concept behind the direct comparison is the method which has traditionally been used in Pennsylvania, other approaches and factors may be proposed by applicants and will be considered by the Department.

US EPA's "Appendix M to the Water Quality Standards Handbook – Second Edition, Interim Economic Guidance for Water Quality Standards," EPA-823-B-95-002, March 1995 presents an approach which looks at the absolute value of nondischarge alternative rather than at comparisons. The approach separates projects into two basic types: publicly and privately financed. The approach assumes that publicly financed projects provide a public service by a non-profit public entity, and that privately financed projects are proposed by persons or private-sector entities which require certain profit margins to stay in business.

For public proposals, which are being financed directly by public rate-payers or taxes, the criterion for cost-effectiveness in the EPA manual is the affordability of the project to the rate-payers. If a nondischarge alternative is affordable, regardless of its relative cost compared to other alternatives, it is cost-effective and must be implemented. The actual criterion for affordability is outlined in the manual. It suggests 1% of the median household income of the rate paying public as a first screening for presumptive affordability. When projected annual rates are higher than 1% of the median income, secondary tests of affordability, including debt indicators (like bond ratings), socioeconomic indicators (like unemployment rate), and community financial management indicators (like property tax revenue collection rate) are factored into the determination. Criteria for these secondary tests are applied in a "scored" matrix.

For private-sector proposals, the approach measures the impact which a nondischarge alternative would have upon profit and financial operation of a facility. The primary test estimates how much profits would decline due to the implementation of a nondischarge alternative. While no specific criterion is given, the approach involves comparing the reduced profit level to past operating profit levels shown in the same or similar type developments or industries, and to operating profit levels which would be maintained with utilization of other wastewater disposal alternatives. The approach implies that where reduction in projected profit level is small compared to industry standard or other alternatives, then the nondischarge alternative is deemed to be cost effective. The secondary tests described in the EPA manual involve more complicated financial factors including liquidity, solvency, and leverage. As with the profitability test, no specific criteria are given for these financial elements, other than their utility as subjective evaluation measures of a private-sector facility's financial status.

3) Combined approach

Aspects of the EPA evaluation concept can be integrated or combined with the direct comparison approach. For instance, in the evaluation of a public project, the 1% of median household income user-fee criteria can be applied as a first test of cost-effectiveness, even before the direct cost comparisons are considered. Only if the user-fees exceed the screening criteria would the direct comparison of the nondischarge alternative cost to the discharge alternative costs come into play. Likewise, for the private-sector projects, a primary screening test can be added to evaluate profit level. The test would require private developers or businesses to submit an analysis which estimated the profit levels resulting from the use of each alternative, and compare these to each other and to typical profit levels for the nature of the activity or business proposed. Only if a reduction in profits were deemed to be significant would the direct comparison of alternative costs be considered.

Where appropriate, the Department may require that the submitted demonstration of cost effectiveness include information to support both a primary screening/affordability evaluation as well as a secondary alternative-to-alternative cost comparison.

D. Selection of an Environmentally Sound and Cost-Effective Nondischarge Alternative

Each proposal on a Special Protection watershed will have its own unique environmental sensitivities and cost considerations, and because of this, standardized criteria may not always fit the case. The preceding portions of this section described some of the environmental factors and cost tests which should be considered in an evaluation of alternatives. In most cases, it will be appropriate to look at all such factors, and to make a determination based on the overall picture. In other cases, there may be one over-riding environmental factor or cost consideration which is critical to the determination. In order to most effectively encourage applicant and public attention to nondischarge alternatives, where they would best serve the environment and constitute effective use of the applicant's resources, the Department will use an interactive decision-making process with the project proponents. The process follows these steps:

1) As a first step in the evaluation process, a preliminary screening of alternatives will be performed by the applicant in consultation with the Department. This screening will remove from detailed evaluation those alternatives which are obviously cost prohibitive, technically infeasible, or environmentally unsound. This screening can be most effectively accomplished in a pre-application conference between the applicant and the Department. Alternatively, it may occur as part of the first technical review of the permit application package.

For public and private sewerage projects, the process will start in the first phases of Act 537 planning. In this process, the list of potential discharge, nondischarge, and combination discharge/nondischarge alternatives will be reduced to those which are reasonable, technically implementable, and not obviously cost prohibitive. Also, at this step of the process, the applicant and Department will agree upon which environmental and cost factors should be further analyzed in detail for the remaining alternatives, and upon a method for comparison. The level of detail in this screening step will be scaled to the size and nature of the proposed activity.

2) In the next step of evaluation, the environmental and cost factors for each of the remaining alternatives must be developed in detail, and a general ranking of the alternatives presented.

At a minimum the following environmental factors must be considered:

- Sensitivity of stream uses.
- Need for low-flow augmentation of stream flow.
- Sensitivity of groundwater uses in the area.

- Potential to induce secondary water quality impacts (storm water, hydrology)
- System reliability, potential for upsets/accidents.

Examples of cost factors to be considered are these:

- Direct comparison of present worth costs or equivalent annual costs.
- User fees in relationship with ability to pay (public sector projects).
- Profit margin implications (private sector projects).

3) Rankings are to be done separately for the environmental factors pertinent to the case and for each applicable cost factor. Where a group of alternatives have cost estimates with equal variability and error bands that overlap, the ranking should be judged to be equal. An overall rank should also be described for each alternative. Based upon these rankings and consideration to the preferences of the applicant and to public input as described below, the Department will select the allowable alternative or alternatives. Processing and review of plan approvals and permit applications will proceed on the basis of the selection.

E. Public Involvement in the Alternative Evaluation and Selection Process

Input from the public is encouraged as early as possible in the alternative evaluation process. The Department advises applicants to meet with public officials, local and regional planning agencies, economic development agencies, and watershed groups as part of the pre-application planning process. The Department will participate in these information exchanges, and may seek public input independently. In the case of public and private sewerage projects, this process should occur in the initial stages of Act 537 planning.

The early involvement of the public and local government is important because it can provide early identification of local and regional environmental and economic issues, so that they can be considered in the alternative screening and evaluation steps. Also, it will be useful to the applicant to learn which alternatives are most likely to be supported by the public during the official public comment period. The early receipt of information and ideas from the public can minimize the time and resources which may confront the applicant, while maximizing public acceptance of the project.

CHAPTER 8

NON-DEGRADING DISCHARGES

1. Introduction

The purpose of this section is to provide a framework for discussion of concepts and approaches dealing with the test for non-degradation. This test, as applied to proposed point source discharges to HQ and EV waters, is the criteria or screening process by which a determination is made as to whether or not a discharge will cause degradation. The test for non-degradation, in the context of Pennsylvania's anti-degradation regulations, is applied after it has been determined that there are no nondischarge alternatives which are cost effective and environmentally sound. (see Section 5 of this Chapter). This test is used and applied in conjunction with the requirement that the best available combination of technologies (ABACT) be used (see Chapter 9 of this guidance).

If cost-effective and environmentally sound nondischarge alternatives do not exist, the anti-degradation regulations require that a non-degrading discharge must be used to ensure maintenance of existing water quality. Discharges that will cause water quality degradation are not permitted in Exceptional Value (EV) waters.

For discharges to EV waters, where no degradation of water quality is allowable, the criteria for the non-degradation test are critical. Pennsylvania's regulations and guidance recognize the possibility of discharges which do not cause degradation, and allows that such discharges, after passing extensive inter-governmental and public evaluation of their degradation potential, may be permittable on HQ or EV waters. Thus, it is necessary to develop objective criteria for a non-degradation test which are clear and workable.

2. Background

The definition of degradation and application of the non-degradation test have been the subject of considerable technical and analytical discussion. This section will provide some background information on the main approaches that have been used.

In the previous Special Protection Waters Implementation Handbook (1992), a strictly chemical interpretation defined degradation as "any adverse measurable change in the long-term average in-stream concentration of a chemical parameter of concern, caused by the discharge." This definition depended upon the interpretation of the term "measurable," and over the years, DEP's interpretation evolved from one based on the sensitivity of analytical methods to one based on evaluation of the statistical significance of the projected change. Both interpretations require a very accurate chemical characterization of the long-term average quality of the receiving stream as the baseline for evaluation of the measurable change.

Another version of a non-degradation test is called the "de minimis" test. This test identifies a percentage of the receiving stream's assimilative capacity that may be consumed before a pollutant load in the discharge is considered to be degrading. Thus, if each of the pollutants of concern uses less than the established "de minimis" percentage of assimilative capacity, as predicated by the water quality criteria, then the discharge meets the test and does not have to undergo further anti-degradation review procedures. The "de-minimis" concept was used by US EPA Region VIII in its 1993 anti-degradation manual, wherein a level of 5% is suggested as a "de minimis" guideline, rather than criteria, subject to other qualifications

Other criteria, such as ratio of stream flow to discharge flow (dilution ratio), and duration of discharge, have also been used by states to serve as additional non-degradation test criteria. Some states have evaluated these criteria quantitatively (for example, determining that a dilution ratio of >100/1 is sufficient to assimilate an

effluent without impact), while others apply such factors in a more subjective manner, on a case by case basis, eventually arriving at a "finding" of degradation or non-degradation.

The EPA Region VIII Anti-degradation Manual supports this "finding" type process, but recommends that guidelines be established, and that all relevant information (dilution ratio, duration, degree of change in instream quality, nature of pollutants – conservative vs. non-conservative vs. persistent, percentage of assimilative capacity taken, degree of confidence in evaluation procedures, etc) be considered. This type of evaluation is applied at the Tier 2 (HQ) level as a tool to screen out minor discharges which would pass anti-degradation reviews.

Section 4.6 of EPA's Water Quality Standards Handbook (1994) provides that no new or increased discharges are allowed in Tier III waters (Outstanding National Resource Waters or ONRW) except for limited activities that result in temporary and short-term changes in the water quality of the ONRW. EPA views temporary in terms of weeks and months, not years. During the time of the "temporary degradation," according to this guidance, all practical means of minimizing such degradation shall be implemented.

After having considered a means of practical application of these possible approaches, the Department will use the following process to determine if a discharge is non-degrading.

3. DEP's Test for Non-Degradation of Water Quality

This evaluation is used to determine if a new or expanded discharge to a High Quality or Exceptional Value water will cause degradation or demonstrates a high potential to cause degradation. The Department uses a two-part test that evaluates all facets of the discharge's potential effect on the receiving stream to make this determination. The first part of this test evaluates each pollutant of concern that is contained in the discharge using statistical and water quality modeling procedures for appropriate parameters. The second part of this test evaluates other considerations, such as the nature of the pollutants, treatment reliability, discharge duration, and physical/location concerns. Together, these two evaluations provide a comprehensive basis for the Department's determination of whether or not the proposed discharge will maintain the quality of the receiving water. The following describes both parts of this evaluation in detail.

A. Part 1 Evaluation

This section describes the water quality modeling component of this evaluation. There are two conditions that must be satisfied: 1) existing quality must be maintained, and 2) instream water quality criteria must be met at the critical design condition. Two separate analysis must be conducted to make this determination. Both are discussed in detail in this section.

The assessment of whether or not a point source discharge together with any non-point sources will cause an adverse measurable change in water quality is directly related to the technical and scientific ability to discern whether a change in stream quality will take place as a result of the discharge. The natural quality of surface waters is constantly changing and the use of long-term data assures that these variations are accounted for in the anti-degradation permit review process. A change is adverse if it results in lowering water quality. A change is measurable if the instream concentration of a pollutant exceeds the confidence limit around the average (mean) value in the data set is used to determine the instream water quality objective. The confidence limit and the statistical analysis used for this evaluation are explained below.

The estimated mean (average) value is determined by summing available data on concentration values and dividing by the number of samples in the data set. This mean value is used to define the instream concentration of a pollutant above a proposed discharge. The minimum date set that can be used for this purpose is 24 samples collected over a 12 month period (see Chapter 5). A confidence limit around the mean value specifies an upper and lower boundary, which represents with some degree of certainty, that the true mean value lies within. The Department uses the 95% confidence limit around the mean to

establish these boundaries. This band represents that we are 95% sure that the true mean value of the data set lies between these two values. The upper bound of the 95% confidence limit around the mean is the instream water quality objective for defining the total allowable concentration of a pollutant instream after adding in the discharge.

The next step in the process is to determine which data are appropriate (protective) for use in the statistical analysis. Most evaluations of point source discharges are completed using a steady state model at a specified design stream flow condition. The Department uses the harmonic mean flow (Q_{HM}) condition to evaluate water quality characteristics representative of long-term average conditions over the range of natural flow variations. Q_{HM} is a statistically derived mean flow. Q_{HM} is available from the USGS which calculates Q_{HM} data for all of its stream gage stations. These values are posted on the agency Website (http://wwwpa.er.usgs.gov/flowstats/).

The Department has performed these statistical analyses for key parameters at numerous stations throughout the Commonwealth. This process sets default water quality objectives for use as existing quality for anti-degradation waters throughout the Commonwealth. The default water quality objectives are listed in Table 3 at the end of this Section. Alternatively, a project sponsor may collect site-specific data to develop the instream water quality objectives for a specific stream for use in place of the default values, but the Department must approve the sampling procedure and protocol to perform this analysis.

TABLE 3
DEFAULT WATER QUALITY OBJECTIVES FOR HQ AND EV WATERS

SUBSTANCE	UPSTREAM CONCENTRATION (mean of data set)	WATER QUALITY OBJECTIVE (upper bound on 95% conf. limit of mean)
Nitrate/Nitrite Nitrogen	0.71 mg/L	0.79 mg/L
Phosphorus	0.027 mg/L	0.030 mg/L
Sulfate	13 mg/L	14 mg/L
Suspended Solids	10 mg/L	12 mg/L
Total Dissolved Solids	93 mg/L	144 mg/L

Discharge Evaluation: As part of an NPDES permit application the discharger must provide the Department a list of parameters that are known or suspected to be present in the discharge. As part of this list the discharger must also provide the expected influent and effluent concentrations of these pollutants, based on the technology they propose to install. These effluent values will be evaluated through DEP water quality analysis models to determine if they would degrade the stream. The water quality analysis modeling will be carried out at the Q_{HM} stream flow condition. All pollutants will be evaluated using either the water quality objectives listed in Table 3 or site-specific data as the criteria that must be met instream. The discharge flow used for these evaluations is the treatment facility's permitted discharge flow or the maximum hydraulic design capacity of the plant.

The following simple mass balance equation shows how the upper bound of the 95 percent confidence interval is used in the analysis. This equation is given to illustrate how the data used in the statistical analysis are applied in the water quality modeling process.

$$(Q_{discharge} \times C_{discharge}) + (Q_{upstream} \times C_{upstream}) = (Q_{total} \times C_{total})$$

Variable	Definition
$Q_{discharge}$	Discharge Flow (permitted discharge flow or the maximum hydraulic design capacity of the treatment system)
$C_{discharge}$	Discharge Concentration (This is the factor solved for in the equation)
$Q_{upstream}$	Instream flow above the point of discharge (appropriate design stream flow condition, ie Q_{HM})
$C_{upstream}$	Instream Concentration above the point of discharge (mean concentration value of the data set)
Q_{total}	Combined flow of the discharge and the stream below the point of discharge. (Sum of the discharge flow and Upstream flow)
C_{total}	Concentration in the stream below the point of discharge (the water quality objective, which is the concentration represented by the upper bound of the 95 percent confidence of the data set)

The value obtained when this equation is solved for discharge concentration is used to determine if the technology value that the proposed treatment system is expected to achieve will meet the existing quality of the stream.

Evaluation of Water Quality Criteria: For NPDES permitting of sewage and industrial wastewaters, the Department uses the Q_{HM} for carcinogens and the Q_{7-10} flow condition to evaluate the assimilative capacity of a stream for pollutants which could affect aquatic life and for threshold human health pollutants. The Q_{7-10} flow condition represents low-flow conditions which could be expected to occur once in 10 years. Use of these flows represent a 99 percent protection level, as specified in Chapter 96 (relating to Implementation of Water Quality Standards).

Persons proposing to discharge to HQ and EV Waters must also demonstrate that the discharge they are proposing is non-degrading from a biological perspective, as well as a chemical one. To this end, an applicant must, as part of a complete application, conduct a biological assessment, pursuant to Department protocols, at the point of the proposed new or expanded discharge, prior to commencement of the new or expanded discharge. In addition, follow up biological assessments will be required by permit condition. If degradation is detected, the discharger will be required to initiate and implement corrective actions.

B. Part 2 Evaluation

The part 2 evaluation is a more subjective evaluation that is designed to account for factors other than the existing concentrations of pollutants in the stream. It is a sliding scale evaluation that considers the following factors:

1) Nature of Pollutants,
2) Dilution Ratio/Assimilative Capacity
3) Discharge Duration,
4) Treatment Reliability/Technology,
5) Siting and Other Environmental Considerations.
6) Beneficial Impact of Discharge

These topics are addressed below.

Nature of Pollutants: There will be no discharge of non-naturally occurring substances. In addition, no measurable flow or heat or other pollutants may be added from the new or expanded discharge which may adversely impact the existing quality, or the chemical, physical, or biological integrity of the surface

water. The list of naturally occurring substances that may be discharged, under strict permit conditions, to a HQ or EV water is shown in Table 4.

TABLE 4
NATURALLY OCCURRING SUBSTANCES

Alkalinity	Fecal Coliforms	Nickel	Selenium
Aluminum	Fluoride	Nitrate/Nitrite Nitrogen	Specific Conductivity
Ammonia Nitrogen	Hardness	Osmotic Pressure	Sulfate
5-day CBOD	Iron	pH	Suspended Solids
Chloride	Lead	Phenols	Total Dissolved Solids
Copper	Manganese,	Phosphorus	Zinc
Dissolved Oxygen			

If any pollutant that is not listed in Table 4 is introduced to the wastewater through the manufacturing or treatment process, it must be removed before discharge. The demonstration of non-degradation should document adequate treatment and control reliability/redundancy and contingency procedures. These provisions should be incorporated into the permit issued for such a proposal. The greater the degree of control, the more likely a discharge would be non-degrading. In the absence of an adequate control and reliability demonstration by the project sponsor, the potential for impact will disqualify the discharge as non-degrading

Dilution Ratio/Assimilative Capacity: The dilution ratio is a measure of the surface water flow directly above a pollutant source divided by the pollutant source flow. The dilution ratio is taken into account when performing the mass balance model calculations that are used by the Department. The larger the dilution ratio, the greater is the available assimilative capacity and the likelihood that a discharge will be non-degrading.

Discharge Duration: For this evaluation, duration defines the length of time that the discharge would exist, as opposed to whether or not the discharge would be continuous or sporadic based on the type of treatment system. This draws a distinction between a temporary discharge (earth disturbance) vs. planned long-term discharges (sewage plant, industrial discharge). The shorter the duration of the discharge, the more likely it will be considered non-degrading. Long-term discharges will not be precluded solely because of the duration.

Treatment Reliability/Proposed Technology: This is an evaluation of the treatment system's ability to operate reliably at a maximum efficiency with little chance of failure. The project sponsor must demonstrate, to the Department's satisfaction, the reliability and safeguards built into the process. The project sponsor must demonstrate that adequate steps have been taken to identify and minimize risks associated with the project. The more stable and reliable the treatment system, the more likely that the discharge would be considered non-degrading.

Siting and Other Environmental Considerations: This evaluation is based on the physical location of the treatment system and its surroundings. The evaluation focuses on a worst-case event, such as a plant upset, chemical spill, accessibility of emergency response staff to the site, or proximity to other significant resources. These considerations will be included in the evaluation of whether a discharge is non-degrading or degrading.

Beneficial Impact of Discharge: This evaluation considers the benefits that may be associated with a discharge. There may be instances where a discharge from a treatment system provides an environmental gain over the current condition of not having a treatment system. An example is replacing a community's failing on-lot septic systems with sewers and a wastewater treatment plant. It is the responsibility of the project sponsor to document the beneficial impacts of the proposed project.

CHAPTER 9

ANTI-DEGRADATION BEST AVAILABLE COMBINATION OF TECHNOLOGIES (ABACT)

1. Introduction

Section 93.4c.(b)(1)(i)(A) of the anti-degradation regulations, pertaining to point source discharge proposals on HQ or EV waters, contains the following requirement:

> ***"...If a non-discharge alternative is not environmentally sound and cost-effective, a new, additional or increased discharge shall use the best available combination of cost-effective treatment, land disposal, pollution prevention and wastewater reuse technologies."***

This regulatory language provides a basis for anti-degradation best available combination of technologies (ABACT) for point source discharges, applied by the Department as one of the "tests" of acceptability for proposed discharges to HQ or EV waters. The concept ensures that any proposed point source discharge to HQ or EV waters, allowable under all other conditions established in the regulation, meets stringent minimum technology based standards of quality reflective of the best available combination of practices like land disposal, pollution prevention, wastewater reuse and others. It also represents an appropriate level of treatment acceptable in HQ waters where Social or Economic justification has been demonstrated and should be used as a goal to minimize degradation in that context.

As evidenced in the citation above, the ABACT requirement for discharges to HQ or EV waters is applied in conjunction with the anti-degradation requirement to utilize cost-effective and environmentally sound non-discharge alternatives (land disposal, wastewater recycle, wastewater minimization, etc.) when they are available. Other sections of this implementation guidance explain how the Department evaluates the feasibility (cost-effectiveness and environmental soundness) of non-discharge alternatives, and at what point in the generalized anti-degradation review process these determinations are made. These sections also explain that, even if a total non-discharge alternative is not feasible, any partial non-discharge alternative (combination of non-discharge and discharge wastewater management) which is feasible must be utilized. If there are no nondischarge alternatives which are feasible, or if there is only a partial nondischarge alternative which is feasible, then the discharge alternative, or the discharge portion of the partial nondischarge alternative, may be further evaluated.

2. Discussion

The first step in the evaluation of discharge alternatives is to ensure that the discharge will meet the standards of technology established as ABACT for the type of discharge under consideration. This section provides a discussion of the general standards and guidelines for ABACT requirements for such proposals.

Because the goal of the Department's anti-degradation program is to protect and preserve existing water uses and the quality of Pennsylvania's HQ and EV waters, the technologies required by ABACT reflect levels of reliability and effectiveness which are better than those in common use. Accordingly, the degree of treatment required under ABACT will generally be higher than regulatory minimums established in state and federal regulations for dischargers to waters which are not HQ or EV waters.

Examples of typical standards are the secondary treatment standards for sewage discharges established in 40 CFR Part 133, the NPDES federal effluent limit guidelines (ELGs) for industrial waste discharges established in 40 CFR Parts 400 through 471, or the standards for surface mining discharges in 25 PA Code Section 87.102. These standards were developed to meet less stringent criteria for cost and quality, because these standards have universal applicability. They are not, therefore, generally appropriate as ABACT standards for HQ or EV waters, and should not be confused with ABACT. Nevertheless, these

effluent quantity standards are useful "measuring sticks" for determining whether proposed discharges meet the higher levels of technology of ABACT.

ABACT is specific to discharge type and wastewater characteristics. Subsequent program specific Appendices to this guidance present ABACT, as well as unique parameters and considerations to be evaluated for the other anti-degradation requirements, for each of the major discharge types (sewage, industrial wastes, stormwater, mining, oil and gas, and municipal/residual wastes). In establishing program specific ABACT, or for cases which do not clearly fall into one of the above categories, the Department applies the following general principles:

- ABACT must generally provide a higher degree of water quality protection than that provided by water quality based or technology based effluent limits alone.

- ABACT must have a high degree of reliability and demonstrated effectiveness. Experimental or unproven methods may not be appropriate for ABACT.

- ABACT should account for pertinent pollutants and water quality parameters associated with the discharge type under consideration.

- ABACT may be established as a list of required unit treatment processes and management practices, or as effluent quality standards, or as a combination of both.

- ABACT should be flexible enough to account for case-specific or site-specific unique characteristics.

- ABACT should be cost-effective. The technology required should not be unaffordable to rate payers or cost prohibitive to the financial capability of the proposed activity.

Given these considerations, it is evident that the ABACT determinations must be made on a case-by-case basis, subject to the program specific guidelines included as appendices to this guidance document. They will vary in flexibility depending on the program but in all cases, the general principles stated above must be met and all other anti-degradation requirements must be satisfied.

As illustrated in the flowcharts depicting the generalized anti-degradation process (Section 3 of this Chapter, Figures 1 and 2) meeting ABACT may not justify approval of a request to discharge to HQ or EV waters. Additional anti-degradation tests must also be applied and met. In EV waters, a discharge at ABACT quality must meet the test for non-degradation of water quality. In HQ waters, a discharge at ABACT quality must meet either the test for non-degradation of water quality or have demonstrated social or economic justification for the degradation that will occur.

Appendices B-F contain the program specific guidelines and standards by which the Department will determine ABACT for specific proposals, specifically:

Appendix B – Wastewater Discharge
Appendix C – Waste Management
Appendix D – Mining
Appendix E – Oil & Gas
Appendix F – Storm Water

CHAPTER 10

SOCIAL OR ECONOMIC JUSTIFICATION (SEJ)

1. Background

The anti-degradation requirements relating to Social or Economic Justification (SEJ) are very important components of water quality protection for High Quality waters (HQ). For proposed discharges to HQ waterbodies, if it has been determined that there are no cost-effective and environmentally sound nondischarge alternatives, the discharge must either meet a test of non-degradation, or, when it cannot meet that test, demonstrate that the proposed degradation is socially or economically justified. In all cases, a discharge shall use the best available combination of cost-effective treatment, land disposal, pollution prevention and wastewater reuse technologies (ABACT).

The regulatory requirements are established in § 93.4c.(b)(1)(i)(B) which states:

> ***"(B) A person proposing a new, additional or increased discharge to High Quality or Exceptional Value Waters, who has demonstrated that no environmentally sound and cost-effective nondischarge alternative exists under clause (A), shall demonstrate that the discharge will maintain and protect the existing quality of receiving surface waters, except as provided in subparagraph (iii)."***

and in subparagraph § 93.4c(b)(1)(iii) which states:

> ***" (iii) Social or economic justification (SEJ) in High Quality Waters. The Department may allow a reduction of water quality in a High Quality Water if it finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the Commonwealth's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located."***

Finally, the regulations establish some special provisions relating to SEJ for sewage facilities proposed in High Quality Waters, in § 93.4c(c)(1) and (2):

> ***"(1) SEJ approval in sewage facilities planning and approval in High Quality Waters. A proponent of a new, additional, or increased sewage discharge in High Quality Waters shall include an SEJ impact analysis as part of the proposed revision or update to the official municipal sewage facilities plan under Chapter 71 (relating to administration of sewage facilities planning program). The Department will make a determination regarding the consistency of the SEJ impact analysis with subsection (b)(1)(iii). The determination will constitute the subsection (b)(1)(iii) analysis at the National Pollutant Discharge Elimination System (NPDES) permit review stage under Chapter 92 (relating to National Pollutant Discharge Elimination System), unless there is a material change in the project or law between sewage facilities planning and NPDES permitting, in which case the proponent shall recommence sewage facilities planning and perform a new social or economic justification impact analysis.***
>
> ***(2) SEJ for sewage facilities in High Quality Waters correcting existing public health or pollution hazards. A sewage facility, for which no environmentally sound and cost-effective nondischarge alternative is available under subsection (b)(1)(i)(A), proposed to discharge into High Quality Waters, which is designed for the purpose of correcting existing public health or pollution hazards documented by the Department, and approved as part of***

an official plan or official plan revision under § 71.32 (relating to Department responsibility to review and act upon official plans), satisfies the SEJ requirements in subsection (b)(1)(iii).”

Important information and explanation is also included in the preamble to the Department’s regulations, as published in the *Pennsylvania Bulletin* on July 17, 1999 (29 Pa.B.3720). The preamble explains that, by tracking the language of the federal anti-degradation regulations (40 CFR § 131.12) which contain the phrase “important economic or social development”, and in light of the interpretation which has been given to that phrase in federal guidance and policy, the SEJ analysis should be a “balancing” type evaluation. In such an evaluation, the asserted beneficial social or economic development must be viewed in light of, and weighed against, the degree of water quality degradation that the discharge and the proposed activity are projected to cause.

Historically, Department guidance for the evaluation and review of SEJ has consisted of a checklist of economic and social factors to be considered on a case-by-case basis. Guidance used in other states is similar to the Department’s in that it generally consists of various social and economic factors which are to be taken into account, subjectively, on a case-specific basis. EPA’s “Interim Economic Guidance for Water Quality Standards, 1995,” Appendix M to the Water Quality Standards Handbook, also reinforces this type of approach, as evidenced by these excerpts from the Anti-degradation chapter: “There are no economic ratios per se that determine whether a development would be considered important” and “While there are no explicit criteria, it is recommended that changes in the socioeconomic indicators be considered.”

Given this brief background, the following chapter will outline the process, including public participation, for the evaluation of SEJ demonstrations in Pennsylvania.

2. SEJ Evaluation Process Overview

Figures 1 and 2 in Chapter 6 illustrate the planning/permitting process used by the Department to review applications for discharges to High Quality and Exceptional Value waters. The importance of public participation in this process (including SEJ review) is recognized by inclusion of early and frequent opportunities for public review and comment. This aspect of the process is discussed in Chapter 12. It should also be noted that the evaluation of the siting of the project, other nondischarge alternatives and, if necessary, the evaluation of non-degrading discharge alternatives (see SEJ Forms) occurs early in the process and may obviate the need for submission of an SEJ by finding a viable alternative to a degrading discharge to a High Quality water. These factors are discussed briefly in the following procedure for alternatives and SEJ review.

A. Factors to consider in determining the need for and subsequent development of SEJ

Nondischarge alternatives: Cost-effective and environmentally sound nondischarge alternatives must first be considered for a proposed discharge to High Quality waters. Such alternatives, if implemented, can contribute significantly to the protection of the receiving High Quality water by reducing or eliminating the point source component of the project’s impact. These alternatives are discussed in detail in Chapter 7. One important issue that must be addressed by the project sponsor early in the process is the siting of the proposed project.

Project Siting is an important component of non-discharge alternatives analysis. It is critical that the site chosen for the project is appropriate. To this end, the following questions must be answered by the project sponsor to ensure that the High Quality water is the only suitable location for the proposed project or activity.

- What are the requirements for locating this project/activity?

  Infrastructure

  Utilities

Transportation
Raw Materials
Work Force
Other

- Is this watershed or specific stream segment the only location that offers these requirements?
- Were other sites considered?

Non-degrading discharge alternatives: If no cost-effective and environmentally sound nondischarge alternatives exist, the project sponsor must consider discharge treatment processes that will "…maintain and protect the existing quality of receiving surface waters…" including the use of "… the best available combination of cost-effective treatment, land disposal, pollution prevention and wastewater reuse technologies." (ABACT). This aspect of project review is discussed in detail in Chapter 9.

Definition of affected area for social or economic impact: If, after consideration of the above factors, it is concluded that a degrading discharge to a High Quality water is the only option for the proposed project/activity, the Department "…*may allow a reduction of water quality*" if it finds "…*that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located*." This language suggests the Department define a geographic area in which it will focus its SEJ evaluation. Since most discharges to High Quality waters involve the construction of housing, small businesses or retail operations, it is reasonable to define "area" using the distance most people are willing to travel to work or to shop as the radius of a circle of influence for the project. However, since most information sources readily available to the Department are organized by political subdivisions (county or local), a reasonable approach to this circle of influence is to define the area as the county in which the High Quality waters are located plus all contiguous counties. This approach will accommodate projects located near the boundaries with neighboring counties and becomes the area within which all pertinent social or economic justification data is gathered.

If an applicant seeks a social or economic justification and submits a request for a degrading discharge on behalf of important development projected to occur in the area where the High Quality waters are located, a balancing type of evaluation is conducted by the Department. Criteria described later in this chapter are used to assess the relative weight of the social or economic benefits of the proposal against the degree of degradation it is expected to cause. The burden of proof is on the project/activity sponsor to document and demonstrate that the benefits of the proposal clearly outweigh the environmental impacts of lower water quality.

If a degrading discharge to High Quality waters is ultimately approved, the permit will be issued to ensure that the amount of degradation is minimized and specifically limited through enforceable permit conditions and the implementation of best available technologies and management practices. The new or expanded discharge will be required to use the best available combination of cost-effective treatment, land disposal, pollution prevention and wastewater reuse technologies (ABACT).

Although no specific format is prescribed, the listed factors must be considered in the analysis. The following sections describe the key factors to be considered in each facet of this balancing evaluation. The attached checklist and the SEJ worksheet is included as a suggested way to employ these factors.

B. Factors to consider in the balancing of social or economic development against potential water quality impact

The next step is to weigh the social or economic benefit of the action against the water quality degradation that may result. As stated above, under the regulation, the Department decides when proposed economic or social development is important enough to justify allowing lower water quality in

High Quality waters. The regulation provides for balancing the environmental impact against the social or economic benefits of a proposed discharge. It is intended to allow some lowering of water quality in High Quality waters only under those circumstances where the economic or social need for a project clearly outweighs the benefit of maintaining the existing water quality, and both cannot be achieved. Under no circumstances can water quality be degraded below the base water quality standards established for uses other than HQ or EV set forth in Chapter 93.

Environmental factors

The following is a list of factors that must be considered, at a minimum, in reviewing an SEJ:

- Water uses associated with the waterbody including; maintenance and/or propagation of flora and fauna, water supply (public, industrial, livestock, wildlife, irrigation), boating, fishing, swimming, esthetics.
- Wetlands
- Flood plain
- Public health and safety

This detailed review considers the effects on water quality from wastewater discharges, stormwater (during construction and post-construction), water withdrawal, non-point sources, air pollution sources, solid waste sources, and any other potential effects of development associated with the proposal.

In addition to the items listed above, the SEJ should discuss secondary issues, such as:

- Reliability of the treatment process/facility
- Nature of the proposed activity
- Materials stored on site
- Duration of discharge
- Compliance record of the applicant
- Proposed mitigation
- Beneficial impacts
- BMPs employed

Important social factors

- Provision of public or social services
- Correction of a public health or safety problem
- Consistency with regional, county or local land use, zoning, and/or recreational plans
- Enhancement of the quality of life in the area
- Protection of cultural resources
- Effects upon recreational uses

Important economic factors

- Estimated impact on employment opportunities
  - Relationship to current unemployment rate in the impacted area, as compared to national, state, or local average
  - Longevity of jobs
  - Type and quality of jobs

- Estimated impact on median household income
  - Relationship to current economic status of community, as indicated by % of households below state median or % below the poverty line
- Estimated impact on state and local tax revenues
- Estimated impact on property values
- Estimated impact on development potential, secondary jobs
- Estimated impact on public costs or user charges to maintain, improve or provide infrastructure or municipal services to support the proposed development or anticipated secondary impacts
- Estimated impact on recreational or tourism economies, especially those dependent upon water quality and water uses

C. Review and decision responsibility for SEJ determinations

Chief responsibility for review of SEJ submissions rests with the DEP Regional Office Act 537 planning staff (for sewage discharge) and NPDES permitting staff (for industrial discharges) in the Water Management program. Coordination with other program areas such as solid waste, oil and gas management and environmental clean-up that fall under the jurisdiction of the Regional Director is affected as needed. For projects with no impacts outside the county in which the project is located, the Regional Water Quality Manager has final decision authority based upon input from water management staff and staff in other programs pertinent to the SEJ under review.

Because the Bureau of Mining and Reclamation operates a separate set of Field Offices, analysis of SEJs submitted for mining discharges is conducted by district mining office staff. They make recommendations to the District Mining Manager who is responsible for making the final decision on mining projects, in consultation with the Regional Water Quality Manager.

For projects affecting contiguous counties within one DEP Region, the Regional Director makes the final decision after considering the recommendations of the Regional Water Quality Manager, the District Mining Manager and the Chief, Division of Water Quality Assessment and Standards in the Bureau of Water Supply and Wastewater Management. For projects affecting counties in two or more DEP regions, authority rests with the Regional Director of the region in which the discharge is located after consideration of recommendations received from the above listed staff. Staff in the Bureau of Water Supply and Wastewater Management are available for consultation on all SEJs, as needed, and all SEJ determinations must receive a consistency review and concurrence by the Chief of the Division of Water Quality Assessment and Standards before the Department's decision can be made public. The Division Chief will maintain a file of all SEJs for historical purposes. This lends statewide consistency to SEJ decision-making and helps ensure compliance with policy or procedure relating to this aspect of the anti-degradation program.

Public notice that SEJ has been demonstrated is published with the draft NPDES permit notification.

TABLE 5
SOCIAL OR ECONOMIC JUSTIFICATION
WORKSHEET

Environmental Considerations	*Degree of Impact* **Low → High**
1. Sensitivity of Water Use	
Presence of Threatened and Endangered Species	
Public Water Supply Use	
Water Contact Sports	
2. Nature of Pollutants	
Synthetic	
Bioaccumulative	
Naturally Occurring	
3. Proposed degree of Change in Water Quality	
Available Dilution	
Amount of Assimilative Capacity Used	
4. Proximity to Wetlands or Floodplain	
Presence of Regular or EV Wetlands	
Location with Respect to Stream Channel	
5. Duration of Discharge	
Permanent	
Continuous	
Short-Term	
6. Reliability of Treatment Technology	
High Tech/Experimental	
Energy Intensive	
Maintenance Intensive	
Natural System	
7. Compliance Record	
Current Violations	
Historical Violations	
Uncooperative Attitude	
8. Secondary Beneficial Impacts	
Groundwater Recharge	
Post-Construction Storm Water	
Hydromodifications	
Thermal Modifications	
Construction on Previously Undisturbed Lands	
Discharge to Previously Undegraded Waters	
OVERALL RATING	

SOCIAL OR ECONOMIC JUSTIFICATION WORKSHEET

Social Considerations	*Degree of Benefit* **Low ▶ High**

1. Public Need/Social Service

- Health/Nursing Care
- Police/Fire Protection
- Infrastructure Need

2. Correction of Public Health/Safety Problem

- Food/Drinking Water
- Disease Vectors
- Air Quality
- Industrial Hygiene
- Occupational Health/Safety

3. Consistency with Local Zoning and Planning

- Sewage Facility Planning
- Zoning Requirements
- Land Use Plans
- Patterns of Growth/Development

4. Quality of Life

- Educational
- Cultural
- Recreational

Economic Considerations

5. Employment

- Number and Type of Jobs Relative to Local Unemployment Rate
- Mean Household Income

Economic Considerations	*Degree of Benefit* **Low ▶ High**
6. Tax Revenues	
Tax Revenue Income Relative to Increased Demand for Services	
Change in Property Value or Tax Status	
7. Development Potential	
Potential to Spur Increased Growth Resulting in more NPS Runoff and Demand for Infrastructure	
8. Recreation/Tourism	
Active or Passive Water Based Recreational Opportunities	
Water-Based Tourist Attractions	
OVERALL RATING	

CHAPTER 11

NONPOINT SOURCE CONTROLS

1. Background

The regulation at 25 Pa Code §93.4c(b)(2) provides that:

> ***"The Department will assure that cost-effective and reasonable best management practices for nonpoint source control are achieved."***

Nonpoint source pollution is a pervasive problem, affecting surface and groundwater quality in both urban and rural areas. It is diffuse and is caused primarily when rain water and snowmelt flow over (and through) the ground that has been disturbed by some sort of land use, such as farming, logging operations, urban development, solid waste disposal, and other similar activities. This "runoff," if not properly controlled, can carry pollutants from these sites and deposit them in nearby surface waters and/or the groundwater. Nonpoint source pollution can come from sediments deposited in streams, lakes, or coastal waters as well as from atmospheric (dry and wet) deposition and leaking underground storage tanks or septic systems. In short, nonpoint source pollution comes from a wide variety of sources, most of which are directly related to uses of the land.

The pollutants that arise from nonpoint sources are as varied and numerous as the sources themselves, and cause many of the same water quality problems as point sources. Runoff from streets, parking lots, lawns, etc., can contain heavy metals, nutrients, sediment, toxics, and bacteria. Agricultural activities can contribute runoff laden with sediment, pesticides, herbicides, nutrients, and bacteria. Leachate from landfills, septic tanks, and underground storage tanks may contaminate ground and surface waters with toxic pollutants, nutrients, and bacteria. Airborne pollutants from automobiles and industries contribute to acid precipitation that may have detrimental effects on both terrestrial and aquatic habitats, especially in sensitive areas.

Nonpoint sources also result from natural processes. However, man's activities often cause an increase in the quantity and rate of pollutant runoff. These problems often occur because of a lack of understanding of the relationship between the water resource and associated human activities within the watershed.

Nonpoint source pollution can have significant impacts on the economic and recreational assets of a community. These impacts can be expressed in terms of lower property values, loss of fisheries, loss of wildlife habitat, loss of flood control potential, closed swimming beaches, expensive treatment of drinking water--in short, loss of valuable natural resources. To minimize the impact of nonpoint sources, Pennsylvania requires the implementation of erosion and sediment control and stormwater management best management practices (BMPs) under both the Clean Streams Law and the Stormwater Management Act.

Some activities that have traditionally been categorized as non-point sources have, in recent years, been incorporated into the NPDES program. This includes construction activities disturbing greater than five acres, concentrated animal feeding operation (CAFOs), and other stormwater induced discharges. The Department has continued to control these activities using the BMP approach described below in the context of these permits.

2. Discussion

General Considerations

Certain activities in HQ or EV Waters which are not regulated as point sources under the National Pollutant Discharge Elimination system (NPDES) permitting program meet requirements set forth in Department regulations.

Chapter 102 (Erosion and Sediment Control) requires that persons conducting earth disturbance activities must develop, implement, and maintain Best Management Practices (BMPs) in order to minimize the potential for accelerated erosion and sedimentation and protect, maintain, reclaim, and restore water quality and existing and designated uses of waters of the Commonwealth. In particular, under Seciton 102.4(b), activities other than agricultural activities, regardless of size, which may result in a discharge to a HQ or EV water shall use Special Protection BMPs to maintain and protect the water from degradation. Persons planning or conducting such activities should consider minimizing the amount of disturbance, maintenance (or installation) of riparian buffer strips, and other water quality protective measures. Special Protection BMPs which are required, unless a suitable alternative is proposed and approved, include, but are not limited to: (1) special sediment basin requirements, (2) lining of channels, collectors, and diversions with vegetation, rock, geotextile, or other nonerosive materials, and (3) immediate stabiliztion upon completion or temporary cessation of an earth disturbance activity. Persons proposing earth disturbance activity which may discharge into a HQ or EV Water may propose alternative BMPs other than those specified in Section 102.4(b) on a case by case basis as long as the BMPs will maintain and protect existing water quality and existing and designated uses. These alternative BMPs can be utilized if approved by the Department or a delegated county conservation district.

All agricultural operations in HQ or EV watersheds must be conducted in compliance with the requirements of the Pennsylvania Clean Streams Law, the Nutrient Management Act, the Stormwater Management Act and DEP rules and regulations listed in Chapters 102 relating to erosion and sediment control, 83 relating to nutient management, 91 in sections relating to land application of manure, 92 in sections relating to requirements for concentrated animal feeding operations, and 105 relating to dam safety and waterway management. Information on the development or updating of conservation plans to meet the requirements of Chapters 83 and 102 can be obtained from county conservation districts as well as local Natural Resource Conservation Service offices. Compliance assistance and information on regulations can be obtained from the DEP regional offices.

Program Specific Considerations

In addition to the General Considerations listed above, the following references provide additional, program specific information relating to erosion control practices for various activities frequently pursued in Pennsylvania. These practices, or acceptable substitues, should be employed in all HQ and EV watersheds. It should be recognized that some of the activities for which program specific guidance has been developed may constitute point sources for which a permit is required under the NPDES program. These activities may be subject to the requirements and controls of that program in addition to, or in lieu of, direction set forth in the following program guidances. The listing of and reference to the program guidances set forth below does not excuse a person from any requirements specified in applicable federal or state laws or regulations.

General Construction/Land Development
Erosion and Sediment Pollution Control Program Manual, DEP Document No. 363-2134-008; March 2000.

Timber Harvesting
Controlling Erosion and Sediment from Timber Harvesting Operations, DEP Document No. 3630-BK-DEP2322; April 1999.

Resource Extraction
Engineering Manual for Coal Mining Operations, DEP Document No. 563-0300-101; March 1998.

Oil and Gas Operator's Manual, DEP Document No. 550-0300-001 (draft); Nov 2000.

Waste Management
Engineering Field Manual for Conservation Practices, U.S. Department of Agriculture, Natural Resources Conservation Service, 1984 (w/amendments).

CHAPTER 12

PUBLIC PARTICIPATION

1. Background

The anti-degradation regulation offers opportunities for public participation at several pivotal times in the process. The purpose of this chapter is to provide a single reference for persons who are interested in remaining informed of changes in the existing and designated uses of waters of the Commonwealth and who wish to know the appropriate times in the process at which to provide data and comments to the Department. The public comment opportunities are also noted in the individual chapters of this guidance that address particular phases of assessment, existing use determinations, the permitting process, and designation of uses by the Environmental Quality Board.

The anti-degradation regulation provides the following:

25 Pa Code § 93.4c. Implementation of anti-degradation requirements.

"(a)(1) (i)Existing use protection shall be provided when the Department's evaluation of information (including data gathered at the Department's own initiative, data contained in a petition to change a designated use submitted to the EQB under § 93.4d(a) (relating to processing of petitions, evaluations and assessments to change a designated use), or data considered in the context of a Department permit or approval action) indicates that a surface water attains or has attained an existing use.

(ii) The Department will inform persons who apply for a Department permit or approval which could impact a surface water, during the permit or approval application or review process, of the results of the evaluation of information undertaken under subparagraph (i).

(iii) Interested persons may provide the Department with additional information during the permit or approval application of review process regarding existing use protection for the surface water.

-and-

(b)(1)(ii) Public Participation requirements for discharges to High Quality or Exceptional Value Waters. The following requirements apply to discharges to High Quality or Exceptional Value Waters, as applicable:

(A) The Department will hold a public hearing on a proposed new, additional, or increased discharge to Exceptional Value Waters when requested by an interested person on or before the termination of the public comment period on the discharge.

(B) For new or increased point source discharges, in addition to the public participation requirements of §§ 92.61, 92.63 and 92.65 (relating to public notice of permit application and public hearing; public access to information; and notice to other government agencies), the applicant shall identify the anti-degradation classification of the receiving water in the notice of complete application in § 92.61(a).

(c)(3) Public participation requirements for official sewage facilities plans or revisions to official plans in High Quality or Exceptional Value Waters. A proponent of a sewage facility in High Quality or Exceptional Value Waters seeking approval of an officla plan or revision shall comply with the public participation requirements in § 71.53(d)(6) (relating to municipal administration of new land development planning requirements for revisions).

25 Pa Code § 93.4d. Processing of petitions, evaluations and assessments to change a designated use.

(a) Public notice of receipt of evaluation, or assessment of waters, for High Quality or Exceptional Value Waters redesignation. The Department will publish in the Pennsylvania Bulletin and in a

local newspaper of general circulation notice of receipt of a complete evaluation which has been accepted by the EQB recommending a High Quality or Exceptional Value Waters redesignation, or notice of the Department's intent to assess surface waters for potential redesignation as High Quality or Exceptional Value Waters. The assessments may be undertaken in response to a petition or on the Department's own initiative. The notice will request submission of information concerning the water quality of the waters subject to the evaluation, or to be assessed, for use by the Department to supplement any studies which have been performed. The Department will send a copy of the notice to all municipalities containing waters subject to the evaluation or assessment.

(b) Combined public meeting and fact-finding hearing. As part of its review of an evaluation or performance of an assessment, the Department may hold a combined public meeting and fact finding hearing to discuss the evaluation or assessment, including the methodology for the evaluation or assessment, and may solicit information, including technical data, to be considered in the Department's evaluation or assessment.

(c) Submission to EQB to alter designated use. Upon the completion of its assessment or review of a complete evaluation, and the satisfaction of the other applicable requirements of this section, the Department will submit the results of its assessment or review to the EQB for proposed rulemaking following review and comment by the petitioner, if applicable, in accordance with Chapter 23 (relating to Environmental Quality Board policy for processing petitions—statement of policy)."

2. Submittals to Change the Designated/Existing Use of a Waterbody

Persons or organizations may request evaluation of a waterbody by the Department in the following ways:

- **Petition to the EQB**: A person, group, organization or local government may at any time submit a petition for redesignation of a waterbody to the Secretary of DEP (who serves as the Chairman of the EQB) as provided in Chapter 23, the Environmental Quality Board policy for processing petitions—statement of policy. Chapter 23, which is available via the Fry Communications Website (http://www.pacode.com) or from the Department, lists the elements needed to complete a petition. Chapter 4 of this guidance discusses the requirements.

- **Submittal to the Department:** Alternatively, if a person or group gathers sufficient, quality data, they may submit a complete evaluation of the water quality of a watershed or segment of a stream to the Department. The evaluation report must document all of the elements of the evaluation and meet the Department's criteria for completeness and quality assurance, as provided for in Chapter 93 of DEP regulations. These elements are described in the Department's quality assurance project plan for HQ/EV evaluations. The Department may also initiate actions to assess waters for possible redesignation on its own or in response to requests from another agency.

All assessments and evaluations which are performed by the Department for the purpose of determining the appropriate classification of a waterbody are subject to the public notice provisions of the regulations which provide broad opportunities for public input.

3. Public Participation in assessment/evaluation of existing uses

The evaluation of the existing use of a waterbody considers the nature, quantity and quality of all existing and readily available data which the Department gathers or receives. Submittals containing complete support for an existing use determination must contain all the required information and follow the procedures outlined in Department protocols. Agencies, organizations and individuals may provide data to support the position that the existing use differs from the designated use, or provide enough information to establish, after Department review and approval, that a waterbody warrants an existing use evaluation.

Department Notice: As part of the planning process for an assessment or evaluation and in accordance with § 93.4d(a), the Department publishes notice in the *Pennsylvania Bulletin* and in a local newspaper, and provides notice to all municipalities, county planning commissions and, when applicable, petitioners in the watershed. The notice solicits technical data on water quality, instream habitat or the biological condition of the stream.

The Department may also hold public meetings or fact-finding hearings to share information and solicit more data, as provided by § 93.4d(b). Notice of meetings and hearings is also published in the *Pennsylvania Bulletin* and in a local newspaper.

In response to the notice, persons may submit data to the Department for consideration in the evaluation of a waterbody.

Existing Use List: The Department maintains a publicly accessible list of surface water segments where data has been collected or evaluated which indicates that the existing use differs from the designated use (including those segments which are HQ or EV). The list is maintained on the DEP Website (http://www.dep.state.pa.us, directLINK "Existing Use") by the Bureau of Water Supply and Wastewater Management. This listing will be used by the public, along with DEP and county conservation district staff with responsibility to protect surface water quality, in reviewing requests for permits and approvals. The public may also access the list for current information on streams of interest.

Waterbodies on this list are compiled into rulemaking actions for the EQB to consider the Department's recommendation on the designated use of the water. These rulemakings are subject to extensive public notice and input opportunities before finalization, as discussed below.

Draft Stream Evaluation Reports: Following evaluation of all valid data, the Department prepares a draft evaluation report. DEP distributes the draft report to all potentially affected municipalities, county planning commissioners and, if applicable, to the petitioner, providing 30 days to comment. The draft report is also put on the DEP website for public comment. This is another opportunity for persons to submit comments and data in support of a stream's uses.

The Department considers all comments and, within 6 months, prepares a report and recommendations to the EQB for a decision on redesignation. If any changes are made to the original draft, the revised report is sent to the petitioner, local municipalities, county planning commissioners, and it is also placed on the DEP website. If no changes are made, the report remains on the website until the Board concludes its action.

4. Public participation during permit or approval requests

NPDES Application: An applicant for an NPDES permit must identify the anti-degradation classification of the receiving water in its notice of complete application.

NPDES Permit: Under the provisions of § 92.61, notice of a draft NPDES permit containing, among other things, the anti-degradation classification of the receiving waterbody, is published in the *Pennsylvania Bulletin* with a minimum 30-day public comment period. During this period, persons may submit data regarding the water segment or the draft permit. A public hearing on the draft permit will be scheduled if one is requested for a proposed discharge to an EV water. A public hearing will be held on draft permits proposing to discharge to other waters if there is sufficient public interest. A notice of the hearing will be advertised in the *Pennsylvania Bulletin* and a local newspaper at least 30 days before the hearing. Persons may offer testimony at the hearing regarding the proposed discharge as well as the stream uses. Sections 92.63 and 92.65 list other public participation provisions relating to NPDES permits.

The Department will consider all pertinent data submitted during the permit review process in making its final decision on the existing use classification of the waterbody. The final permit is based on the final existing use determination.

Persons may also comment on other issues during the comment period on a draft permit, including issues regarding threatened and endangered (T&E) species. At this time, issues not previously considered may be brought to the Department's attention for consideration.

Act 537 Plans: Section 93.4c(c)(3) reiterates the requirement of § 71.53(d)(6) that an applicant or his agent provide proof of publication in a local newspaper of a sewage facility plan or revision if sewage facilities are proposed to discharge into HQ or EV waters. The newspaper notice shall notify the public where the plan is available for review and indicate the location of the planning area including the anti-degradation classification of the receiving water. The notice includes the plan's major recommendations, including a list of the sewage facilities alternatives considered, and provides for a 30-day public comment period. A copy of written comments received and the municipal response to each comment shall be submitted to the Department with the plan.

Other Permits and Approvals: Interested persons and applicants may also submit existing use information on other applications and requests for Department approval that may impact a surface water. In addition to NPDES discharges and the sewage facilities planning (Act 537) process, these may include resource extraction activities such as surface and underground mining and oil and gas extraction; landfills; requests for approval of water obstructions, encroachments, and dams; stormwater management planning (Act 167) activities; water withdrawal requests; and other activities which require a Department permit or approval and may impact a surface water.

The final existing use classification occurs as part of the Department's final action on the request for permit or approval.

Appealing existing uses: The existing use of a water can generally be appealed before the Environmental Hearing Board (EHB) as part of a challenge to a Department final action on a request for a permit or approval. Pursuant to the Environmental Hearing Board Act, appeals of existing use determinations may be taken before the EHB as part of a challenge to the specific Department action on a permit application or approval request implementing the provisions of existing use protection.

5. Public participation during EQB redesignation process

In response to a petition to the EQB, a submittal of data to the Department, or the Department's initiative, the Department undertakes assessment of a waterbody or evaluation of data to determine the existing uses as discussed above. One or more stream reports that support the existing uses of the waterbodies and that have incorporated the comments received to that point in time are grouped into recommended redesignation packages prepared for the Environmental Quality Board's (EQB) consideration.

Proposed rulemaking: The Department presents recommendations to the EQB for proposed rulemakings regarding redesignation of streams. Following approval by the Board for proposed rulemaking, the package is submitted to the Environmental Resources and Energy Committees of the House and Senate and the Independent Regulatory Review Commission (IRRC) and published in the *Pennsylvania Bulletin* with a public comment period of at least 45 days. In addition to the opportunity for written comments, public meetings may be held, and persons may request a formal public hearing on a proposed redesignation. Oral testimony presented at a public hearing is transcribed into an official record of the proceedings and all comments are considered in the final rulemaking.

Other public input opportunities: Even after a rulemaking is completed, persons may submit a petition to the EQB or assemble data for submittal to the Department that supports a change in use of a waterbody. The EQB generally does not reconsider a recently finalized regulation for two years unless new data is introduced hat was not available or considered earlier.

The following table summarizes the opportunities for public participation during the anti-degradation process.

TABLE 6
SUMMARY OF PUBLIC PARTICIPATION OPPORTUNITIES
IN THE ANTI-DEGRADATION PROGRAM

Process of assessment/evaluation of streams: 1. Submit petition for redesignation to EQB 2. Submit complete stream evaluation to DEP 3. Submit data or request meeting or hearing in response to DEP notice of intent to assess or evaluate a water 4. Use DEP's "Existing Use List" for current information 5. Submit comments on draft stream evaluation reports on DEP website
Permit or approval process: 1. Applicant includes anti-degradation classification in permit application to DEP 2. Submit data or request hearing in response to DEP publication of draft permit 3. Review and comment on Act 537 submittals in HQ or EV water in response to notice published by applicant 4. Submit data on other DEP permit or approval actions
EQB stream redesignations: 1. Submit comments on proposed stream redesignation rulemakings in response to publication by EQB

APPENDIX A

AQUATIC RESOURCE ASSESSMENT METHODS

Section 1
Mesh Size and Taxa Identification

The following excerpts are taken from the DEP document "Standardized Biological Field Collection and Laboratory Methods," December 31, 1997.

The net mesh size and level of identification will be used in the anti-degradation biological assessments as stated below:

Net Mesh Considerations - Benthic macroinvertebrates have historically been defined as animals large enough to be retained by a U.S. Standard No. 30 sieve (595 micron openings). A review of sampling equipment currently in use and commercially available indicates that the 595 micron criterion is very seldom met. Standard D-frame nets have 800 x 900 micron openings. It is apparent, from the above discussion, that the common mesh size is in the 800-900 micron range. Consequently, this size range has been adopted as the standard.

Identification - Taxonomic Level. The level of identification for most aquatic macroinvertebrates will be to genus. Some individuals collected will be immature and not exhibit the characteristics necessary for confident identification. Therefore, the lowest level of taxonomy attainable for these specimens will be sufficient. Certain groups are routinely identified to a higher taxonomic level, as follows:

Snails (Gastropoda) - Family

Moss animacules (Bryozoa) - Phylum

Clams, mussels (Bivalvia) - Family

Proboscis worms (Nemertea) - Phylum

Flatworms (Turbellaria)

- identifiable planarids - genus or Family Planaridae
- others - Phylum Turbellaria

Roundworms (Nematoda) - Phylum

Water mites (Hydracarina) - Class

Segmented worms (Annelida)

- aquatic earthworms & tubificids - Class Oligochaeta
- leaches - Class Hirudinea

The identification of midges (Chironomidae) - Family

Section 2
Semi-Quantitative Method (PaDEP-RBP):

The following excerpts concerning sample collection are taken from the DEP document "Standardized Biological Field Collection and Laboratory Methods," December 31, 1997.

Sample Collection - Riffle/run habitats are sampled using the D-frame net method described earlier in this document. Each sample consists of two D-frame kicks, one collected from an area of fast current velocity and the other from an area of slower current velocity. The two kicks are composited into one sample jar, preserved, and returned to the lab for processing. Taxonomic data are not recorded in the field.

Sample Processing - The following procedure adapted from EPA RBP methodology is used to process qualitative D-frame samples so that the resulting data can be analyzed using benthic macroinvertebrate biometric indices (or "metrics"). Equipment needed to process benthic samples includes: a large laboratory pan gridded into 28 equal sized squares, magnesium sulfate, illuminated magnifying viewer, slips of paper (numbered from 1 to 28) for drawing random numbers, and forceps (or any tools that can pick floating benthic organisms).

a. Only larger rocks, detritus, and other debris are removed while in the field before the sample is preserved.

b. Samples are rinsed in a standard USGS No. 35 (500 microns - mesh) sieve to remove fine materials and residual preservative and then placed in a pan to be sorted.

c. A saturated solution of magnesium sulfate (Epsom salts) is added to the pan. This causes most organisms to float; making it easier to separate them from the detrital and mineral materials. Enough solution should be used to allow complete dispersion of the sample.

d. The sample is stirred to spread the contents evenly throughout the pan.

e. The floating organisms are removed and retained. The materials on the bottom of the pan are inspected until the investigator is satisfied that all organisms have been removed. Ideally, the same person should "float and pick" all the samples for a survey, unless technique and consistency between other sample processors can be assured.

f. The organisms are placed in a clean gridded pan with enough water to cover the organisms and stirred to spread them evenly throughout the pan.

g. An individual grid is selected by any conventional random number method and all organisms within that grid are removed. Any organism which is lying over a grid line is considered to be in the square containing its head. Any grid chosen must be picked in its entirety.

h. Repeat the process of selecting squares and removing organisms until the sub-sample yields at least 100 organisms (EPA's methodology allows for larger sub-samples). The "100 organism" count is the minimum number required for valid computations of the recommended RBP biometric indices. Record the number of grids picked to yield the "100 organism" sample.

i. The sample should be preserved unless identification will be done immediately.

Section 3
Habitat Assessment

The following excerpts concerning habitat are taken from the DEP document "Standardized Biological Field Collection and Laboratory Methods," December 31, 1997.

The Department has adopted the habitat assessment methods outlined in EPA's Rapid Bioassessment Protocols (Plafkin, et al., 1989) and subsequently modified. The matrix used to assess habitat quality is based on key physical characteristics of the waterbody and surrounding lands. All parameters evaluated represent potential limitations to the quality and quantity of habitat available to aquatic biota. These, in turn, affect community structure and composition.

The main purpose of the habitat assessment is to account for the limitations that are due to existing stream conditions. In order to minimize the effects of habitat variability, every effort is made to sample similar habitats at all stations. The habitat assessment process involves rating twelve parameters as excellent, good, fair, or poor, by assigning a numeric value (ranging from 20 - 0), based on the criteria included on the Habitat Assessment Field Data Sheets (Riffle/Run and Glide/Pool, Appendix A), available from the Department.

The twelve habitat assessment parameters used in the PaDEP-RBP evaluations for Riffle/Run prevalent (and Glide/Pool prevalent) streams are discussed below. The Glide/Pool parameters that differ from the Riffle/Run parameters are shown in italics. The first four parameters evaluate stream section conditions in the immediate vicinity of the benthic macroinvertebrate sampling point:

- **Instream Fish Cover**- evaluates the % makeup of the substrate (boulders, cobble, other rock material) and submerged objects (logs, undercut banks) that provide refuge for fish.

- **Epifaunal Substrate** - evaluates riffle quality, i.e. areal extent relative to stream width and dominant substrate materials that are present. (In the absence of well defined riffles, this parameter evaluates whatever substrate is available for colonization.)

- **Embeddedness** - estimates the % (vertically) of the substrate covered with fine sediments. (Pool substrate characterization**:** evaluates the dominant type of substrate materials, i.e. gravel, mud, root mats, etc. that are more commonly found in glide/pool habitats.)

- **Velocity/Depth Regime** - evaluates the presence/absence of four velocity/depth regimes - fast-deep, fast-shallow, slow-deep, and slow-shallow. (Pool variability**:** describes the presence and dominance of several pool depth regimes.)

The next four parameters evaluate a larger area surrounding the sampled riffle. As a rule of thumb, this expanded area is the stream length defined by how far upstream and downstream the investigator can see from the sample point:

- **Channel Alteration** - primarily evaluates the extent of channelization or dredging but can include any other forms of channel disruptions that would be detrimental to the habitat.

- **Sediment Deposition** - estimates the extent of sediment effects in the form of islands, point bars, and pool deposition.

- **Riffle Frequency (pool/riffle or run/bend ratio)** - estimates the frequency of riffle occurrence based on stream width. (Channel sinuosity**:** the degree of sinuosity to total length of the study segment.)

- **Channel Flow Status** - estimates the horizontal extent of exposed substrates due to water level or flow conditions.

The next four parameters evaluate an even greater area. This area is usually defined as the length of stream that was electroshocked for fish. It can also take into consideration upstream land-use activities in the watershed:

- **Condition of banks** - evaluates the extent of bank failure or signs of erosion.

- **Bank vegetative protection** - estimates the extent of stream bank that is covered by plant growth providing stability through well-developed root systems.

- **Grazing or other disruptive pressures** - evaluates disruptions to surrounding land vegetation due to common human activities, such as crop harvesting, lawn care, excavations, construction projects, and other intrusive activities.

- **Riparian vegetative zone width** - estimates the width of protective buffer strips or riparian zones. This is a rating of the buffer strip with the least width.

It is best to conduct the habitat assessment after sampling since the investigator has observed all conditions in the sampled segment and immediate surrounding watershed. After all parameters in the matrix are evaluated and scored, the scores are summed to derive a habitat score for that station. The "optimal" category scores range from 240-192; "suboptimal" from 180-132; "marginal" from 120-72; and "poor" is 60 or less. The gaps between these categories are at the discretion of the investigator's best professional judgment.

Section 4
Metric Scoring and Selection

Scoring - The current DEP procedure compares five metrics from a candidate site to the same five metrics from a single reference site matched by type (riffle/run or glide/pool), size (stream order), gradient, and pH (alkalinity). Each metric uses a different scoring scale, so they must first be converted to the same scale using the normalizing scores listed in the table below. All five of both the candidate and reference metrics must be normalized using this table.

Biological Condition Scoring Criteria

Metric	6	4	2	0
Taxa Richness (candidate/reference)	>80%	79-70%	69-60%	<60%
*Modified EPT Index (candidate/reference)	>80%	79-60%	59-50%	<50%
**Modified Hilsenhoff (candidate-reference)	<0.71	0.72-1.11	1.12-1.13	>1.31
%Dominant (candidate-reference)	<10	11-16	17-22	>22
*%Modified Mayflies (reference-candidate)	<12	13-20	21-40	>40

* Pollution tolerant taxa removed

** Pollution tolerances modified from original publication

Taxa Richness = Total number of taxa.
Modified EPT Index = Total number of Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) minus EPT genera considered to be pollution tolerant.
Modified Hilsenhoff Index – An index that reflects macroinvertebrate tolerance to organic pollution with zero the least tolerant and ten the most tolerant. The original Hilsenhoff tolerance scores have been modified and some added to reflect the behavior of taxa found in Pennsylvania.
%Dominant – The percent of the total abundance made up by the single most abundant taxon.
%Modified Mayflies – The percent of the total abundance made up by the total abundance of mayflies minus the pollution tolerant mayfly genera.

The numbers in the above table normalize the metrics to the same scoring scale (6, 4, 2, and 0). Each metric has equal weighting so the five can be summed to obtain a total score. The highest total score is six (highest metric score) times five (number of metrics), or thirty. The final step is to divide the candidate total score by 30 and multiply b 100 to obtain a percentage. This percentage determines the anti-degradation status of the stream according to the values in the following table.

%Comparison of Candidate Score to Reference Score	**Stream Classification Category**
>=92%	EV
83-92%	HQ
<83%	Existing use or designated use (Non-HQ or EV)

To attain an EV classification, the percent comparison of the candidate to the reference must be equal to or greater than 92%. This means that the summed biological condition scores of the candidate's five metrics must total either 28 (93%) or 30 (100%). Therefore, in order to total 28, the candidate must have the maximum score of 6 for at least four of the five metrics and not less than a four for the fifth metric.

In order to attain a HQ classification, the percent comparison of the candidate score to reference score must be between 83 and 92%. This means that the summed biological condition score for the five metrics must total at least 26 (87%) when compared to the reference. Any summed biological condition score less than 26 would not qualify the candidate stream for Special Protection. The Department believes that these criteria assure that the best streams in the Commonwealth receive either EV or HQ protection.

Example: The following table shows how the entire scoring system would work for a hypothetical candidate stream.

	Taxa Richness	**Modified EPT**	**Modified Hilsenhoff**	**%Dominant**	**%modified mayflies**
Reference	28	12	1.23	25%	40%
Candidate	23	9	1.57	37%	32%
Difference	82%	75%	.34	12	8
Score	6	4	6	4	6

The summed score of the candidate stream is 6+4+6+4+6=26. Twenty-six is 87% of the thirty possible points, putting the candidate in the 83-91% range. The candidate stream is HQ.

Metric Selection and Derivation of Scores - The metrics used in the comparison were carefully selected using the "box and whisker plot" process now outlined in "Rapid Bioassessment Protocols For Use in Streams and Rivers: Periphyton, Benthic Macroinvertebrates, and Fish" (Barbour et al.); EPA 841-B-99-002; July, 1999. Box and whisker plots are simply graphical representations of frequency distributions. The "boxes" represent the 25th, 50th (median), and 75th quartiles while the whiskers represent the range of more extreme values. The frequency distributions of forty-one metrics were analyzed to determine their discriminatory power in identifying Special Protection streams.

The available RBP samples were first divided into three groups depending upon the stream they were taken from. The three groups were EV, HQ, and non-anti-degradation. For each metric, three side-by-side box and whisker graphs, each representing one of these groups, were plotted on a page. When the box and whisker plots are far apart on the vertical scale (little or no overlap), the metric has good discriminatory power. In other words, the values of the metric are noticeably different in EV, HQ, and non-anti-degradation streams. Metrics where the three side-by-side box and whisker plots overlapped were eliminated because they did not differentiate between anti-degradation and non-anti-degradation samples.

The last consideration is the elimination of one metric from pairs of correlated metrics. If the Simpson Index and percent dominant metric have a correlation coeffic ient of 0.95, they convey the same information. Including them both in the final set of metrics means that the same information (in this case diversity of taxa) is counted twice. Deleting one of the metrics prevents this double counting. The existing data indicated that the metrics (a) taxa richness, (b) modified EPT index, (c) modified Hilsenhoff Index, (d) percent dominant, and (e) modified percent mayflies were the best indices.

EPA and other state agencies across the country have consistently found taxa richness, EPT, modified Hilsenhoff, percent mayfly, and percent dominant metrics to be useful. The percent mayfly metric is also used by many agencies, including states in EPA Region III. In discussions with other states' biologists and EPA's contractor working on the RBP protocols, the modified versions (removal of pollution tolerant taxa from the indexes) of our EPT and percent mayfly index are considered good improvements over the original versions.

A modification to the percent dominant metric became necessary when some unusual conditions occurred. A benthic community dominated by a single taxa is usually considered bad. However, on occasion this single taxon is a sensitive one, intolerant of pollution. To account for such cases, the percent dominant metric is given the maximum score when the dominant taxa has a low pollution tolerance value (3 or less) even though the metric would normally receive a low score when a single taxon dominates the community.

The five metrics utilize different measurement scales. For example, the modified Hilsenhoff Index ranges from 0 to 10 while the percent dominant ranges from 0 to 100. The metrics had to be normalized to the same scoring scale so that each has the same weight when they are summed. The normalization starts by selecting a scoring interval. The Department selected a scoring interval of 6, 4, 2, and 0. Six is the best and zero the worst score.

After the scoring interval is selected, the next step is to determine the scoring ranges that are assigned a 6, 4, 2, or 0 for each metric. Taxa richness is used in the following paragraphs as the example of how the scoring ranges were derived.

The EV, HQ, and non-special protection samples were further subdivided into ecoregions. All possible comparisons between the EV samples within an ecoregion were calculated. As an example, assume there are three EV samples in ecoregion 62 with taxa richness of 25, 27, and 30. All possible comparisons give percentage differences of 25/27= 92%, 25/30= 83%, and 27/30= 90%. The data were always arranged lowest to highest to avoid percentage differences greater than 100%. This process was repeated for all the available EV samples in all the ecoregions. The percentage differences from all the ecoregions were combined into a single frequency distribution. The distribution showed that 95% of the time the percentage difference between EV samples in the same ecoregion were never less than 80%. As a result, any taxa richness percentage difference between a candidate and reference sample equal to or greater than 80% was assigned a score of six.

The same process was repeated comparing all the EV samples to all the HQ samples in the same ecoregion. Again, all the percentage differences were combined into a single frequency distribution. This distribution showed that 95% of the time the percent difference between EV and HQ streams in the same ecoregion was never less than 70%. A taxa richness percent difference between a candidate and reference sample equal to or greater than 70%, but less than 80%, was assigned a score of four.

Finally, the EV samples were compared to the non-special protection samples in the same ecoregion. The frequency distribution showed that 95% of the time the percent difference is not less than 60%. A candidate taxa richness compared to a reference with a percent difference equal to or greater than 60% and less then 70% is assigned a score of two. Any comparison that is less than 60% is assigned a score of zero.

With slight modifications, this same scoring procedure is applied to the other metrics. The difference between the candidate and reference was expressed as a difference, rather than a percentage, for percent dominant (candidate minus reference) and percent modified mayflies (reference minus candidate) because these metrics are already expressed as percents. The Hilsenhoff Index is also expressed as a difference (candidate minus reference) because a small change in the index reflects a large difference in instream conditions. The importance of small changes in the Hilsenhoff Index would be lost if the differences were expressed as percentages.

The final scoring range was based upon the graph on page 8-1 of "Rapid Bioassessment Protocols For Use in Rivers And Streams – Benthic Macroinvertebrates and Fish" (Plafkin, et al; EPA/444/4-89-001; May, 1989*)* which compared the relationship between biological condition and habitat quality. An analysis of Pennsylvania RPB III sampling data in the metric selection process showed that 83% is a number which clearly differentiates between average streams and those deserving of Special Protection. The Department selected 92% as a break between HQ and EV waters based on best professional judgment. Experience with this number has proven that it does reflect outstanding waters of ecological significance.

APPENDIX B

ANTI-DEGRADATION BEST AVAILABLE COMBINATION OF TECHNOLOGIES FOR WASTEWATER DISCHARGES

For wastewater discharges to High Quality and Exceptional Value waters the most effective treatment/disposal (T/D) technologies consist of a hierarchy of preferred methods which take technical and economic feasibility as well as expected water quality impacts into consideration. The goal of this hierarchy is to minimize or eliminate surface water discharges and protect both surface and groundwater from degradation by providing advanced wastewater treatment and/or soil renovation prior to discharge to groundwater. However, for methods which involve a stream discharge, there also exist effluent limitations defined as "Anti-degradation Best Available Combination of Technologies" (ABACT). ABACT in this context refers to treatment and disposal methods designed to help maintain water quality. One or more of the following technologies or alternatives suggested by the applicant and agreed upon by the Department should be applied to sewage or selected industrial waste discharges in High Quality or Exceptional Value waters. These T/D technologies must also be combined with effective erosion control and stormwater management (See Chapter 11 and Appendix F) in order to minimize the total impact of the activity on the watershed.

1) The most preferred technology for wastewater discharges is to eliminate the discharge through a variety of options including year round spray irrigation or extension of existing collection systems to convey wastewater to an existing sewage treatment system outside the HQ or EV watershed. Year-round spray irrigation includes the installation of a treatment system providing a minimum of secondary treatment prior to spraying. Sufficient storage to prevent any stream discharge during wet or cold weather periods when spraying is not technically feasible is also required. Year-round spray irrigation or conveyance to an existing treatment plant outside of the watershed is required whenever it is technically feasible and cost effective. Where year-round spray irrigation is practiced, only a Part II Clean Streams Law permit is required and since there is no discharge to surface waters, there should be no water quality degradation. Social or Economic Justification (SEJ) is, therefore, not required for proposals in High Quality watersheds which do not involve a discharge to surface waters.

   An equivalent technology for wastewater discharge is subsurface disposal. This disposal method may consist of either conventional or *alternate* on-lot systems or a permitted groundwater discharge system as long as its review and approval is consistent with DEP regulations and policies for the protection of both surface and groundwater. On-lot disposal systems with domestic sewage flows of 10,000 gpd or less are permitted by local sewage enforcement officers under Act 537. For domestic flows of more than 10,000 gpd and industrial wastes, subsurface disposal options are much more limited but, where appropriate, can be approved by the Department through issuance of a Part II (Clean Streams Law) permit. Since there is no discharge to surface waters, social or economic justification is not required in High Quality waters.

   Collection and conveyance of sewage to existing treatment facilities outside the watershed or stream segment is another option because it eliminates the discharge of treated wastes to High Quality or Exceptional Value waters. One possible disadvantage is the export of water out of the basin and potential disruption of the existing hydraulic balance. This will be considered in the context of the evaluation. Since there is no discharge to HQ or EV waters, there is no need for a National Pollutant Discharge Elimination System (NPDES) (Part I) permit. Depending upon the circumstances, planning (Act 537) approval and/or a Clean Stream Law (Part II) permit may be required.

2) Where year-round spray irrigation, subsurface disposal or collection/conveyance outside the basin are not technically or economically feasible the next preferred treatment/disposal alternative is seasonal and/or partial spray irrigation. The chief difference between year-round and seasonal spray irrigation is that a stream discharge is permitted for the portion of the year when soils cannot attenuate the wastewater. The advantages lie in the fact that: 1) the discharge occurs during wetter portions of the year (usually November through April)

when stream flows and waste assimilation capacities are higher and therefore, the impact of a stream discharge is less significant, and 2) the portion of the effluent that is sprayed helps recharge groundwater. Where seasonal spray irrigation is employed, minimum wintertime stream discharge requirements are set using the more stringent of ABACT or water quality based effluent limits (WQBELs). Seasonal spray irrigation is required whenever it is technically feasible and cost effective. Seasonal spray irrigation requires both an NPDES permit and a Clean Streams Law Part II permit. Since there will be a stream discharge for at least a portion of the year, social or economic justification is also required if the discharge would result in degradation of High Quality waters. (See Chapter 10).

Partial spray irrigation consists of disposing of a portion of the wastewater effluent utilizing spray irrigation on either a year-round or seasonal basis. Partial spray irrigation is required whenever it is technically feasible and cost effective. Generally, permit requirements for the portion of wastewater to be discharged are the same as for a system based on year-round stream discharge. The advantage to partial spray is that it reduces the total annual volume of wastewater discharged while increasing groundwater recharge. Partial spray irrigation requires both an NPDES and Clean Streams Law Part II permit. Since there is a stream discharge, social or economic justification is also required if degradation occurs in the receiving stream.

3) The final technology option is the year-round discharge of treated wastes. This technology is only employed when non-discharge alternatives are not environmentally sound and cost-effective. Where this technology is employed, a discharger must provide, as a minimum, the more stringent of ABACT or water quality based effluent limitations (WQBELs). WQBELs are developed to assure compliance with water quality criteria at a specific design stream flow. Where the proposed activity/project is socially or economically justified, the seven consecutive day, ten year low flow (Q_{7-10}) is used to calculate the WQBELs but ABACT is also considered as an appropriate level of treatment. For proposed discharges to High Quality waters where the proposed activity is not socially or economically justified, the effluent requirements are established to maintain existing water quality and are calculated using the more stringent of either median or Q_{7-10} stream flow.

ABACT requirements, such as those defined below for sewage discharges, are designed to help maintain existing water quality. Requirements for industrial waste discharges will be determined by the Department on a case-by-case basis after review of the proposed activity, and its associated pollutants. All treatment/disposal facilities must be enhanced with pollution prevention technologies applied to the raw waste streams as well as water conservation or water reuse technologies designed to minimize the volume of wastewater discharged.

ABACT for municipal, non-municipal and small flow sewage discharges is defined as follows:

Parameter	***Effluent Limits (mg/l)***		
	<2,000	***2,000 to 50,000 gpd***	***>50,000***
C-BOD_5 (May 1, - Oct. 31)	*10*	*10*	*10*
C-BOD_5 (Nov. 1, - Apr. 30)	*20*	*20*	*10*
Suspended Solids	*20*	*10*	*10*
NH_3-N (May 1 - Oct. 31)	*5.0*	*3.0*	*1.5*
NH_3-N (Nov. 1 - Apr. 30)	*15.0*	*9.0*	*4.5*
Dissolved Oxygen	*-*	*6.0*	*5.0*
Effective Disinfection	*- - - As defined in Chapter 92 - - - **		
Other Parameters as needed	*- - - Determined by the size and characteristics of the proposed discharge - - -*		

***** Disinfection should be accomplished using a method that leaves no detectable residual. If disinfection is accomplished with chlorine, total residual chlorine levels in the receiving stream must meet the requirements of Chapter 92.2(d) of DEP Rules and Regulations. Disinfection using ultra-violet light or other non-chlorine based systems must be considered.

These values are expressed as average monthly effluent limitations. Additional treatment requirements for nutrients may be evaluated if necessary. (See Tables A-3 and A-4 for treatment methods). Year-round discharge requires both an NPDES and Clean Streams Law Part II permit as well as SEJ, if the discharge causes measurable change in a High Quality receiving stream. Selected point source control technologies from Tables A-1 and A-2 are appropriate to apply to the year-round discharge of treated wastes.

Exceptional Value Waters: For wastewater discharges (sewage or selected industrial wastes) to Exceptional Value waters treatment technologies center on the use of pollution prevention technologies to reduce pollutant loads on treatment systems followed by the use of the soil/geologic matrix to remove some or all of the wastewater constituents as an alternative to surface water discharge. Except in the case of individual on-lot sewage systems, land application preceded by varying degrees of advanced chemical, physical and/or biological treatment will be required for treatment/disposal of wastewaters in Exceptional Value waters if cost effective. The use of land application minimizes or eliminates surface water discharge and the associated water quality degradation. In addition, these combined technologies offer the highest likelihood of producing an effluent that will not degrade the protected stream. Treatment and discharge of wastewater to Exceptional Value waters can only be permitted if the maintenance or enhancement of existing surface and ground water quality can be demonstrated.

Treatment/Disposal Methods: Tables B-1 through B-4 list treatment, land application and nutrient removal methods that could be combined to provide wastewater management that satisfies the requirements of the anti-degradation program. A more detailed discussion of various land application methods can be found in the DEP Manual of Land Application of Treated Sewage and Industrial Wastes, 1997. Technically feasible combinations of treatment/disposal processes from these tables may be approved if the Department determines that the proposal meets all antidegration requirements.

The processes in Tables B-1 through B-4 are not intended to represent a comprehensive list nor are they presented in any preferred order based on treatment removal efficiency. Many factors such as unit construction and combination or modification of processes will determine the ultimate treatment efficiency on a case-by-case basis. Because of the very high levels of treatment required in anti-degradation waters, filtration units should be an integral component of any treatment process approved by the Department for a direct stream discharge. In addition, the Department will encourage the use of wastewater conveyance, management and treatment/disposal systems which have the highest reliability and which are the least maintenance intensive.

Table B-1

Treatment Processes For Discharges

Type	Processes	Benefits/ Limiting Factors
Physical	Screening, mixing, flocculation sedimentation, flotation, filtration	Lowest cost/Lowest degree of treatment; Lowest nutrient removal
Chemical	Chemical precipitation, gas transfer, adsorption, disinfection	High degree of treatment/High cost for chemicals; Increased sludge production; High operation and maintenance costs
Biological (Trickling Filter Activated Sludge)	Aeration, coagulation, settling	Most cost effective/increased sludge production; high operation and maintenance costs.
Wastewater Stabilization Ponds	Aerobic, anaerobic facultative	Low capital cost; Low operation and maintenance costs/ Large area required
Constructed Wetlands	Marsh, pond and/or meadow	Low capital cost; Low operation and maintenance costs/ Weather dependent treatment efficiencies
Natural Treatment Systems	Intensely managed biological populations or complete ecosystems	Low capital cost; Minimal sludge production; Production of usable by-products/ Labor intensive operation and maintenance

Table B-2

Land Application Systems for Discharges

Land Application Method	Limiting Factors
Individual on-lot disposal system (treatment tanks, soil absorption system).	• Soils requirements in Chapter 73 • NO_3-N discharge of 45 ppm from each unit resulting in a density factor of less than 1 equivalent dwelling unit per acre.
Community on-lot disposal system or equivalent individual on-lot disposal system of less than 10,000 gpd.	• Soils requirements in Chapter 73 • NO_3-N impact on groundwater and development of a groundwater plume which may affect surface water.
Large volume on-lot disposal system (treatment tank and soil absorption field for systems exceeding 10,000 gpd).	• Soils requirements in Chapter 73 • NO_3-N impact on the groundwater and plume development which may affect surface waters.
Treatment and slow rate infiltration (spray irrigation).	• Soils requirements in spray irrigation manual • Large area required • NO_3-N impact on groundwater and plume development which may affect surface waters • Metals build up in soils • Need for advanced secondary or tertiary treatment prior to spraying • Need for winter storage.
*Treatment and rapid infiltration	• Deep-highly permeable deposits of sand or sandy loam required • Large area required • Long resting periods needed • Potential for groundwater pollution • NO_3-N impact on the groundwater and plume development which may affect surface waters • Metals build-up in soils • Need for winter storage • Need for advanced secondary or tertiary treatment prior to land application • Unsuitable for steep slopes and/or high groundwater table

*Treatment and overland flow	• Soils with low permeability required • Large area required • NO_3-N impact on ground water and plume development which may affect surface waters • Metals build-up in soils • Winter storage may be needed • Advanced secondary or tertiary treatment needed prior to land application • Distribution may clog or freeze • Runoff collection required • Variable quality of run-off • Some additional method of ultimate disposal required • Unsuitable for steep slopes.

The systems described in this table all depend upon the soil as an integral part of the effluent treatment process. However, when treatment processes are proposed which claim to treat effluent to the degree that additional attenuation by the soil is not needed, the approval process requires documentation that disposal of the hydraulic load from the system will be designed to prevent a nuisance, runoff or other water related problems on the site or adjoining properties. One method of disposal is the use of an absorption area sited and designed using criteria similar to the requirements for on-lot treatment and disposal systems. When such systems are proposed, they are not classified or reviewed as on-lot systems but are reviewed as disposal systems under the Clean Streams Law Part II permitting process. While these systems do not depend upon the soil for treatment, the designer should consider factors such as soil permeability (hydraulic conductivity), depth to perched or seasonal high water table, hydrology and hydrogeology when designing these systems. These factors will determine if the hydraulic load to be applied to the absorption area can be handled by the system proposed without significant groundwater mounding.

The Department will evaluate these proposals on the basis of the documentation submitted in support of the treatment technology and its capability to adequately treat sewage to protect ground water without the use of soils for renovation. Where such documentation is lacking, additional treatment using soils may be necessary and compliance with the standards for on-lot systems will have to be met.

* May be considered experimental and not permitted if insufficient operational data is available.

Table B-3

Treatment Processes for Nitrogen Removal

Treatment Method	Benefits/Limiting Factors
Biological Activated Sludge	Activated Sludge Most cost effective Highest removal of all three nitrogen species
Trickling Filter	Trickling filter Lowest removals
Breakpoint Chlorination	Ammonia nitrogen concentration reduced to near zero/Nitrate and nitrite are not removed; Chlorine toxicity to aquatic life
Selective Ion Exchange (Natural and synthetic)	Good ammonia removal/Prior filtration required; Operation and maintenance problems (resin binding - carbonate deposits); Difficult to dispose of carbonate deposits and backwash from regeneration.
Air Stripping	Good ammonia removal/Nitrate and nitrite are not removed; Inefficient in cold weather; Increased sludge production; Requires pH adjustment
Land Application	Metals build-up in soil; NO_3 impact on groundwater; Plume development which may affect surface waters
Constructed Wetlands	Low capital cost; Low operation and maintenance costs/Poor efficiency in cold weather

Table B-4

Treatment Processes For Phosphorus Removal

Treatment Method	*Benefits/* **Limiting Factors**
Biological (luxury uptake) A/O Process Phostrip Modified Bardenpho Sequential Batch Reactor Operationally Modified Activated Sludge Land Application	Most cost effective/High initial cost; Process control difficult; High Operation and maintenance costs; Moderate sludge production
Chemical Addition	
Aluminum and Iron Salts	High chemical cost; Poor sludge dewatering; Higher sludge production
Lime	High chemical cost; High operation and maintenance costs; Process control difficult; Highest sludge production
Polymers (In conjunction with lime and alum)	Highest chemical cost
Land Application	Metals build-up in soils; NO_3 impact on groundwater; Plume development which may affect surface waters
Constructed Wetlands	Low capital cost; Low operation and maintenance costs/Poor efficiency in cold weather

APPENDIX C

ANTI-DEGRADATION BEST AVAILABLE COMBINATION OF TECHNOLOGIES FOR WASTE MANAGEMENT ACTIVITIES

Waste management facilities include a variety of processing, storage and disposal activities designed to deal with hazardous, municipal and residual wastes. Due to the variety of these facilities, discharges may be highly variable in quality and quantity. Point source discharges from waste management facilities are generally limited to treated leachate and discharges from erosion control devices. Nonpoint discharges may occur from unlined landfills or storage areas and from facility appurtenances.

For waste management facilities sited in watersheds not designated as High Quality or Exceptional Value waters, the following requirements generally apply.

Processing facilities typically have impervious pads to facilitate collection of leachate or other wastewaters. The leachate can be treated and discharged through a National Pollutant Discharge Elimination System (NPDES) permit, collected and transported to a treatment facility or discharged to a publicly owned treatment works (POTW).

For storage facilities, only certain municipal and residual wastes that have no potential to adversely effect the environment may be stored without leachate or wastewater collection. If leachate is generated, it is typically treated *on-site* and discharged through an NPDES permit, transported to a treatment facility or discharged to a POTW.

Landfills for the disposal of municipal, hazardous and some residual wastes are required to have a double liner system, one of which is a composite liner, with leachate collection and treatment. Other residual waste landfills may be designed with a single composite liner system or be unlined depending upon the characteristics of the waste. All landfills must be designed with a minimum isolation distance of eight feet to the regional ground water table. All leachate collected at the lined facilities is treated and either discharged to a stream through an NPDES permit or discharged to a POTW.

Although the regulations for municipal, residual and hazardous waste do not prohibit the siting of processing, storage or disposal facilities in High Quality or Exceptional Value watersheds, an environmental assessment is required to evaluate potential impacts. In addition, the following requirements also apply.

Solid waste processing facilities must discharge collected leachate or wastewaters to an existing POTW or transport the liquids off-site for disposal in a non-HQ/EV watershed if the estimated net present value cost of these treatment/disposal technologies is equal to or less than the estimated cost of a stream discharge alternative that causes no adverse measurable change.

Solid waste storage facilities must be designed to ensure containment of any leachate or wastewaters generated. The collected leachate or wastewaters *must* be transported off-site for disposal in a non-HQ/EV watershed or discharged to an existing POTW.

Landfills must be lined facilities with leachate collection and treatment. The leachate *must* then be discharged to an existing POTW or to a stream through an NPDES permit since *long-term* transportation of leachate is prohibited. Siting of landfills will be prohibited in areas where connection to an existing POTW or issuance of an NPDES discharge permit are not possible.

For discharges from waste management facilities in HQ or EV watersheds, the most effective technologies consist of a hierarchy of preferred methods which take technical and economic feasibility as well as expected water quality impacts into consideration. The goal of this hierarchy is to minimize or eliminate surface water discharges while protecting both surface and groundwaters from degradation. However, for methods which involve a stream

discharge, there also exist *technology based* effluent limitations defined as Anti-degradation Best Available Combination of Technologies (*A*BACT). In this context, *A*BACT refers to treatment *and disposal methods designed to help maintain* water quality.

1. The preferred technology for leachate management is on-site pretreatment followed by discharge to an existing POTW or other permitted treatment facility outside the watershed. This option must be considered and found not to be environmentally sound or economically feasible before the Department will approve any other option. Practicability considerations include:

    a. Ability of the POTW to accept and treat the leachate and still meet NPDES requirements;

    b. Proximity of an adequate size sewer line or the availability of the necessary right-of-way to construct one;

    c. Degree of pretreatment needed to enable the POTW to accept the leachate;

    d. Problems the contents of the leachate may create in sludge disposal.

    This option has several on-site requirements including sufficient storage capacity at least equal to the maximum expected production of leachate for any 30 day period for the life of the facility, or 250,000 gallons, whichever is greater. No more than 25% of the total leachate storage capacity may be used for flow equalization on a regular basis. Pretreatment requirements vary with the size and capabilities of the POTW and its NPDES limitations. Minimal requirements for pretreatment include biological treatment with gravity separation of solids. In cases where POTW circumstances are more limiting, carbon absorption or ion exchange treatment may be indicated.

    Collection and conveyance of leachate outside the watershed is a preferred option because it eliminates the discharge of treated wastes to High Quality or Exceptional Value waters. If there is no discharge to these waters, there is no need for an NPDES permit or SEJ (in the case of HQ waters).

2. The next preferred technology is pretreatment and partial conveyance to a POTW or other permitted treatment facility. This option disposes of a portion of the wastewater through existing treatment facilities and reduces the amount of wastewater treated and discharged. For that portion of the wastewater that remains for treatment and discharge the requirements outlined in Item 3 apply.

3. The least preferred technology is the year-round discharge of treated leachate. Where this approach is employed, the discharge is required to meet as a minimum, the more stringent of ABACT or water quality based effluent limits (WQBELs). WQBELs are developed to assure compliance with water quality criteria at a specific design stream flow. Where the proposed activity/project is socially or economically justified, the seven consecutive day, ten year low flow (Q_{7-10}) is used to calculate the WQBEL. For proposed discharges to HQ waters, where the proposed activity <u>is not</u> socially or economically justified, the effluent requirements are established to maintain existing water quality (see Chapter 8) and are calculated using the more stringent of either median or Q_{7-10} stream flow.

    ABACT requirements, such as those defined below for leachate, are designed to help maintain existing water quality. Requirements for other types of waste management discharges will be determined on a case-by-case basis.

ABACT for leachate discharges, are as follows:

Parameter	***Effluent Limits (mg/l)***
C-BOD_5	*10*
Suspended Solids	*10*
NH_3-N (May 1 to October 31)	*1.5*
NH_3-N (November 1 to April 30)	*4.5*
Total Iron	*1.5*
Dissolved Oxygen	*6.0*
Effective Disinfection	*---As defined in Chapter 92.2d---**
Other Parameters as needed	*- - - Determined by the size and characteristics of the proposed discharge - - -*

These values are expressed as average monthly effluent limitations and additional parameters may be evaluated if necessary.

When discharge to a permitted POTW or other permitted treatment facility has been proven "not practicable," the landfill operator *is* required to obtain a Part I NPDES permit for discharge of the leachate and a Part II Clean Streams Law permit for construction and operation of a treatment facility. DEP regulations require a 30 day minimum storage/equalization ahead of the treatment. Treatment requirements include, at a minimum, biological treatment with gravity separation of solids, carbon adsorption and ion exchange followed by disinfection. *SEJ is required if the proposed discharge is projected to cause a measurable change in a High Quality receiving stream.*

Appendix F, lists BMPs for storm water management.

APPENDIX D

ANTI-DEGRADATION BEST AVAILABLE COMBINATION OF TECHNOLOGIES FOR MINING ACTIVITIES

1. GENERAL

Mining involves a wide variety of activities that disturb the surface of the land. Mining activities such as coal surface mines and small industrial minerals surface mines are temporary and may exist for a year or two at any one location. Large quarries and underground mines can be considered permanent since they may exist for 10 years or longer. Consequently, water discharged from mining activities can be intermittent or continuous and, before treatment, highly variable in quality. Effects of mining activities on streams include changes in both water quality and physical habitat (including stream flow) which can change the composition of the aquatic biological community.

Water from mining operations can be characterized as:

- **Stormwater discharge from earth disturbances:** This is runoff from up-slope undisturbed and disturbed areas and reclaimed areas.
- **Stormwater discharge from permanent facilities:** This is runoff from areas containing permanent facilities.
- **Pumped stormwater discharge:** This is water from precipitation that is collected in pits, excavations and sumps. This water may include permanent or intermittent inflows of groundwater. These discharges are generally associated with surface mining sites.
- **Pumped groundwater discharge:** This is water that is pumped from underground mine workings or excavations, including surface mine sites that receive a continuous inflow of ground water.
- **Process water:** This is water used in the processing and cleaning of minerals and rocks, including coal.

2. TREATMENT TECHNOLOGIES

Mining activities routinely employ a number of technologies that influence the quantity and quality of discharges and protect the overall ecosystem. These technologies are required on all mine sites and include:

- Diversions
- Stream barriers
- Acid-forming materials controls
- Surface and ground water monitoring.

a. Diversions

Surface water from undisturbed areas is intercepted and diverted away from areas disturbed by mining. Operations in High Quality and Exceptional Value watersheds should minimize the amount of water that enters the mine site by installing upslope diversions as close to disturbed areas as possible. The *Engineering Manual for Mining Operations* 9 (DEP technical guidance 563-0300-101) recommends that diversions be constructed to provide positive drainage across their entire length, preferably with a slope of 1% to 2%. The ditch should be lined with permanent vegetation, durable rock, geotextile or other nonerosive materials. The outlet for a diversion ditch should be a rock-lined energy dissipater, a level spreader or a stable existing drainage way.

b. Stream buffers

Areas authorized for coal and industrial minerals surface mining activities are required to maintain a minimum 100-foot buffer along perennial and intermittent streams. In High Quality or Exceptional Value watersheds variances to the 100-foot buffer are only allowed if the mining activity will result in a demonstrated environmental enhancement or for minor activities like ditches or stream crossings. Such variances take the form of an order of the Department. Streams in HQ or EV watersheds may not be relocated to accommodate coal or noncoal surface mining activities unless the relocation results in environmental improvement. For example, environmental improvement can occur by relocating a stream to prevent it from flowing into abandoned mine areas or onto coal refuse. Relocation can occur only after issuance of a permit in accordance with the requirements of Chapter 105 of DEP Rules and Regulations and only if existing uses are maintained or protected.

c. Acid-forming materials control

Each proposed mine site is evaluated for its potential to produce pollution. Because of the wide variety of geologic conditions in Pennsylvania, the evaluation is site specific. If there is any potential for the mining activities to encounter acid-forming material, the evaluation includes analysis of the overburden material for the volume and chemical character of acid and alkaline strata. It also includes a review of drainage from similar mines in the general area. This information is used to design the site to maximize the potential that no pollutional discharges will occur. Designs can include isolation through proper management of earthen materials during mining, backfilling and grading; the addition of alkaline material to prevent the formation of acid drainage; or, if the amount of acid material is small, removal of the acid material and disposal outside of the High Quality or Exceptional Value watershed. By regulation, mining permits cannot be issued if there is presumptive evidence of pollution.

Geological conditions are sometimes difficult to predict accurately. Occasionally mining on an approved permit may encounter unanticipated deposits of acid-forming materials. When this occurs, the mine operator is required to revise the mining plan so that these materials will be hydrologically isolated to minimize drainage into surface and ground water.

d. Surface and groundwater monitoring

Although water monitoring does not influence the quality of the water discharging from the mine site, it does provide a measure of the point and non-point source impacts of the operation. All permit applications for coal mining activities and large, industrial minerals mining activities must contain a plan for monitoring surface and groundwaters. The plan must describe the nature and frequency of data collection and the duration of the monitoring program for each permit.

A typical monitoring plan has point source discharges of stormwater and pumped stormwater being sampled twice a month with the results reported quarterly. Groundwater and surface water monitoring points would be sampled and reported quarterly.

If coal is being mined, the parameters monitored include, but are not limited to, pH, acidity and alkalinity, iron, manganese, sulfates, specific conductance or total dissolved solids, suspended solids if the water is a point source discharge or surface water, and either flow or water level. If industrial minerals are being mined, the chemical constituents that are monitored depend on the character of the mineral and overburden, but at a minimum would include pH and total suspended solids for discharges to surface water.

3. STORMWATER DISCHARGE FROM EARTH DISTURBANCES

Stormwater discharges from earth disturbances occur when precipitation-induced runoff from disturbed areas, including areas that have been reclaimed but not yet stabilized with permanent vegetation, is collected and then

discharged from erosion and sedimentation control structures. The best available technologies for this type of discharge involve removal of suspended and settleable solids using the Special Protection BMPs described in the erosion and sediment control regulations at §102.4(b)(6) and the *Engineering Manual for Mining Operations* (DEP technical guidance 563-0300-101). The following are required for erosion and sedimentation controls in anti-degradation watersheds:

- Protect the area down-slope from sediment basins with hay bales or filter fence before construction and until vegetation is established.
- Construct collection ditches to encompass all areas disturbed by mining, including areas where topsoil, subsoil and mine spoil are stored.
- Line channels, collectors and diversions with permanent vegetation, durable rock, geotextile or other nonerosive materials and design these structures with a minimum capacity to convey the peak discharge from a 5-year frequency storm, as required by §102.4(b)(6).
- Design sedimentation impoundments to have a capacity of 8600cf/acre or be able to contain the 10-year, 24-hour precipitation event without flow through the emergency spillway and with a flow length to width ratio of 4:1 or greater as specified in §102.4(b)(6).
- Design sedimentation impoundments with a manual dewatering device to allow additional settling before releasing water or so that it dewaters in at least 4 days and no more than 7 days when at full capacity as described in §102.4(b)(6).
- Mulch with hay or straw immediately after backfilling and topsoil distribution.
- Stabilize all discharge points to prevent bank erosion or channel scouring in the receiving stream.

4. STORMWATER DISCHARGE FROM PERMANENT FACILITIES

Stormwater discharges from permanent facilities are discharges of precipitation-induced runoff from stabilized areas on which long-term structures and buildings are situated. These discharges are typically associated with surface facilities at underground mines and industrial mineral processing plants. Land cover in these areas may include impermeable roofs, pavements and grassy areas. Runoff from these areas is discharged through sediment basins.

a. If contaminants in the runoff are limited to sediment and suspended solids, the Special Protection BMPs for transient stormwater discharges are applied. See Section 3, of this Appendix. Dust and clays from quarry operations are also handled in this way.

b. If the runoff comes in contact with acid-forming materials, such as coal, coal refuse or dust from coal and coal refuse, the best available technologies for the collected runoff will be the best technologies for pumped stormwater discharges. See Section 5 below.

c. If the runoff contains contaminants other than those identified in paragraphs "a" and "b," the best available technologies for stormwater from industrial sites will be applied. See Appendix B, Best Available Combination of Technologies for Wastewater Discharges.

5. PUMPED STORMWATER DISCHARGES

Pumped stormwater discharges are normally intermittent in nature. These are discharges of water that periodically accumulate in surface mine or quarry pits and excavations due to precipitation events or the inflow of groundwater. The water is collected, pumped and treated before it is discharged. In all cases, this accumulated water must be pumped to treatment facilities. No gravity flow of contaminated water is permitted from pits and excavations. The ABACTs for these discharges are described below.

a. Nondischarge

Because precipitation is inevitable, only a few, small mining operations can easily achieve a nondischarge state. These operations are usually small sand and gravel mines where all water within the confines of the mine boundary drains to one or more internal sumps and then percolates into the ground water. A few larger industrial minerals operations may achieve this through the use of specially designed infiltration beds if geologic conditions are conducive to a high percolation rate. This option is acceptable for coal mining operations if the pumped water is treated to the technology-based standards in 25 Pa. Code §§87.102, 88.92, 88.187, 88.292, 89.52 and 90.102 prior to infiltration. Another nondischarge option is to pipe the treated mine water overland and discharge it to a stream that is not High Quality or Exceptional Value.

b. Overland Flow

The ABACT involving overland flow requires the water to be treated to the technology-based standards in 25 Pa. Code §§87.102, 88.92, 88.187, 88.292, 89.52 and 90.102 for coal or §77.522 for industrial minerals mining. After treatment the water may be discharged directly to the surface of the land as sheet flow or by spraying. Overland flow must be directed to undisturbed, level or gently sloping ground. Care must be taken to prevent the sheet flow from forming rills and gullies.

c. Discharge to Surface Waters

In circumstances where a surface water discharge is the only viable approach, a discharger must meet the more stringent of water quality-based effluent limitations (WQBELs) or the following ABACT.

(ii) WQBELs are developed to assure compliance with water quality criteria at a specific design stream flow. Where the project proponent has demonstrated that the proposed activity/project is socially or economically justified, the seven consecutive day ten-year low flow (Q_{7-10}) is used to calculate the WQBEL. For proposed discharges to HQ waters, where the proposed mining activity is not socially or economically justified, the WQBELs are designed to maintain existing water quality (See Chapter 8). In these situations WQBELs are calculated using the more stringent of either median or Q_{7-10} stream flow.

(iii) The ABACT for pumped stormwater discharges consists of treatment to the best available technology effluent requirements shown below followed by a surface water discharge at a minimum dilution ratio (stream flow: discharge) of 6:1. This dilution ratio may be increased if necessary to protect instream water quality. If adequate dilution ratios cannot be maintained, the extent of surface mining in the watershed will be restricted. Other effluent control technologies may also be required such as: enhanced physical/chemical treatment or effluent polishing via additional ponds or wetland systems. The ABACT effluent requirements for coal and industrial minerals mining are:

(iv)

Parameter	***Effluent Limits (mg/l***
Acidity	*< Alkalinity*
Suspended Solids	*10*
pH	*6.5-9.0 (units)*
Total Iron	*1.5*
Total Manganese	*1.0*
Other Parameters as needed	*- - - Determined by the size and characteristics of the proposed discharge - - -*

These limitations are expressed as average monthly values. Limitations on additional parameters may be assigned if necessary to preserve ambient stream quality.

6. PUMPED GROUNDWATER DISCHARGES

Discharges of groundwater pumped from underground mines and large excavations that intercept regional groundwater are typically long-term, high-volume and continuous. Discharges from underground coal mines often contain relatively high levels of iron, manganese, acidity and total dissolved solids. Discharges from industrial minerals mines frequently contain high levels of suspended solids.

Mine operators proposing pumped groundwater discharges are encouraged to consider conveying the discharges to a non-anti-degradation stream or otherwise locating the discharge outside of the watershed or stream segment. If such a discharge is permitted to a High Quality or Exceptional Value water, the discharge must meet the WQBEL or ABACT requirements outlined in Section 5, Pumped Stormwater Discharges.

7. PROCESS WATER

Process water is the water used in the cleaning and processing of coal and other rocks and minerals. The process water from coal preparation plants generally contains high concentrations of the constituents in mine drainage, including very high levels of total dissolved solids. Process water may also contain detectable amounts of metals. If a coal preparation plant is proposed in an anti-degradation watershed, the appropriate technology is nondischarge. These plants will be expected to operate a closed-system with collection, treatment and reuse of the process water. If process water must be discharged periodically, the discharge will be conveyed to a non-HQ/EV stream. Solids from the cleaning process and treatment sludge must also be disposed of outside the watershed. The ABACT for stormwater runoff that may come in contact with acid-forming and toxic materials on the site is the ABACT for pumped stormwater discharges described in Section 5.

Process water from most industrial mineral processing facilities is high in suspended solids, and occasionally high in dissolved solids. The ABACT for these waters consists primarily of collection, settling and reuse. Excess water is given enhanced physical/chemical treatment or effluent polishing, which may include additional ponds. The water is then discharged to infiltration ponds or wetland systems or discharged via overland flow depending on the geologic and topographic characteristics of the site.

APPENDIX E

ANTI-DEGRADATION BEST AVAILABLE COMBINATION OF TECHNOLOGIES FOR OIL AND GAS ACTIVITIES

Technologies for discharges of wastewaters from oil and/or gas development to High Quality or Exceptional Value waters consist of a hierarchy of preferred treatment/disposal techniques which consider technical and economic feasibility as well as projected water quality impacts. This hierarchy is designed to minimize or eliminate surface water discharges, maintain existing surface water quality, and achieve the ultimate goal of the Department's Principles for Groundwater Pollution Prevention and Remediation (http://www.dep.state.pa.us directLINK "Drinking Water Publications") which is to prevent groundwater contamination whenever possible. For methods which involve a stream discharge, *effluent limits developed as part of* Anti-degradation Best Available *Combination of* Technologies (ABACT) also apply (see Section 3 of this Appendix). One of the following technologies or a DEP approved equivalent, must be applied to oil and/or gas discharges in High Quality or Exceptional Value waters. These wastewater treatment processes must also be combined with effective erosion control *(Chapter 11)* and stormwater management *(Appendix F)* in order to minimize the total impact of the activity on the watershed.

1. Disposal Wells

The most preferred T/D technology for High Quality or Exceptional Value waters is deep well injection because it returns oil and gas development fluids to geologic strata that approximate their point of origin. There is no discharge to surface or groundwaters and consequently no need for a National Pollutant Discharge Elimination System (NPDES) permit. If properly done, this method should not degrade existing water quality and therefore no Social or Economic Justification (SEJ) would be required.

The best opportunity for developing a successful disposal well in Pennsylvania exists in the many depleted oil and gas reservoirs scattered throughout the Commonwealth. Depleted gas reservoirs that have sufficient permeability to accept large volumes of water can make ideal disposal reservoirs when the wells that open to the reservoir can be located and monitored or plugged.

Two permits are required before a disposal well may be constructed and operated: a well permit (or registration) under the Oil and Gas Act; and an underground injection control (UIC) permit from EPA. For a description of the requirement for obtaining these permits, refer to the Oil and Gas Wastewater Permitting Manual - 550-2100-002 - (http://www.dep.state.pa.us directLINK "Public Participation") which is available from the Bureau of Oil and Gas Management. Prior to preparation and submittal of a disposal well application, it is recommended that the applicant and/or the design engineer arrange a preliminary technical conference with the Regional Oil and Gas Manager. For a listing of the federal requirements of the Underground Injection Control program contact the U.S. EPA Drinking/Ground Water Protection Branch, Region III, 1650 Arch Street, Philadelphia, PA 19103 (215/814-5445).

2. Collection and Discharge to Existing Treatment Facility

If deep well injection is not technically feasible, the next most preferred technology is collection and discharge to an existing industrial waste or sewage treatment facility on a stream that is not designated HQ or EV. The existing NPDES permit for the receiving facility must be amended to accommodate the new wasteload if the current permitted capacity of the treatment plant is exceeded. However, no SEJ is required unless the existing treatment plant discharges to High Quality waters.

This method involves collecting the wastewater and hauling it to an industrial waste or sewage treatment facility which is approved to accept brines and fluids from oil and gas exploration and development operations. These facilities operate under an NPDES and Part II Water Quality Management permits issued by the Department. They treat the wastewater to the point where it is suitable for discharge to surface waters. The

wastewaters must be collected in tanks or pits that are impermeable and any pit used for the storage of production fluids must have an identification number issued by the Department.

For more information on brine, sewage and industrial waste treatment facilities that accept wastewaters from oil and gas operations, contact the DEP's Bureau of Oil and Gas Management Regional Office in Pittsburgh (412) 442-4000 or Meadville (814) 332-6860.

3. Treatment and Discharge to Surface Water

The least preferred oil and gas T/D technology in High Quality waters is on-site treatment and discharge of production fluids to surface waters. These discharges require Part I NPDES and Part II Water Quality Management permits. The NPDES permit establishes appropriate effluent limitations, monitoring and reporting requirements, and compliance schedules and in High Quality watersheds may be applied only to production fluids. SEJ is required if the discharge causes a measurable change in existing quality of the receiving stream. The treatment and discharge of drilling, fracing and servicing fluids is prohibited in High Quality and Exceptional Value watersheds. The Part II construction/operation permit authorizes the construction and operation of the treatment plant for treating the wastewaters being discharged.

Where this technology is employed, a discharger must provide, as a minimum, the more stringent of ABACT or water quality-based effluent limitations (WQBELs). WQBELs are developed to assure compliance with water quality criteria at a specific design stream flow. Where the proposed activity/project is socially or economically justified, the seven consecutive day, ten year low flow ($Q_{7\ 10}$) is used to calculate the WQBEL. For proposed discharges to HQ waters where the proposed activity is not socially or economically necessary, the effluent requirements are designed to assure no adverse measurable change in water quality and calculated using the more stringent of median or $Q_{7\text{-}10}$ stream flow.

Effluent limits associated with ABACT for Oil and Gas activities are defined below.

Parameter	***Effluent Limits (mg/l)***
Acidity	*< Alkalinity*
Suspended Solids	*10*
pH	*6.5-9.0 (units)*
Total Iron	*1.5*
Dissolved Oxygen	*6.0*
Oil and Grease	*10*
Benzene, Toluene, Xylene and Ethylbenzene	*not detectable with the most sensitive analytical method described in Chapter 16 of Title 25 of the Pa Code.*
Other Parameters as needed	*- - - Determined by the size and characteristics of the proposed discharge - - -*

These values are expressed as average monthly effluent limitations and additional parameters may be evaluated if necessary.

The following treatment processes are suggested to achieve ABACT:

1. Chemical addition for pH control and metals removal.
2. Aeration (or equivalent technology) to reduce volatile hydrocarbons and oxidize metals.
3. Gravity separation and surface skimming (or equivalent technology) for oil and grease removal.
4. Settling or filtration for removal of solids and oxidized metals.

5. Treatment to remove MBAS.

6. Flow equalization to ensure optimal treatment efficiency.

All of the above treatment/disposal technologies can be enhanced with procedures designed to minimize wastewater volume and properly contain all fluids and wastes produced. A list of fluid management alternatives is included below. As many of these procedures as are technically feasible must be implemented on oil and gas operations in High Quality watersheds in an effort to reduce wastewater volume.

a. On-site Fluids Handling and Storage

Proper control and storage of fluid and waste produced during drilling, operation, servicing and plugging of the well are essential to the protection of surface and ground water. Pollutional substances and wastes resulting from these operations must be contained in a pit or tank or a series of pits and tanks. This includes brine, drill cuttings, drilling muds, oils, stimulation fluids, well treatment and servicing fluids, drilling fluids other than gases and other pollutional substances. Pits and tanks must be impermeable, structurally sound, reasonably protected from unauthorized acts of third parties and have sufficient capacity to contain the fluids and wastes. For detailed information on the requirement for on-site control and disposal of wastes and pollutional substances refer to the Oil and Gas Operators Manual 550-0300-001 (http://www.dep.state.pa.us directLINK "Public Participation").

b. Fluid Volume Reduction and Reuse

One of the most efficient waste fluid management alternatives is fluid volume reduction and fluid reuse. Any fluid that can be reused or recycled represents a savings in disposal costs and a benefit to the environment. Although the procedures listed below may not be appropriate for all operations, every operator must, where appropriate, incorporate selected techniques to reduce waste fluid generation in High Quality watersheds. A number of suggested alternative practices follow.

(1) Recycling of Produced Fluids

Perhaps the best example of efficient reuse of produced water is in recycling or closed-loop enhanced recovery operations. Waterfloods, when operationally feasible, should be set up to collect the water produced from the wells and reinject the fluid back through the system. Under this concept, no discharge to surface or groundwater occurs. In some situations, it may be possible to use produced fluids generated at one location as make-up water at a closed-loop recycle operation.

Another example for the reuse of produced fluids is for pressure maintenance at an enhanced gas recovery operation. In this case, the brine is collected from the other gas wells in the area and transported to the injection well. The brine is injected into the gas reservoir at specific locations to maintain pressure on the gas reservoir and enhance gas production.

(2) Drilling and Completion Procedures that Reduce Fluid Volumes

The following procedures have been demonstrated to be effective in fluid volume reduction in Pennsylvania during well drilling and completion phases:

- **Groundwater Protective Casing (Surface Casing)**

  The major purpose for installing groundwater protective casing is to keep groundwater out of the well during drilling and production. This protects groundwater quality and avoids

dewatering shallow aquifers. Groundwater protective casing must be set deep enough to shut off all fresh groundwater and cemented in accordance with 25 Pa Code Section 78.81-78.86.

- **Continuous Air Drilling**

  When water, saline or fresh, is encountered during drilling, the well should be completed as rapidly as possible to minimize the time water is being blown back to the surface. Drilling on a 24-hour schedule to eliminate daily blow off of water accumulated in the well bore and doing everything possible to reduce the likelihood of an extra "trip" can result in substantial savings in terms of water blown to the pit.

- **Cable Tool Drilling**

  In some situations cable tool drilling may be preferred to air rotary drilling to limit the volume of water brought to the surface. Although the fresh groundwater zone is exposed for a longer time, the only surface discharge expected during cable tool drilling occurs when the cuttings are bailed out of the hole.

- **Intermediate Strings**

  In some areas, while drilling below the surface casing, specific geologic horizons or zones produce large quantities of brine during air drilling. While it is sometimes possible to overcome this water with large air volumes or pressures, it may be desirable to shut these zones off with intermediate strings of casing. In this procedure the formation or zone is fully penetrated, a string of pipe is placed in the hole and a seal established at the bottom of the pipe. The seal may be made permanent by cementing the annular space between the well bore and the intermediate casing back to the surface, or spotting cement over the salt water producing zone.

- **Plugging Water Bearing Zone**

  In this procedure, cement or another water blocking material, is placed over the water producing zone. This may be done under elevated pressure to promote penetration of the formation with the water blocking material. This technique is usually not as successful as using intermediate casing.

- **Fluid or Mud Drilling**

  For deep wells or in areas where it is anticipated that the operator will encounter large volumes of water, drilling with fluid or mud can be very effective in reducing the volume of wastewater produced. When a closed loop system is used the drilling fluid is continuously recycled down the hole to remove cuttings to the surface. The high hydrostatic head in the well bore prevents large inflows of formation water that might otherwise be blown to the surface during air drilling. Although mud or fluid drilling represents an effective water control alternative for drilling, this practice results in the additional problem of mud disposal.

(3) Stimulation Procedures that Reduce Fluid Volumes

A number of techniques are available to reduce the waste-fluid volume generated by hydrofracturing. Several of these involve use or re-use (recycling) of previously-generated fluids. Other methods involve reduction of fluid volumes required to treat the well.

- **Re-Use of Frac Water**

  By containing the flow back from a well after hydrofracturing, it is possible to re-use some of the water on successive stages of the same job or on other wells. On-site pretreatment such as flocculation, settling or filtration may be necessary to re-use the water. This activity has a dual advantage in that: 1) flow-back water is carefully controlled and not allowed to spill onto the land surface or discharge to streams and 2) the total volume of water required is reduced. The re-use of frac water has caused formation plugging and may not be acceptable for every operation.

- **Use of Production Brines in Frac**

  In some situations it is possible to utilize production brine to hydrofracture wells. The use of brines in this manner reduces the total volume of wastewater generated. Again, pretreatment may be necessary as formation plugging can result.

- **Use of Pit Water to Frac**

  Like production brine, pit water which consists of drilling and perhaps frac water may in some applications, be used for stimulation. Again, pretreatment may be necessary.

- **Use of Efficient Frac Fluids**

  Recently developed hydrofracturing fluid systems are so efficient in transporting and depositing the propping agent in the created fracture that smaller volumes of fluid can achieve excellent results. One example is the foam frac which consists of a gas and water phase with large concentrations of surfactants. This system can reduce the water requirements by more than 75% over conventional gel or water fracs. Sand concentrations in excess of 15 pounds per gallon of water are possible. While this system is not used in open hole completions because of the danger involved, it is an effective fluid reduction technique in cased wells. Although it is a more expensive method, great reductions in spent fracturing fluid, water handling, clean-up and storage and reservoir damage are definite benefits. The results of this type of fracturing may be unsatisfactory in some formations.

(4) Water-Oil Ratio Improvement Chemicals

Water-oil ratio improvement chemicals consist of polymeric materials which decrease the relative permeability of the rock to water as compared to oil. They are introduced into the formation by pumping under pressure. Thus, a more favorable water-to-oil ratio is achieved.

(5) Evaporation

Natural evaporation from open holding ponds as a waste fluid disposal alternative is not viable, year-round in Pennsylvania. The average yearly precipitation throughout the state exceeds evapotranspiration by 10 to 24 inches. As a result, uncovered impoundments that may be utilized to evaporate waste water would increase in fluid volume from precipitation rather than decrease in volume through evaporation. Only during selected months does evaporation occur at a significant rate in Pennsylvania. However, even during these months, precipitation may exceed the reported evaporation rate.

Innovative systems that enhance evaporation artificially, however, may be viable methods of wastewater reduction or disposal. Such systems, using waste heat at compressor stations, exist in Pennsylvania today and have proven to be effective.

APPENDIX F

ANTI-DEGRADATION BEST AVAILABLE COMBINATION OF TECHNOLOGIES FOR STORMWATER MANAGEMENT

The objective of storm water management, both during and after construction, is to maintain and/or enhance the surface and groundwater conditions that existed before a change in land use. Key components of storm water management include provisions for the recharge of groundwater, removal of pollutants, and minimization of accelerated runoff and resultant peak flows

Effective storm water management is an important component of comprehensive watershed management. Storm water runoff when not managed effectively may result in: increases in flood frequencies and threats to local and downstream communities; increases in stream flow velocities causing bed and bank scour, steam realignment, and sediment deposition which diminishes the carrying capacity and efficiency of streams; increases in pollutant discharges affecting water quality, habitat and aquatic life; increases in municipal costs to improve, manage, and maintain facilities to carry and control storm water; and reductions in groundwater recharge which slowly depletes groundwater resources affecting public and private wells and base flows for streams.

Through the construction, operation and maintenance of various BMPs into comprehensive site plans, storm water in High Quality and Exceptional Value watersheds can be managed effectively and efficiently The selection of the BMPs is dependent on specific site conditions, and the anticipated characteristics of the storm water generated. The use of multiple BMPs in series or arranged in other ways designed to complement each may be necessary to achieve the goals of controlling the volume and quality of stormwater runoff and groundwater recharge. For example, filter strips or constructed wetlands provide water quality treatment before allowing the water to discharge through detention ponds or recharge to groundwater through infiltration trenches. The following table identifies some of the more common BMPs that may be used for activities located in HQ or EV watersheds.

• Grass Buffer	• Constructed Wetland (Basin)
• Grass Swale	• Constructed Wetland (Channel)
• Porous Pavement	• Retention Pond
• Porous Landscape Detention	• Sand Filter Extended Detention
• Extended Detention Basin	• Grit-Oil Separator
• Water Quality Inlet Pretreatment	• Underground Storage/Treatment
• Infiltration Trench	• Pollution Prevention (Materials Management, Source Control, Maintenance, Non-structural BMPs etc.)

Additional information on these BMPs can be found in the Pennsylvania Handbook of Best Management Practices for Developing Areas.

The following are key focus points for developing a storm water management plan:

- Preserve and utilize natural site conditions and minimize impervious areas to reduce the need for structural storm water controls
- Develop a ground and surface water budget for pre and post-development to aid in the selection and design of BMPs to maintain pre-development conditions
- Maximize use of non -discharge alternatives to encourage groundwater recharge and minimize runoff
- Long term operation and maintenance of the BMPs---Who, What, Where, When, How?
- Compatibility of storm water management with existing site conditions (low impact development), benefits to resources, regional watershed management, local land use/zoning requirements, and project economics.

NOTE: The Department is in the process of refining the performance standards and administrative mechanism for approval of post-construction storm water controls. Upon full public participation and final adoption of the new policy, relevant provisions will be incorporated into this guidance.

APPENDIX G

CHAPTER 23 OF TITLE 25 PA CODE
ENVIRONMENTAL QUALITY BOARD POLICY FOR PROCESSING PETITIONS - STATEMENT OF POLICY

§23.1. Petitions

(a) Petitions shall be submitted on forms supplied by the Department to the Secretary of the Department of Environmental Protection, Rachel Carson State Office Building, Post Office Box 2063, Harrisburg, Pennsylvania 17105-2063, and shall contain the following information:

(1) The petitioner's name, address and telephone number.

(2) A description of the action requested in the petition and one of the following:

(i) Suggested regulatory language if the petition requests that the EQB adopt or amend regulations.

(ii) A specific citation to the regulations to be repealed if the petition requests that the EQB repeal existing regulations.

(3) The reason the petitioner is requesting this action from the EQB, including factual and legal contentions as well as supporting documentation which establish the petitioner's justification for the requested action by the EQB.

(4) The types of persons, businesses and organizations likely to be impacted by this proposal.

(5) For petitions for redesignation of streams under Chapter 93 (relating to water quality standards) and the Clean Streams Law (35 P.S. §§691.1-691.1001), the petition shall include the following information to satisfy §23.1(3):

(i) A clear delineation of the watershed or stream segment to be redesignated, both in narrative form and on a map.

(ii) The current designated use(s) of the watershed or segment.

(iii) The requested designated use(s) of the watershed or segment.

(iv) Available technical data on instream conditions for the following: water chemistry, the aquatic community (benthic macroinvertebrates and/or fishes), or instream habitat. If such data are not included, provide a description of the data sources investigated.

(v) A description of existing and proposed point and nonpoint source discharges and their impact on water quality and/or the aquatic community. The names, locations, and permit numbers of point source discharges and a description of the types and locations of nonpoint source discharges should be listed.

(vi) Information regarding any of the qualifiers for designation as high quality waters (HQ) or exceptional value waters (EV) in §93.4b (relating to qualifying as high quality or exceptional value waters) used as a basis for the requested designation.

(vii) A general description of land use and development patterns in the watershed. Examples include the amount or percentage of public lands (including ownership) and the amount or percentage of various land use types (such as residential, commercial, industrial, agricultural, etc.)

(viii) The names of all municipalities through which the watershed or segment flows, including an official contact name and address.

(ix) Locational information relevant to subparagraphs (iv)-(viii) (except for contact names and addresses) displayed on a map or maps, if possible.

(b) The general procedures in this chapter apply to petitions unless the EQB adopts specific procedures for a particular type of petition. Special procedures have been adopted for petitions requesting that the EQB designate an area as unsuitable for mining activity. These petitions are reviewed under Chapter 86 (relating to surface and underground coal mining: general).

§23.2. Departmental review.

The Department will examine the petition to determine if it meets the following conditions:

(1) The petition is complete as required by §23.1 (relating to petitions).

(2) The petition requests an action that can be taken by the EQB.

(3) The requested action does not conflict with Federal law.

§23.3. Notification.

The Department will notify the EQB and petitioner of its determination within 30 days of receipt of the petition. If the Department determines that the petition is not appropriate for submittal to the EQB because it does not meet each of the conditions in §23.2 (relating to Departmental review), the Department's notification shall state the reasons for its determination and give the petitioner 30 days to complete the petition or modify the request.

§23.4. Oral presentation.

At the next EQB meeting occurring at least 15 days after the Department's determination that a petition is appropriate for consideration by the EQB, the Chairperson of the EQB shall inform the EQB of the petition for rulemaking, the nature of the request ad the petitioner. The Chairperson shall give the petitioner or the petitioner's representative the opportunity to make a 5-minute oral presentation on why the EQB should accept the petition. The Department will also make a recommendation on whether the EQB should accept the petition.

§23.5. Board determination.

Te EQB may refuse to accept a petition if it determines that one or more of the following conditions exist:

(1) The EQB has within the previous 2 years considered the issue addressed by the petition for rulemaking as part of an earlier decision concerning the adoption, amendment or deletion of a regulation.

(2) The action requested by the petitioner concerns a matter currently in litigation.

(3) The requested action is not appropriate for rulemaking by the EQB due to policy or regulatory considerations.

(4) The petition involves an issue previously considered by the EQB, and it does not contain information that is new or sufficiently different to warrant reconsideration of that decision. If a petition does present

new or sufficiently different information, this information must have been either unavailable at the time of the EQB's previous decision or not contained in the record of the proceeding in which the previous decision was made.

§23.6. Notice of acceptance and Department report.

If the EQB accepts the petition, a notice of acceptance will be published in the *Pennsylvania Bulletin* within 30 days. In addition, a report will be prepared in accordance with one of the following procedures:

(1) *Petitions other than stream redesignation petitions.* The Department will prepare a report evaluating the petition within 60 days. If the report cannot be completed within the 60-day period, at the next EQB meeting the Department will state how much additional time is necessary to complete the report. The Department's report will include a recommendation on whether the EQB should approve the action requested in the petition. If the recommendation is to change a regulation, the report will also specify the anticipated date that the EQB will consider a proposed rulemaking.

(2) *Stream redesignation petitions.* The Department will publish notice of its intent to assess the waters subject to evaluation. The notice will include a request for submittal of technical data that interested persons have. Following the assessment and review of all technical data, the Department will prepare a draft evaluation report.

§23.7. Response to report.

Upon completing the report, the Department will send a copy of the report to the petitioner. Within 30 days of the mailing of the report, the petitioner ma submit to the Department a written response to the report.

§23.8. Board consideration.

The Department will prepare a recommendation to the EQB based on the report and comments received from the petitioner. If regulatory amendments are recommended, the Department will develop a proposed rulemaking for EQB consideration within 6 months after the Department mailed its report to the petitioner. If regulatory amendments are not recommended, the Department will present its recommendation and basis to the EQB at the first meeting occurring at least 45 days after the Department mailed its report to the petitioner.

Commonwealth of Pennsylvania
Environmental Quality Board

PETITION FORM

I. PETITIONER INFORMATION

A. Name: _____

B. Mailing Address: _____

_____

_____

C. Telephone Number: _____

D. Date: _____

II. PETITION INFORMATION

A. The petitioner requests the Environmental Quality Board to: (check one of the following)

☐ Adopt a regulation

☐ Amend a regulation (Citation _____)

☐ Repeal a regulation (Citation _____)

B. Why is the petitioner requesting this action from the Board? (Describe problems encountered under current regulations.)

C. Describe the content of the petition. (Describe what changes are being recommended to address the problems noted in Section B.)

D. What types of persons, businesses and organizations would be affected by this proposal?

E. State factual and legal contentions as well as supporting documentation which establishes a clear justification for the requested action by the Board.

All petitions should be submitted to the
Secretary of the Department of Environmental Protection
P.O. Box 2063
Harrisburg, PA 17105-2063

This guidance document and related environmental information are available electronically via Internet. For more information, visit us through the PA PowerPort at http://www.state.pa.us or visit DEP directly at http://www.dep.state.pa.us (directLINK "Water Quality Assessment and Standards").

www.GreenWorks.tv - A web space dedicated to helping you learn how to protect and improve the environment. The site features the largest collection of environmental videos available on the Internet and is produced by the nonprofit Environmental Fund for Pennsylvania, with financial support from the Pennsylvania Department of Environmental Protection, 877-PA-GREEN.

Bureau of Water Supply and Wastewater Management
P.O. Box 8467
Harrisburg, PA 17105-8467

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