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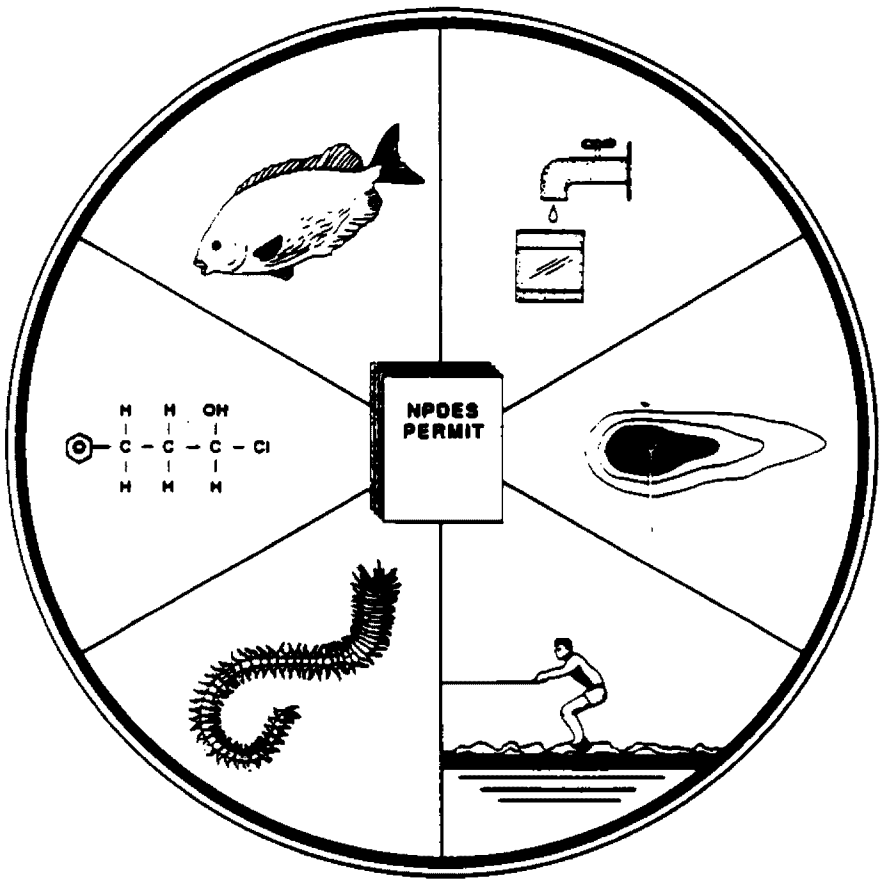
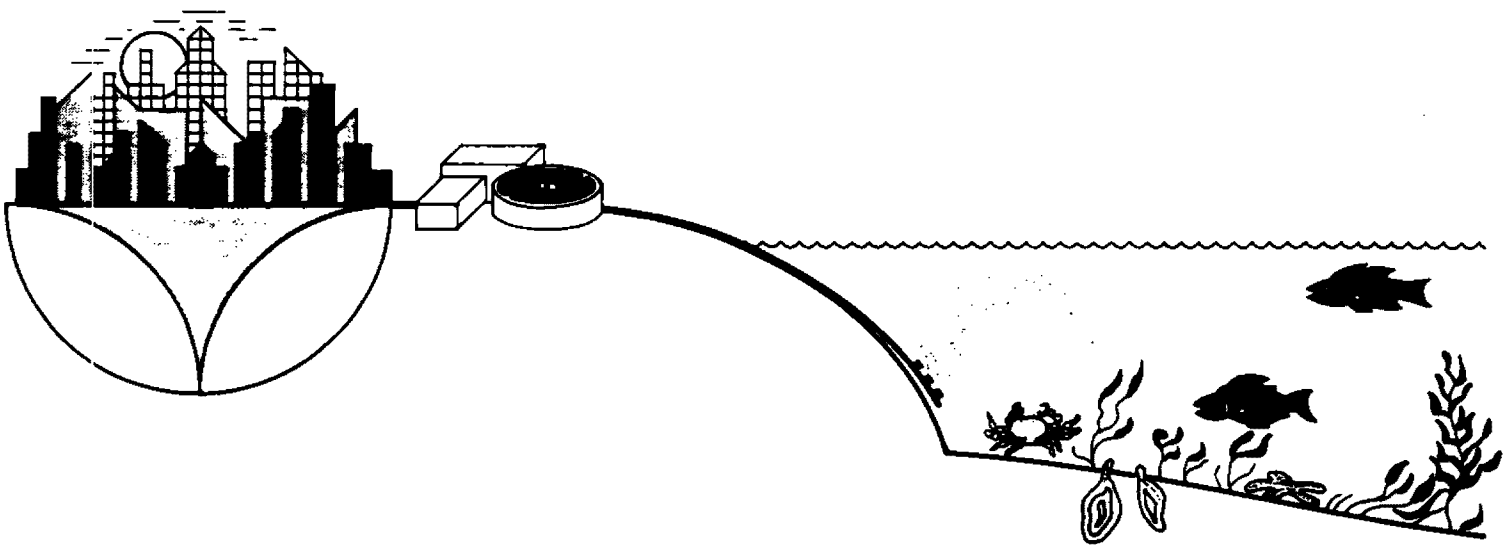
301(h) PERMIT REISSUANCE GUIDANCE DOCUMENT FOR SMALL DISCHARGERS





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301(h) PERMIT REISSUANCE GUIDANCE DOCUMENT FOR SMALL DISCHARGERS

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This guidance document was prepared by the contractor to provide small municipal dischargers and the U.S. Environmental Protection Agency (EPA) with technical guidance on the preparation and evaluation of applications for reissuance of Section 301(h) modified NPDES permits.

CONTENTS

FIGURES

TABLES

ACKNOWLEDGEMENTS

This guidance document was prepared by Tetra Tech, Inc. for the U.S. Environmental Protection Agency under the Section 301(h) pre-decision technical support contract No. 68-01-6922, Mr. Barry Burgan, Project Officer. The primary author was Dr. Gordon R. Bilyard. Dr. A. Mills Soldate assisted with the presentation of technical information. Ms. Marcy Brooks-McAuliffe edited the document and supervised document production.

This document has been reviewed by the 301(h) Task Force and the Office of General Counsel of the U.S. Environmental Protection Agency. The Task Force includes representatives from the Water Management Divisions of U.S. EPA Regions I, II, III, IV, IX, and X; the Office of Research and Development - Environmental Research Laboratory - Narragansett (located in Narragansett, RI and Newport, OR); and the Marine Operations Division in the Office of Marine and Estuarine Protection, Office of Water.

INTRODUCTION

Modified National Pollutant Discharge Elimination System (NPDES) permits have been issued to many publicly owned treatment works (POTWs) discharging to the marine environment under Section 301(h) of the Clean Water Act. The first of these permits to expire will be small discharger permits. Small dischargers are defined as POTWs that (U.S. EPA 1982, p. 53676)

> "have contributing populations of less than 50,000 people and average dry weather flows of less than 5.0 mgd (million gallons per day). For the purposes of this document the contributing population and flows shall be based on projections for the end of the five year permit term. Average dry weather flows shall be the average daily total discharge flows for the maximum month of the dry weather season"

POTWs that were classified as small dischargers under their original Section 301(h) modified permits, but that no longer meet the conditions of the foregoing definition or that are not expected to meet the conditions of the foregoing definition during the term of the new permit, must apply for reissuance of their Section 301(h) modified permit as a large discharger.

This document identifies the regulatory requirements applicable to reissuance of Section 301(h) modified permits held by small dischargers, and presents a framework for meeting those requirements. Assessments and data analyses that are needed for small dischargers to satisfy applicable regulatory requirements, and methods by which regulatory personnel may evaluate compliance with regulatory requirements are also discussed. The U.S. Environmental Protection Agency (EPA) believes that applicants for permit reissuance and regulatory personnel in the Regional offices of the U.S. EPA will benefit greatly by following the guidance provided in this document. The regulatory requirements and assessments applicable to reissuance of

Section 301(h) modified permits held by large dischargers will be provided at a later date.

BACKGROUND

The first modified NPDES permits under Section 301(h) of the Clean Water Act were issued during 1983. Each of these permits is for a 5-yr period. At least 180 days prior to the expiration of these permits, POTWs holding such permits must apply for the reissuance of their NPDES permits and may at the same time apply for reissuance of their Section 301(h) modification as stipulated in 40 CFR 125.59(g)(6), 122.21(d), and 124.3. Six Section 301(h) modified permits will expire during the next two fiscal years (FY 88 and FY 89). All six permits are for small dischargers [serving populations of less than 50,000 and having average dry-weather flows of less than 0.22 m^3/sec (5 MGD)]. One of these discharges is in New Hampshire (Region I), and five are in Alaska (Region X). The first Section 301(h) modified permit for a large discharger will expire in FY 90.

POTWs that apply for reissuance of their Section 301(h) modification "should be prepared to support the continuation of the modification based on studies and monitoring performed during the life of the permit" [40 CFR 125.59(g)(6)]. However, neither the aforementioned subsection nor other parts of 40 CFR 125 Subpart G [Criteria for Modifying the Secondary Treatment Requirements under Section 301(h) of the Clean Water Act] provide specific guidance on how the results of studies and monitoring should be used to support the application for reissuance of the permit. Subsection 40 CFR 125.59(g)(6) states only that "upon a demonstration meeting the statutory criteria and requirements of this subpart, the permit may be renewed under applicable procedures of 40 CFR Part 124."

The revised Section 301(h) regulations (U.S. EPA 1982) recognize the limited financial resources of most small applicants and the lower potential for environmental impacts typically associated with small discharges. The revised Section 301(h) regulations therefore provide separate questionnaires for small and large applicants, with fewer requirements placed on small applicants. In 1982, U.S. EPA made available to potential applicants a

technical support document (Tetra Tech 1982b) that provided guidance on responding to the questionnaires required of small and large applicants. General guidance provided for small applicants in the 1982 technical support document should still be useful for the preparation of applications for permit reissuance and for evaluation of those applications by the U.S. EPA Regions. However, a need now exists for guidance specific to the permit reissuance process.

PURPOSE AND SCOPE

This guidance document provides the needed guidance specific to reissuance of Section 301(h) permits for small dischargers. [Additional guidance for large dischargers seeking reissuance of their Section 301(h) modified permits will be provided at a later date.] This document serves two major purposes:

- It identifies the regulatory requirements applicable to reissuance of Section 301(h) modified permits
- It provides technical explanations of the assessments and data analyses needed to satisfy applicable regulatory requirements.

The revised Section 301(h) regulations do not provide specific guidance on the level of detail required in applications for reissuance of Section 301(h) modified permits. Therefore, the Regions have considerable discretion regarding the level of detail that is necessary to demonstrate continued compliance of these permittees with the Section 301(h) statutory and regulatory criteria. This document addresses the appropriate levels of detail that the Regions may require of permittees during the permit reissuance process. Just as the revised Section 301(h) regulations and the 1982 technical support document (Tetra Tech 1982b) discussed simplified methods for small dischargers to demonstrate compliance with certain 301(h) criteria, guidance is provided herein on how the reapplication process can be streamlined for small dischargers.

This document also provides the Regions with procedures for evaluating compliance with Section 301(h) regulatory requirements. Appropriate uses of monitoring data to evaluate compliance with regulatory criteria are discussed, including the use of monitoring data to evaluate predictions of conditions that were expected to occur during the term of the Section 301(h) modified permit. Guidance is also provided to the Regions on how to evaluate the presence or absence of environmental impacts, and whether those impacts comply with 301(h) criteria.

Having reached a decision regarding an application for reissuance of a Section 301(h) modified permit, the Region may reissue the Section 301(h) modified permit with the same or different permit conditions, or deny the Section 301(h) application. In the case of denial, the permit would then be reissued by U.S. EPA (or, in NPDES-delegated states, by the state) with secondary treatment requirements. This document defines the conditions under which each of these actions is appropriate, and provides the Regions with guidance on procedures for reissuing and terminating Section 301(h) modified permits. Guidance on the preparation of NPDES permits has been published by the U.S. EPA (1986b) and is not discussed in this document.

Monitoring data that are collected during the term of the modified permit are submitted to the Regions in accordance with procedures set forth in the permit. These data are used by the Regions to determine continuing compliance with the terms and conditions of the permit, and with Section 301(h) regulations. The purpose of this document is not to provide guidance to the Regions on the conduct of ongoing evaluations of monitoring data during the terms of the modified permits. However, much of the guidance provided below is applicable to such evaluations. In the event that an ongoing evaluation of monitoring data indicates the presence of adverse impacts, the Region may modify, or revoke and reissue, the discharger's NPDES permit in accordance with procedures set forth in Section 122.62.

REGULATORY REQUIREMENTS

BASIS FOR PERMIT REISSUANCE

The basis for permit reissuance is found in 40 CFR 125.59(g)(6):

> "At the expiration of the section 301(h) modified permit, the POTW should be prepared to support the continuation of the modification based on studies and monitoring performed during the life of the permit. Upon a demonstration meeting the statutory criteria and requirements of this subpart, the permit may be renewed under the applicable procedures of 40 CFR Part 124."

This clause mandates that two actions occur before a permit is reissued. First, the POTW "should be prepared to support the continuation of the modification based on studies and monitoring performed during the life of the permit." Second, a demonstration should be made that the criteria and requirements of 40 CFR 125 Subpart G are met. This clause does not specify that POTWs holding Section 301(h) modified permits must prepare applications for permit reissuance. However, each application for permit reissuance is considered to be an application for a completely new NPDES permit. Therefore, a new, completed application for reissuance of a Section 301(h) modified permit is required of each applicant, and that application must contain all relevant information and demonstrations required by 40 CFR 125 Subpart G. This document addresses all technical issues associated with the preparation and evaluation of such an application. However, areas are identified where the application process can be simplified, thereby reducing the financial burden to small applicants.

STATUTORY CRITERIA AND REQUIREMENTS

Statutes and regulations that are applicable to applications for reissuance of Section 301(h) modified permits are discussed below. They include regulations applicable to the issuance of NPDES permits (40 CFR Part 122), the Section 301(h) regulations (40 CFR 125 Subpart G), the 1982 revised Section 301(h) regulations, and the Water Quality Act of 1987.

40 CFR Part 122. EPA Administered Programs: The National Pollutant Discharge Elimination System

Subsection 122.21(d). Duty to Apply--

Under this subsection, POTWs with an existing NPDES permit must submit an application for a new NPDES permit a minimum of 180 days before the expiration date of the existing permit. The applicant may request that the new application be submitted after the applicable submittal date, and the Region may grant such a request. The Region may grant permission for an application to be submitted up to the expiration date of the existing permit. Upon review of an application, the Region may determine that additional information is needed to determine compliance with 301(h) regulations and permit conditions. Such information may be requested at any time (including after the application deadline has passed) in accordance with Subsection 122.41(h).

Subsection 122.21(d) allows POTWs to submit applications for reissuance of Section 301(h) modified permits up to the expiration date of the existing permit, upon approval by the Regions. However, it is strongly recommended that POTWs submit their applications for reissuance of Section 301(h) modified permits as early as possible, and no later than 180 days prior to expiration of the existing permit. This early submittal is particularly important because of the need to establish compliance with the recent statutory amendments to Section 301(h). As is discussed below, early submittal gives the Regions time to review applications for completeness, and to request any information needed to complete applications before existing permits expire. An applicant must submit a completed application

containing all required information prior to expiration of the existing permit, or at the time the application is due, whichever is first. Timely submittal of a completed application is required to qualify for the continuation described below.

Section 122.6. Continuation of Expiring Permits--

A permittee may have submitted a complete, timely application to the Region, but through no fault of the permittee, the Region may not have issued a new permit with an effective date on or before expiration of the previous permit. This section provides that in those cases, the previous permit will remain fully effective and enforceable, pursuant to the Administrative Procedures Act.

40 CFR 125 Subpart G

Section 125.56. Scope and Purpose--

40 CFR 125 Subpart G establishes the criteria by which the U.S. EPA evaluates requests for Section 301(h) modified permits. It also establishes special permit conditions that must be included in Section 301(h) modified permits. The criteria established in this subpart are affected by the provisions of Section 303 of the Water Quality Act of 1987. This subpart is presently being revised to reflect those provisions. Because the revisions are not yet completed, the provisions of Subpart 303 of the Water Quality Act of 1987 are discussed separately below.

Section 125.57. Law Governing Issuance of a Section 301(h) Modified Permit--

All applicants for Section 301(h) modified permits must demonstrate satisfactorily to the U.S. EPA that seven requirements will be met by the modified discharge. The importance of each of these requirements to permittees applying for reissuance of Section 301(h) modified permits is discussed below.

1. An applicant must demonstrate that an applicable water quality standard exists for each pollutant for which the modification is requested. Details of this requirement are given in Section 125.60. Demonstrations that applicable water quality standards exist will be superfluous for reissuance of Section 301(h) modified permits because the original Section 301(h) modified permit was based, in part, on successful demonstrations that such standards exist. However, as specified in Section 125.60, an applicant must demonstrate that the modified discharge will comply with applicable water quality standards. An applicant must also provide a determination signed by an authorized state or interstate agency, stating that the modified discharge will comply with state law. Both the demonstration of compliance with applicable water quality standards and the state's determination are required of applicants for reissuance of Section 301(h) modified permits.

2. An applicant must demonstrate that the modified discharge will result in water quality that assures the protection of public water supplies; assures the protection and propagation of a balanced indigenous population of fish, shellfish, and wildlife; and allows for recreational activities. Specific demonstrations that must be performed by an applicant are specified in Section 125.61. All are required of applicants for reissuance of Section 301(h) modified permits.

3. An applicant must demonstrate that a monitoring program has been established that is capable of documenting the impact of the modified discharge on a representative sample of aquatic biota. General requirements of the monitoring program design and specific requirements applicable to the biological, water quality, and effluent monitoring programs are specified in Section 125.62. Demonstrating that an effective monitoring program has been established will be simple for most POTWs applying for reissuance of Section 301(h) modified permits because monitoring data will have been collected over the

life of the existing modified permit. However, the U.S. EPA may require an applicant to demonstrate the effectiveness of an established monitoring program when the quality of the data is suspect, or when incomplete data have been submitted to the U.S. EPA.

4. An applicant must demonstrate that the modified discharge will not result in additional requirements on other point or nonpoint sources of pollutants. Section 125.63 reiterates the necessity of this demonstration, and requires an applicant to provide a determination signed by an authorized state or interstate agency indicating whether the modified discharge will result in any such additional requirements. The foregoing demonstration and determination of compliance are required of applicants for reissuance of Section 301(h) modified permits.

5. An applicant must demonstrate that pretreatment requirements for sources that introduce industrial wastes into the treatment works will be enforced. This demonstration includes chemical analysis of the discharge for all toxic pollutants and pesticides, identification of sources of toxic pollutants and pesticides, and development and implementation of an approved industrial pretreatment program, as specified in Section 125.64. However, these requirements are waived for small applicants that certify that there are no known or suspected sources of toxic pollutants and pesticides, and that document the certification with an industrial user survey as described by 40 CFR 403.8(f). Because most small applicants receive influent only from municipal sources, most small applicants for reissuance of Section 301(h) modified permits will be required to provide only an updated certification that there are no known or suspected sources of toxic pollutants or pesticides. Because industrial sources of pollutants may have changed over the term of the original Section 301(h) modified permit, all applicants for reissuance

of Section 301(h) modified permits should review updated information on industrial sources of pollutants before performing the required demonstration or certifying that there are no known industrial sources of toxic pollutants or pesticides.

6. An applicant must demonstrate that a schedule of activities has been established to eliminate the introduction of toxic substances from nonindustrial sources into the treatment works. Just as was required in the original Section 301(h) application, applicants must comply with the specific requirements of Section 125.64. These requirements are that a public education program be developed, submitted with the application, and implemented; that nonindustrial source control programs be developed and implemented in accordance with schedules submitted with the application; and that it is understood that the foregoing program may be revised by the U.S. EPA before issuance of a Section 301(h) modified permit, or during the term of that permit. However, for small applicants certifying that there are no known or suspected problems related to toxic pollutants or pesticides in the discharge, only a public education program is required. As was true for original Section 301(h) applications, most small applicants for reissuance of Section 301(h) modified permits should be able to provide the foregoing certification. However, updated information on water quality, sediment quality, and biological conditions should be reviewed by the applicant before certifying that there are no known or suspected water quality, sediment accumulation, or biological problems that are related to the discharge of toxic pollutants or pesticides.

7. An applicant must demonstrate that the modified discharge will not result in new or substantially increased discharges of the pollutant for which a Section 301(h) modification is being requested. Details of this requirement are given in

Section 125.65, which states that where pollutant discharges are attributable, in part, to combined sewer overflows, an applicant must minimize such overflows and prevent increased discharges of pollutants. An applicant must also provide projections of effluent volumes and mass emission rates for pollutants to which the modification applies. These projections must be provided in 5-yr increments for the design life of the facility. This demonstration applies to applicants for reissuance of Section 301(h) modified permits.

Section 125.58. Definitions--

Regulatory and technical terms used in 40 CFR 125 Subpart G are defined in this section. All but two definitions remain applicable to applicants for reissuance of Section 301(h) modified permits.

The definition of the term "application" is no longer applicable because it defines only original Section 301(h) applications submitted under the 1979 or 1982 revised Section 301(h) regulations. In accordance with Subsection 125.59(c), an application for reissuance of a Section 301(h) modified permit consists of a certification of veracity; a signed, completed NPDES application; and a completed Application Questionnaire.

The definition of the term "current discharge" is also not applicable because it refers to the 5-yr period of time prior to the 1982 deadline for submittal of original Section 301(h) applications. Applications for reissuance of Section 301(h) modified permits should consider "current discharge" to mean the volume, composition, and location of the discharge at the time of permit reapplication.

Of critical importance to small dischargers applying for reissuance of Section 301(h) modified permits is the definition of "applicant." A small applicant is defined as a POTW that has a contributing population of less than 50,000 people **and** average dry-weather flows of less than 0.22 m^3/sec (5.0 MGD). A large applicant is defined as a POTW that has a contributing population of more than 50,000 people or average dry-weather flows greater

than 0.22 m^3/sec (5.0 MGD). The definition further stipulates that estimates of the contributing population and average dry-weather flows "should be based on projections for the end of the five year permit term" and that "(a)verage dry weather flows shall be the average daily total discharge flows for the maximum month of the dry weather season" (U.S. EPA 1982, p. 53676).

During the preparation of an application for reissuance of a Section 301(h) modified permit, a small applicant may estimate that the contributing population will exceed 50,000 or that the average dry-weather flows will exceed 0.22 m^3/sec (5.0 MGD) during the upcoming permit term. In either case, that small discharger will be required to apply for reissuance of the Section 301(h) modified permit as a large discharger. Because small discharger monitoring programs are typically reduced in scope compared with those of large dischargers, insufficient information may be available for that discharger to respond to some of the questions in the Large Applicant Questionnaire. Therefore, the Region should be prepared to exercise its discretionary powers in determining the appropriate level of technical detail required of the applicant.

Section 125.59. General--

This section establishes general criteria and requirements that must be met by applicants for Section 301(h) modified permits. Also specified are several regulatory options that may be exercised by the U.S. EPA during the application process. As indicated below, some of the general regulations are not relevant to applications for reissuance of Section 301(h) modified permits.

Subsection 125.59(a) states that an application may be based on a current, improved, or altered discharge into ocean waters or saline estuarine waters. This requirement remains relevant to applications for reissuance of Section 301(h) modified permits. However, applications for permit reissuance that are based on altered discharges are permissible only when downgrading of effluent quality results from population growth and/or industrial growth in the service area, and not simply from a lower level of effluent treatment.

No Section 301(h) modified permits may be issued for discharges that would not assure compliance with 40 CFR Part 122 and 40 CFR 125 Subpart G; for the discharge of sewage sludge; or for discharges that would not be in compliance with state, local, or other federal laws and Executive Orders [40 CFR 125.59(b)]. This requirement also remains relevant to applications for reissuance of Section 301(h) modified permits.

Subsection 125.59(c) states that all applications for Section 301(h) modified permits must contain a signed, completed NPDES application; a completed Application Questionnaire; and a certification of veracity. This provision remains valid for applications for reissuance of Section 301(h) modified permits. However, as was the case for original Section 301(h) applications, the level of detail required of applicants responding to questions in the application questionnaire will vary according to the volume, composition, and characteristics of the discharge, and to the characteristics of the receiving environment and biota. The Regions should consult with each applicant for permit reissuance well in advance of the application deadline. Timely consultation will ensure that each applicant is informed of the appropriate level of detail required to complete the Small Applicant Questionnaire, and will ensure that all data necessary for completing the Small Applicant Questionnaire have been collected and are adequate to demonstrate compliance with 301(h) criteria and regulations.

Revisions to original Section 301(h) applications that were submitted under the 1979 and 1982 application deadlines are discussed in Subsection 125.59(d). Such revisions are not relevant to applications for reissuance of Section 301(h) modified permits.

Application deadlines and distribution schedules discussed in 40 CFR 125.59(e) are also relevant only to original Section 301(h) applications. Deadlines relevant to applications for reissuance of Section 301(h) modified permits are specified in 40 CFR 122.21(d), and are discussed above. Distribution schedules relevant to applications for reissuance of Section 301(h) modified permits are not specified in 40 CFR Part 124 or 40 CFR 125 Subpart G. However, applicants should adhere to the distribution schedule required for original Section 301(h) applications, as indicated in 40 CFR

125.59(e)(1). That schedule required an applicant to submit one original application and one copy to the appropriate U.S. EPA Regional Administrator, and one copy to state and interstate agencies that are authorized to provide certification or concurrence in accordance with Sections 124.53-124.55. One copy should also be sent to U.S. EPA, Marine Operations Division (WH-556F) in Washington, DC. [This requirement will be addressed in the 301(h) regulatory revision process.] Adherence to this distribution schedule would ensure that all appropriate regulatory agencies receive copies of the application in a timely manner.

A favorable state determination is required before the Region reviews an application. Under Subsection 125.59(e)(3), state determinations are due to the Regions no more than 90 days after an application is submitted to the U.S. EPA. The Regions may extend the 90-day deadline for determinations upon request by the state. However, extensions are not recommended because the amount of time remaining until expiration of the existing modified permit, and hence, the amount of time available for an applicant to respond to concerns of the state, is decreased. It is strongly recommended that the state submit a timely determination to the Region, so as not to diminish an applicant's likelihood of being reissued a Section 301(h) modified permit.

Under 40 CFR 125.59(f), the Regions may authorize or request a first-time applicant to submit additional data after the application deadline. This provision is not relevant to applications for reissuance of Section 301(h) modified permits. [Requests for additional information in support of applications for permit reissuance are discussed below under "Demonstrations of Compliance by Permittees."]

Options that the Regions and states may exercise in granting or denying a Section 301(h) modified permit are specified in Subsection 125.59(g). All remain relevant to applications for reissuance of Section 301(h) modified permits. For the Region to grant a Section 301(h) modified permit, an applicant must have demonstrated compliance with Sections 125.59-125.65. State certification (concurrence) is also required, with the state director cosigning the Section 301(h) modified permit if an intent to do so was indicated in the written concurrence. Section 301(h) modified permits must

be issued in accordance with procedures in 40 CFR Part 124, and must contain all applicable terms and conditions specified in 40 CFR Part 122 and Section 125.67. Appeals of Section 301(h) determinations may be made in accordance with procedures in 40 CFR Part 124.

Section 125.67. Special Conditions for Section 301(h) Modified Permits--

Section 125.67 provides special conditions that must be included in Section 301(h) modified permits, in addition to those specified in 40 CFR Part 122. All remain valid for reissued Section 301(h) modified permits. The special conditions are that effluent limitations and mass loadings assure compliance with 301(h) regulations; that schedules of compliance be included for the required industrial pretreatment program, the nonindustrial toxics control program, and control of combined sewer overflows (Section 159.65); that the proposed monitoring program include provisions for monitoring biota, water quality, and effluent; and that the monitoring data be reported at the frequency prescribed in the approved monitoring program.

1982 Revised Section 301(h) Regulations

The text of the 1982 revised Section 301(h) regulations (U.S. EPA 1982) consists of two major parts: the supplementary information and the full text of 40 CFR 125 Subpart G. The latter of these parts is discussed above. The supplementary information includes primarily background information, responses to public comments, and discussions of changes from the 1979 Section 301(h) regulations. All issues discussed in the supplementary information are either discussed therein or are effectively promulgated as regulations in 40 CFR 125 Subpart G. Regulations in 40 CFR 125 Subpart G that are relevant to applications for reissuance of Section 301(h) modified permits are discussed above.

Water Quality Act of 1987

Certain provisions of the Water Quality Act of 1987 may affect some small dischargers. Potentially applicable provisions are found in Section 303, entitled "Discharges into Marine Waters." Section 303 includes

Subsections 303(a) through 303(g). However, Subsection 303(c) is not applicable to small dischargers, and Subsection 303(f) is not applicable to applications for the reissuance of Section 301(h) modified permits.

Subsection 303(a) amends Subsection 301(h)(2) to state that the modified discharge "will not interfere, alone or in combination with pollutants from other sources, with the attainment of maintenance of water quality which assures protection of public water supplies and the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife, and allows recreational activities, in and on the water" (emphasis added). This amendment strengthens the existing regulations to prohibit Section 301(h) discharges in receiving waters where pollutants from the discharge would, in combination with pollutants from other sources, result in adverse impacts to water quality, recreational activities, or the resident biota.

Under Subsection 303(b), the scope of a Section 301(h) discharger's monitoring program is limited to "those scientific investigations that are necessary to study the effects of the proposed discharge." This limitation is applicable only to modifications and renewals of modifications that are tentatively or finally approved after the date of enactment of the Water Quality Act of 1987.

Under Subsection 303(e), Section 301(h) modified permits may not be issued for discharges into marine waters where the dilution water contains "significant amounts of previously discharged effluent from such treatment works." Reentrainment of previously discharged effluent is often a potential problem in receiving waters that exhibit poor flushing characteristics, such as semi-enclosed bays or long, narrow estuaries. It is unlikely that POTWs holding Section 301(h) modified permits were experiencing (or anticipated experiencing) substantial reentrainment of effluent at the time the existing Section 301(h) modified permit was issued. If such problems had been occurring, it is unlikely that many of the 301(h) regulations pertaining to protection of the receiving environment could have been met (e.g., maintenance of water quality; protection and propagation of a balanced indigenous population of shellfish, fish, and wildlife). However, if the contributing population and volume of the applicant's discharge increased substantially

during the term of the existing permit, reentrainment of previously discharged effluent could have become a problem. If monitoring data collected over the term of the existing Section 301(h) modified permit indicate that the dilution water contains substantial quantities of previously discharged effluent, the Region should deny the request for reissuance of the Section 301(h) modified permit.

Subsection 303(e) also states that Section 301(h) modified permits may not be issued for discharges into saline estuarine waters unless those waters meet all of the following conditions:

- Support a balanced indigenous population of shellfish, fish, and wildlife
- Allow for recreational activities
- Exhibit ambient water quality characteristics that are adequate to protect public water supplies; protect shellfish, fish, and wildlife; allow for recreational activities; and comply with standards that assure and protect such uses.

A Section 301(h) modified permit may not be issued if any one of the foregoing conditions does not exist, regardless of whether the applicant's discharge contributes to departures from such conditions. Thus, if the saline estuarine receiving environment exhibits any of the foregoing conditions, then, regardless of cause, the Region should deny the request for reissuance of the Section 301(h) modified permit. Such denials will most likely occur in cases where the applicant's contributing population and volume of the discharge have increased substantially over the term of the existing permit, or where discharges of pollutants from other sources have increased substantially over the term of the existing permit.

In Subsection 303(d), a minimum requirement of primary effluent treatment (or its equivalent) and compliance with federal water quality criteria (U.S. EPA 1980, 1985b, 1986a) is established for all Section 301(h) dischargers. As stated in Subsection 303(g), Subsections 303(a), 303(c),

303(d), and 303(e) do not apply to Section 301(h) modified permits that were tentatively or finally approved prior to enactment of the Water Quality Act of 1987. However, Section 303(g) further states that those subsections will apply to all renewals of Section 301(h) modified permits that postdate enactment of the Water Quality Act of 1987. Therefore, all applicants for reissuance of Section 301(h) modified permits must achieve primary treatment or its equivalent for the Region to be able to grant a reissued Section 301(h) modified permit. "Primary or equivalent treatment" is defined in Subsection 303(d)(2) as "treatment by screening, sedimentation, and skimming adequate to remove at least 30 percent of the biological oxygen demanding material and of the suspended solids in the treatment works influent, and disinfection, where appropriate."

Many small applicants for reissuance of Section 301(h) modified permits will already have met or exceeded the primary treatment requirement under conditions specified in the original Section 301(h) modified permit. Thus, meeting this statute will not impose additional treatment requirements on them. However, some small dischargers were issued permits for the discharge of less than primary treated effluent. Under Subsection 303(g), those small dischargers will be required to improve their treatment facilities such that primary treatment, or its equivalent, is achieved by the effective date of the new Section 301(h) modified permit. The Region, however, may grant a tentative (proposed) waiver with conditions of, and a schedule for, primary treatment or its equivalent. When that schedule has been completed and primary treatment or its equivalent has been achieved, a new final Section 301(h) modified permit may be issued.

Permittees will also be required to demonstrate compliance with federal water quality criteria by the effective date of the new Section 301(h) modified permit. In the original Section 301(h) application, many small applicants were exempted from providing an analysis of toxic substances and pesticides in their effluent because they were able to certify that there are no known or suspected sources of those substances in their service area. However, those exemptions were not permanent (U.S. EPA 1982, p. 53673). Subsection 125.62(d) requires all Section 301(h) permittees to analyze their effluent for toxic substances and pesticides, to the extent practicable, as

part of their monitoring programs. Hence, to the extent practicable, all Section 301(h) permittees shall have performed at least one effluent analysis for toxic substances at a representative time during the 5-yr term of the original Section 301(h) permit. To the extent practicable, they shall also perform another effluent analysis for toxic substances at a representative time during the 5-yr term of the reissued permit. Results of those analyses should be used to demonstrate compliance with federal water quality criteria.

Many small applicants will be able to demonstrate that concentrations of toxic substances and pesticides in their effluent are low or are not detectable. For such discharges, the potential for bioaccumulation of toxic substances or pesticides in the resident biota should be low. However, for small applicants that discharge quantities of toxic substances or pesticides, the Regions should consider the potential impacts that the bioaccumulation of those substances could have on public health and on the health of the biota in the receiving environment. When considering the potential impacts of bioaccumulation, the Regions should consult appropriate 301(h) technical guidance documents and the results of new studies as they are published.

DEMONSTRATIONS OF COMPLIANCE BY PERMITTEES

APPLICATION FORMAT

As specified in Subsection 125.59(c), a full, completed application for a Section 301(h) modified permit contains a certification of veracity; a signed, completed NPDES application [Short Form A or Standard Form A in accordance with 40 CFR 122.21(d) and 124.3]; and a completed Application Questionnaire. The order in which these parts are assembled is not specified in the 301(h) regulations, but many applicants for original Section 301(h) modified permits used the following sequence:

- Cover letter to U.S. EPA with the certification of the application's veracity either included in, or attached to, the letter [many small applicants included the cover letter and certification of veracity in the introduction to the Small Applicant Questionnaire (i.e., Part I)

- The signed, completed NPDES application establishing the requested permit conditions (e.g., effluent limitations)

- The completed application questionnaire.

Although the foregoing sequence of application parts is not mandatory, it is recommended herein that applicants for reissuance of Section 301(h) modified permits adhere to the sequence because it facilitates review by the Region and appropriate state agencies. Accessory documents that would be useful to the Region during review of the application (e.g., data reports) should be appended to the application.

To ensure compliance with the provisions of Section 303(d) of the Water Quality Act of 1987, the Regions should require applicants to demonstrate that the treatment works will discharge, at a minimum, primary treated

effluent (or its equivalent). This demonstration should be made in partial response to Question II.A.3. The Regions must also require applicants to demonstrate that the proposed discharge will comply with federal water quality criteria (U.S. EPA 1986a). This demonstration should be made in partial response to Question II.D 4.

The Small Applicant Questionnaire given as Appendix A of 40 CFR 125 Subpart G, is designed to provide U.S. EPA with all information necessary to determine whether an applicant meets the statutory criteria and regulations of 40 CFR 125 Subpart G. Guidance provided in the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b) and in the document entitled Design of 301(h) Monitoring Programs for Municipal Wastewater Discharges to Marine Waters (Tetra Tech 1982a) were written to complement the Small Applicant Questionnaire. Although all applicants are required to respond to each question, the Regions have the discretionary power to determine the appropriate level of response to each question answered by each applicant. The Region may also allow an applicant to incorporate data by reference to previous submittals, as appropriate.

The appropriate levels of response to questions should be communicated by the Regions to each applicant through timely consultation. Timely consultations will help permittees meet their responsibility for submitting the appropriate information in a timely manner. The Regions should work with each permittee over the 5-yr term of each permit, but these working relationships should be especially close during the end of term of the existing permit. Close working relationships will ensure that all data necessary for completion of the Small Applicant Questionnaire are available well in advance of the application deadline, and that each applicant understands the level of detail appropriate for each response. Because of the substantial differences among the permittees and their respective receiving environments, it is expected that applicants' responses to a given question may range from a single sentence to a very detailed analysis and interpretation of data. Applicants should provide complete, informative responses to all questions. However, wherever possible, the Region is encouraged to discuss the appropriate level of effort with the applicant. Such discussions should result in more concise responses to the questions,

and should help avoid unnecessary effort and expense by the applicant during the application process.

REQUIRED DATA

Applicants "should be prepared to support this continuation of the modification based on studies and monitoring performed during the life of the permit" [40 CFR 125.59(g)(6)]. For most small dischargers, data collected during these studies and monitoring programs will be relevant to many, but not all, of the questions in the Small Applicant Questionnaire. Additional relevant data may be found in publications and technical reports produced by other agencies, institutions, and companies working in nearby areas of the receiving environment. Data from such surveys could be used to better define environmental factors, such as the critical density profile for initial dilution calculations or biological conditions in a reference area. However, for some applicants, no new data [i.e., data collected after issuance of the original Section 301(h) modified permit] will be available to respond to some of the questions in the Small Applicant Questionnaire. It is the permittee's responsibility to determine what types of data are necessary to respond to questions in the Small Applicant Questionnaire, and to provide those data. However, it is also important that the Regions communicate with permittees well in advance of the application deadline regarding any possible needs for additional information, so as to give applicants sufficient time to collect, analyze, and interpret those data.

Although it is the permittee's responsibility to submit the appropriate information, it is critical that the Regions work with, and communicate to, permittees any perceived information deficiencies well in advance of the application deadline. Once informed of information deficiencies, permittees must collect, analyze, and interpret the necessary information for incorporation into the application for permit reissuance. Failure to supply necessary information could result in a denial of the request for permit reissuance on the grounds that a complete application was not submitted. After an application has been received, however, the Region may determine that additional information is needed to determine compliance with 301(h) regulations and permit conditions. Such information may be requested at any

time (including after the application deadline has passed) in accordance with Subsection 122.41(h).

APPROPRIATE ANALYSES AND PRESENTATION OF RESULTS

Guidance is provided below for the preparation of a complete application for reissuance of a Section 301(h) modified permit. The sequence in which the application parts are discussed below corresponds to that recommended above in the discussion of the application format. Any accessory documents that would be useful to the Region during review of the application (e.g., data reports) should be appended to the application.

Just as original Section 301(h) applications were based on the most recent, appropriate, and technically correct data available at the time the application was prepared, applications for reissuance of Section 301(h) modified permits should consider monitoring data collected over the term of the existing modified permit. When monitoring data and other information collected over the term of the existing permit confirm that all values of the variables used in a given calculation or demonstration have not changed and are not expected to change over the term of the new modified permit, the applicant may simply reproduce the calculation or demonstration that was given in the original application. However, in cases where the values of one or more variables have changed, or where new monitoring data are useful for supporting a given demonstration, those data should be included in the required response. Applicants are reminded that under Subsection 303(a) of the Water Quality Act of 1987, all demonstrations of compliance with applicable statutes and regulations must consider the effects of the discharge singly and in combination with pollutants from other sources, if any other sources exist.

I. INTRODUCTION

For clarity and consistency among applications, it is recommended that the introduction contain the following parts:

- A cover letter signed by the responsible official for the POTW

- The statement of veracity mandated in 40 CFR 125.59(c), also signed by the responsible official for the POTW
- A table of contents for the application, including any appendices
- A list of figures for the application
- A list of tables for the application
- A signed, completed NPDES Application Short Form A or Standard Form A.

The foregoing information will establish the conditions of the application for all concerned parties, and will provide information on the organization of the application.

II. GENERAL INFORMATION AND BASIC DATA REQUIREMENTS

A. Treatment System Description

1. Are you applying for a modification based on a current discharge, improved discharge, or altered discharge as defined in 40 CFR 125.58? [40 CFR 125.59(a)]

Applicants for reissuance of Section 301(h) modified permits should consider "current discharge" to mean the actual volume, composition, and location of a 301(h) permittee's discharge at the time of permit reapplication. Use of the latest one full year of data would be most appropriate in the application.

An improved discharge may result from any of the following changes: improvements to the collection system, treatment plant, or outfall (including outfall relocations); improvements to treatment levels or discharge

should emphasize any changes in the service area, treatment system, or outfall system that were implemented during the term of the existing permit. Water depths and navigational coordinates of the outfalls as they exist should be correctly specified. Water depth of the outfall should be specified as the water depth at the midpoint of the diffuser, referenced to mean sea level or mean lower low water. Water depths and navigational coordinates found in engineering design documents are often not correct because of changes in the lengths and routes of the outfalls made during construction. Hence, drawings of "as built" conditions should be used.

3. Effluent Limitations and Characteristics [40 CFR 125.60(b) and 125.61(e)(2)]

Applicants should specify the effluent limitations they are requesting for their Section 301(h) modified permits, and the basis (e.g., monthly average values) for those limits. Information on effluent characteristics can be found in plant operating records. Applicants must request specific limitations. Except for pH, ranges of values or a list of alternatives are not acceptable.

The requirement to submit data on toxic pollutants and pesticides in the effluent is waived when the service area contains no known or suspected sources of toxic pollutants or pesticides, and the applicant provides certification and documentation (i.e., by an industrial user survey) of that fact. Small applicants unable to certify that there are no known or suspected sources of toxic pollutants or pesticides must provide results of chemical analyses for toxic substances, as required by 40 CFR 125.64(a) and discussed in Chapter VIII of Tetra Tech (1982b). The list should include all toxic substances detected in the effluent, including those present at concentrations less than 10 ug/L. The detection limits used should be sufficiently low so that compliance with state and federal ambient water quality criteria and effluent regulations can be assessed.

In addition to describing effluent limitations and characteristics, applicants should demonstrate that the treatment works will discharge, at a minimum, primary treated effluent (or its equivalent), as mandated by

characteristics; improvements in the operation or maintenance of the treatment system; or measures to eliminate or control the introduction of pollutants into the treatment works. For improved discharges, applicants should briefly describe the changes to the treatment system or its operation upon which the application is based.

Discharge alterations include all changes that result in a treatment level less than that currently achieved, including changes in effluent volume and/or composition. All changes that result in the downgrading of effluent characteristics, regardless of whether the outfall was previously improved or relocated to compensate for lower effluent quality, are considered altered discharges. Applications for altered discharges are permissible only for downgrading of effluent characteristics that are attributable entirely to population growth and/or industrial growth within the service area. Applications are not permissible for altered discharges that simply propose a lower level of effluent treatment. Applicants that propose altered discharges based on population growth and/or industrial growth, and that propose improvements in treatment levels, should briefly describe the changes to the treatment system and/or its operation upon which the application is based.

2. Description of the Treatment/Outfall System [40 CFR 125.61(a) and 125.61(e)]

Most of the above information can be found in Sections 1-13 of the NPDES Standard Form A. Past experience in the 301(h) program has shown that applicants often do not provide information on the treatment and outfall system that is of sufficient detail to evaluate the technical merit of the application. Applicants should provide a detailed description of this system such that the reader will have a complete picture of the physical aspects of the treatment and outfall system and will be able to understand the treatment processes that occur therein. Information on diffuser dimensions that are used in determining the port flow distribution achieved by the outfall are especially important (see Question II.A.7 below), and should be specified as accurately as possible. Figures and drawing with dimensions should be included if possible. In those descriptions, applicants

Section 303(d) of the Water Quality Act of 1987. Applicants are advised that "primary or equivalent treatment" is defined in Section 303(d) as "treatment by screening, sedimentation, and skimming adequate to remove at least 30 percent of the biological oxygen demanding material and of the suspended solids in the treatment works influent, and disinfection, where appropriate." To support this demonstration, the applicant should supply monthly averaged data (typically monthly averages) for both the influent and effluent BOD_5, suspended solids, and pH, and flow for the last 1-yr period. The form of such data (e.g., weekly averages, monthly averages) should be specified precisely for each variable. Applicants should also submit data on the predicted maximum 2- to 3-h flow for the new end-of-permit year, and on the measurements of coliform bacteria concentrations in the effluent that are appropriate to satisfy state water quality regulations. Where average values are given (e.g., average dry-weather flow), applicants should specify how they were calculated.

4. Effluent Volume and Mass Emissions [40 CFR 125.61(e)(2) and 125.65]

Applicants should provide projections of effluent flows and mass emissions for the term of the modified permit being requested, and for subsequent years at 5-yr intervals. Projections should be based on expected changes in the service area and population over the term of the modified permit being requested, and over the subsequent periods of time being considered. They should also be based on the annual average flows and annual average effluent characteristics. Projections for the new end-of-permit year must be given, including the average daily flow for the maximum month of the dry-weather season, and average effluent characteristics for that month.

Small dischargers are advised that if the projected population served by the POTW at the end of the 5-yr permit term exceeds 50,000, or if the projected average dry-weather flow at the end of the 5-yr permit term exceeds 0.22 m^3/sec (5.0 MGD), they are required to apply for reissuance of the Section 301(h) modified permit as a large discharger. Because small discharger monitoring programs are typically reduced in scope compared with

those of large dischargers, insufficient information may be available to respond to some questions in the Large Applicant Questionnaire. The applicant is advised to contact the appropriate U.S. EPA Region in a timely manner for guidance on the appropriate levels of responses to questions in the Large Applicant Questionnaire.

5. **Average Daily Industrial Flow (m^3/sec). Provide or estimate the average daily industrial inflow to your treatment facility for the same time increments as in Question II.A.4 above. [40 CFR 125.64]**

In responding to this question, data on average annual industrial flow will generally be sufficient for nonseasonal (i.e., continuous operation) industries. For seasonal industries, applicants should provide average daily industrial flows for the periods of operation, and should indicate those periods of operation. Supporting information (e.g., lists of industries and products manufactured) may be required.

6. **Combined Sewer Overflows [40 CFR 125.65(b)]**

Applicants should provide information on the locations, flow quantities, and frequency of overflows that occur. Data on total effluent flow and on suspended solids and biochemical oxygen demand concentrations in the effluent should also be provided for times when overflows occur. Where appropriate, the effect of increased infiltration during the rainy season should be discussed. Applicants should also provide a narrative description of steps that are or will be taken to minimize combined sewer overflows to the receiving environment.

7. **Outfall/Diffuser Design. Provide available data on the following for your current discharge as well as for the modified discharge, if different from the current discharge: [40 CFR 125.61(a)(1)]**

   - **Diameter and length of the outfall(s) (meters)**
   - **Diameter and length of the diffuser(s) (meters)**

- Angle(s) of port orientation(s) from horizontal (degrees)
- Port diameter(s) (meters)
- Orifice contraction coefficient(s), if known
- Vertical distance from mean lower low water (or mean low water) surface and outfall port(s) centerline (meters)
- Number of ports
- Port spacing (meters)
- Design flow rate for each port, if multiple ports are used (m^3/sec)

The information requested above should be available from the engineering drawings for the treatment plant outfall and diffuser system. If risers are used, information sufficient to compute the riser discharge coefficient by using the method of Koh (1973) should also be provided. For example, if the riser consists of a vertical pipe, the length and inside diameter of the pipe, the material from which it is made, and the port orifice should be specified. Missing information should be so indicated in the responses to the foregoing questions. Because outfalls and diffusers are often built somewhat differently than specified in the engineering design drawings, applicants are advised to verify that the existing outfall and diffuser system is as designed. If not, appropriate changes should be noted on the engineering drawings, and those changes should be reflected in the responses to the foregoing questions.

In addition to the foregoing information, applicants should provide information on the slope of the diffuser and the slope of the port centerlines if they differ from that of the diffuser. If the diffuser ports discharge to opposite sides of the diffuser, that information should be noted. The depths of the ports below mean lower low water (or mean low water as applicable) should be provided, and any variations in port depths along the length of the diffuser should be noted.

The information provided in this section is routinely used in the review process to determine whether the diffuser is well-designed hydraulically for the range of flows (daily minimum to daily maximum) expected

during the requested permit term. Among the characteristics of a well-designed diffuser are uniform port flows and individual port densimetric Froude numbers that are always greater than 1. Methods for computing the port flow distribution from a multiport diffuser are described by Grace (1978) and Fischer et al. (1979). Discharge coefficients for risers can be computed using methods described by Koh (1973). [The explanation of these methods provided by Fischer et al. (1979) should not be used because it is incomplete and contains errors.] The effect of the bottom slope must be included in the diffuser hydraulics computations because some diffusers behave properly on a horizontal seafloor, but poorly on a sloping bottom, especially at low flow rates.

B. Receiving Water Description

1. Are you applying for a modification based on a discharge to the ocean or to a saline estuary [40 CFR 125.58(q)]? [40 CFR 125.59(a)]

Guidance for responding to this question is given in Chapter III of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b). Estuarine dischargers are advised that Section 303(e) of the Water Quality Act of 1987 states that Section 301(h) modified permits may not be issued for discharges into saline estuarine waters unless those waters meet all of the following conditions:

- Support a balanced indigenous population of shellfish, fish, and wildlife
- Allow for recreational activities
- Exhibit ambient water quality characteristics that are adequate to protect public water supplies; protect shellfish, fish, and wildlife; allow for recreational activities; and comply with standards that assure and protect such uses.

These conditions must be met, regardless of whether the applicant's discharge contributes to departures from such conditions. Section 303(g) of the Water Quality Act of 1987 states that the foregoing prohibitions of Section 301(h) modified discharges into estuarine waters that do not exhibit the above characteristics do not apply to discharges with Section 301(h) modified permits that were tentatively or finally approved prior to the enactment of the Water Quality Act of 1987. However, it further states that the foregoing prohibitions do apply to all renewals of Section 301(h) modified permits that postdate enactment of the Water Quality Act of 1987. Thus, all estuarine dischargers must demonstrate in the appropriate parts of the Small Applicant Questionnaire that the receiving waters exhibit the above characteristics at the time of permit reissuance, regardless of whether such conditions existed at the time the existing Section 301(h) modified permit was issued.

2. **Is your current discharge or modified discharge to stressed waters? If yes, what are the pollution sources contributing to the stress? [40 CFR 125.61(f)]**

Guidance for responding to this question is given in Chapter III of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b). The response to this question should be coordinated with the response to Question III.D.7 below. Section 303(a) of the Water Quality Act of 1987 states that permits may not be reissued if the discharge alone or in combination with pollutants from other sources adversely impacts the balanced indigenous population, water quality, or recreational activities. In addition, estuarine dischargers are advised that under Section 303(e) of the Water Quality Act of 1987, permits may not be reissued for discharges to stressed estuarine waters.

3. **Provide a description and available data on the seasonal circulation patterns in the vicinity of your current and modified discharge(s). [40 CFR 125.61(a)]**

The applicant should provide sufficient information on current speed and direction in the vicinity of the discharge to predict the dispersion and

transport of diluted effluent. Useful sources of information include data collected during execution of the monitoring program for the existing modified permit, data collected in the vicinity of the discharge by other researchers, and U.S. Department of Commerce tidal current tables (e.g., Tidal Current Tables 1987, Atlantic Coast of North America; Tidal Current Tables, Pacific Coast of North America and Asia). The information provided should include estimates of near-surface and near-bottom lowest 10 percentile current speeds. Information on the locations of the current meters and the time span over which data were collected should also be provided. The applicant should also provide seasonal average current speeds and directions, and a discussion of the occurrence of onshore surface currents. Because onshore winds induce onshore currents, wind speed and direction statistics appropriate for the diffuser location should also be provided.

Section 303(e) of the Water Quality Act of 1987 prohibits Section 301(h) modified permits for discharges where the dilution water contains "significant amounts of previously discharged effluent from such treatment works." In responding to this question, applicants should discuss the potential for reentrainment of previously discharged effluent. Reentrainment is a potential problem primarily in receiving waters that exhibit poor flushing characteristics.

4. Ambient water quality conditions during the period(s) of maximum stratification.

Guidance for responding to this question is given in Chapters III and VI of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b). Temperature and salinity profiles sufficient to determine the most stratified and the typical conditions should be provided for each oceanographic season. The "most stratified" temperature and salinity profile with depth is the profile that will produce the lowest initial dilution. In some locations, such a profile has the steepest gradients of temperature and/or salinity near mid-depth. Both temperature (expressed in degrees C) and salinity (expressed in ppt) should be measured accurately to two decimal places so that density (expressed in gm/cm^3) can be computed accurately to five decimal places. Also, only measured profiles should be provided.

Averages of measured profiles or "representative" profiles should never be substituted. Density profiles should exhibit a stable water column over the plume height-of-rise (i.e., no higher density water should overlie lower density water). One year is the minimum period of time over which oceanographic data must be collected to establish typical and most stratified conditions. Because oceanographic conditions vary among years, it is recommended that data be collected for 5 yr.

C. Biological Conditions

1. **Are distinctive habitats of limited distribution (such as kelp beds or coral reefs) located in areas potentially affected by the modified discharge? If yes, provide available information on types, extent, and location of habitats.** [40 CFR 125.61(c)]

Guidance on responding to this question is given in Chapters III and VII of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b). Because the biota of many distinctive habitats of limited distribution are very sensitive to pollutants (e.g., Pastorok and Bilyard 1985), brief or infrequent periods of exposure to sewage effluent may be detrimental to those biota. [For this reason, some small applicants may have been required to monitor distinctive habitats of limited distribution periodically over the term of the existing Section 301(h) modified permit]. All distinctive habitats should be considered in the response to this question, regardless of their direction from the outfall (i.e., inshore or offshore, upcoast or downcoast) or the direction of the prevailing currents. To the extent that information is available, the following types of data should be provided on each distinctive habitat in the vicinity of the applicant's discharge:

- Areal extent of the habitat (shown on a chart if possible)
- Physical characteristics of the habitat (water column and substrate)

- Species composition of the biota (flora and fauna)

- Abundance or percent cover (as applicable) of the resident species

- Spatial and temporal variations in the biotic and abiotic components of the distinctive habitat.

Such detailed information is critical for determining whether pollutant stresses from the applicant's discharge or other point or nonpoint sources of pollutants are causing adverse impacts to the biota. The applicant is encouraged to include graphical and tabular data in the response to this question. Extensive graphical or tabular data (or the report in which they are found) may be appended to the application.

2. **Are commercial or recreational fisheries located in areas potentially affected by the modified discharge? If yes, provide available information on types, location, and value of fisheries. [40 CFR 125.61(c)]**

Guidance for responding to this question is found in Chapters III and VII of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b). As recommended for Question II.C.1 (above), detailed information on commercial and recreational fisheries should be presented when it is available. Extensive graphical or tabular data may be appended to the application. When available, data should be provided on each commercial or recreational species harvested from the receiving waters in the vicinity of the applicant's outfall.

D. State and Federal Laws [40 CFR 125.60]

1. **Are there water quality standards applicable to the following pollutants for which a modification is requested:**

   - **Biochemical oxygen demand or dissolved oxygen?**

- Suspended solids, turbidity, light transmission, light scattering, or maintenance of the euphotic zone?
- pH of the receiving water?

2. If yes, what is the water use classification for your discharge area? What are the applicable standards for your discharge area for each of the parameters for which a modification is requested? Provide a copy of all applicable water quality standards or a citation to where they can be found.

3. Will the modified discharge: [40 CFR 125.59(b)(3)]

- Be consistent with applicable State coastal zone management program(s) approved under the Coastal Zone Management Act as amended, 16 U.S.C. 1451 et seq.? [See 16 U.S.C. 1456(c)(3)(A)]
- Be located in a marine sanctuary designated under Title III of the Marine Protection, Research, and Sanctuaries Act (MPRSA) as amended, 16 U.S.C. 1431 et seq., or in an estuarine sanctuary designated under the Coastal Zone Management Act as amended, 16 U.S.C. 1461? If located in a marine sanctuary designated under Title III of the MPRSA, attach a copy of any certification or permit required under regulations governing such marine sanctuary [See 16 U.S.C. 1432(f)(2)]
- Be consistent with the Endangered Species Act as amended, 16 U.S.C. 1531 et seq.? Provide the names of any threatened or endangered species that inhabit or obtain nutrients from waters that may be affected by the modified discharge. Identify any critical habitats that may be affected by the modified discharge and evaluate whether the modified discharge will affect threatened or endangered species or modify a critical habitat [See 16 U.S.C. 1536(a)(2)]

4. Are you aware of any State or Federal laws or regulations (other than the Clean Water Act or the three statutes identified in item 3 above) or an Executive Order which is applicable to your discharge? If yes, provide sufficient information to demonstrate that your modified discharge will comply with such law(s), regulation(s), or order(s). [40 CFR 125.59(b)(3)]

Guidance for responding to these four questions is provided in Chapter II of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b). Because each application for permit reissuance is considered to be an application for a new NPDES permit, applicants are required to provide new determinations of compliance with all applicable local, state, and federal laws and regulations, as indicated above. Moreover, in response to Question II.D.4, applicants should demonstrate compliance with federal water quality criteria established by the U.S. EPA (1986a), as mandated by Section 303(d) of the Water Quality Act of 1987.

Individual states often have water quality standards that must be met independently from federal water quality criteria. State standards that are applicable to the applicant's discharge must be provided in this section, and determinations of compliance with those standards must be provided in Section III.B.5. Occasionally, state water quality standards are dependent on location of the outfall diffuser. If the effluent wastefield is transported to a location having different standards than the diffuser location, then both sets of standards apply.

III. TECHNICAL EVALUATION

A. Physical Characteristics of Discharge [40 CFR 125.61(a)]

1. **What is the lowest initial dilution for your current and modified discharge(s) during 1) the period(s) of maximum stratification? and 2) any other critical period(s) of discharge volume/composition, water quality, biological seasons, or oceanographic conditions?**

The lowest (i.e., critical) initial dilution must be computed for each of the critical environmental seasons. The predicted peak 2- to 3-h effluent flow for the new end-of-permit year and the current speed no higher than the lowest 10 percentile current speed must be used. A simplified procedure for computing initial dilution is described in Chapter III of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b). Five U.S. EPA-approved computer models (i.e., PLUME, UOUTPLM, UMERGE, UDKHDEN, ULINE) as well as several analytical formulations for computing initial dilution are described by Muellenhoff et al. (1985a). ASCII files containing FORTRAN code for these models are available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA, 22161 [(703) 487-4650]. These files are on either nine-track tape or on floppy diskettes that can be read by an IBM compatible personal computer. Muellenhoff et al. (1985a) discuss guidelines for use of the models. During computation of initial dilution by one of these methods, the flow from each of the ports modeled should be approximately constant within a section of the diffuser. The initial dilution and trapping depth for each section should be a flow-rate average to obtain the initial dilution and trapping depth, respectively, for the entire diffuser. The depth of the discharge is determined as the depth of the section below mean lower low water or mean low water, or as the average for the diffuser. If the adjacent ports discharge on opposite sides of the diffuser, the port spacing should be equal to the distance between ports discharging on the same side of the diffuser. (This stipulation is applicable to UMERGE and UDKHDEN, but not ULINE.) Sufficient documentation of the methods and parameters used must be provided so that the results obtained can be independently duplicated.

For many applicants, conditions specified in the original application will not have changed, and it will be necessary only to reproduce the calculations given in the original application. Other applicants will find, however, that monitoring data or other information collected during the term of the original modified permit requires that new calculations be performed. For example, new calculations will be required in cases where the water column density profile is better defined, effluent flows have changed or are expected to change, or the number of open ports has changed.

2. **What are the dimensions of the zone of initial dilution for your modified discharge(s)?**

Guidance for responding to this question is given in Chapters III and V of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b). The water depth used should be the maximum water depth along the diffuser axis (axes) with respect to mean lower low water or mean low water, as applicable.

Unless changes to the outfall system have been made or are anticipated, or unless incorrect water depths or outfall characteristics were used in the original Section 301(h) application, the calculation presented here should be identical to that presented in the original application. Repetition of the calculation in the application for reissuance of the Section 301(h) modified permit is necessary to confirm that all values used in the original application were correct, and that the outfall system has not, and will not, change over the term of the new permit.

3. **Will there be significant sedimentation of suspended solids in the vicinity of the modified discharge?**

The applicant should compute whether significant sedimentation of suspended solids occurs. These computations should be made for an annual period and for the critical 90-day period (i.e., the 90-day period during which the highest sedimentation rate occurs). In these computations, the average plume height-of-rise with respect to the seafloor should be used. A simplified procedure for computing the effect of sedimentation is described in Chapter III of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b). If this method is not applicable, the methods described in Chapter VI of the aforementioned document should be used.

As for Questions II.A.1 and II.A.2 above, new calculations will be needed only in cases where conditions have changed since the original application was submitted. Such changes would include, for example, changes in initial dilution or trapping level, the effective length of the outfall

diffuser (i.e., the closure of ports since the original application was submitted), the concentration of suspended solids in the effluent, and effluent flow.

B. Compliance with Applicable Water Quality Standards [40 CFR 125.60(b) and 125.61(a)]

1. **What is the concentration of dissolved oxygen immediately following initial dilution for the period(s) of maximum stratification and any other critical period(s) of discharge volume/composition, water quality, biological seasons, or oceanographic conditions?**

A simplified procedure for computing the dissolved oxygen concentration immediately following initial dilution is explained in Chapter III of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b). Although simplified, this method yields conservative results. If this method is not applicable, or if its use results in water quality violations, a more complicated, but more accurate method may be used instead. Note that some states limit the maximum allowable dissolved oxygen concentration depression, and that the maximum dissolved oxygen depression may not occur during the season having the lowest initial dilution.

2. **What is the farfield dissolved oxygen depression and resulting concentration due to BOD exertion of the wastefield during the period(s) of maximum stratification and any other critical period(s)?**

A simplified procedure for computing the farfield dissolved oxygen depression is explained in Chapter III of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b). Although simplified, this method yields very conservative results. If this method is not applicable, or if it results in water quality violations, a more complicated, but more accurate method (Brooks 1960) may be used instead. In Brooks' method, the value for a variable n must be chosen, where n has a value of 0, 1, or 4/3. In Chapter VI of the Revised Section 301(h) Technical Support Document

(Tetra Tech 1982b), Brooks' method is provided for n equal to 0 and 4/3. However, in open coastal waters relatively close to shore, it may not be reasonable to choose n equal to 4/3; n equal to 1 may be more appropriate (Grace 1978). In the notation used in equation VI-20 of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b), the centerline dilution (D_s) for n equal to 1 is given by:

$$D_s = \{erf([1.5/((1 + 12\ _o t/b^2)^2 - 1)]^{0.5})\}^{-1}$$

where:

$o = 0.001\ b^{4/3}$ (ft^2/sec)
b = wastefield width (ft)
t = time (sec)
erf = error function.

Regardless of current direction, the wastefield width should be approximated by the diffuser length.

3. **What is the increase in receiving water suspended solids concentration immediately following initial dilution of the modified discharge(s)?**

The formula provided in Chapter III of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b) should be used to compute the receiving water suspended solids concentration following (critical) initial dilution. In cases where the initial dilution or the concentration of suspended solids in the effluent has not changed since the original application was submitted, and are not expected to change over the term of the new permit, it will be necessary only to reproduce the calculation provided in the original application. However, changes in either variable will necessitate recalculating the receiving water suspended solids concentration.

4. Does (will) the modified discharge comply with applicable water quality standards for:

   - Dissolved oxygen?
   - Suspended solids or surrogate standards?
   - pH?

The applicant must demonstrate compliance with applicable receiving water quality standards in this section. Typically, standards exist for dissolved oxygen, suspended solids, and pH, in which case the results of previous sections may be used. If a quantitative state standard exists for turbidity, expressed in a given turbidity unit, then turbidity of the effluent and the receiving water (expressed in turbidity units as a function of concentration) should be measured so that a demonstration that the standard is met can be made. Guidance for the determination of pH following initial dilution is provided in Chapter VI of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b). Other state standards may also exist, such as for coliform bacteria concentrations at the edge of a mixing zone. The dieoff rate D_{cb} for coliform bacteria due to exposure to seawater can be estimated by the formula (Gameson and Gould 1975):

$$D_{cb} = \exp[2.3(\exp[2.303(0.0295T-2.292)])TT]$$

where:

T = seawater temperature (^{o} C)
TT = exposure time (h).

Monitoring data collected during the term of the original Section 301(h) permit may also be useful for demonstrating compliance with applicable receiving water standards, and for verifying predictions that were made in the original application.

Section 303(e) of the Water Quality Act of 1987 states that permits may not be issued if the dilution water for the discharge contains significant

amounts of previously discharged effluent. In general, this criterion will be met if all water quality standards are met.

5. **Provide the determination required by 40 CFR 125.60(b)(2) or, if the determination has not yet been received, a copy of a letter to the appropriate agency(s) requesting the required determination.**

Because all applications for reissuance of Section 301(h) modified permits are considered applications for new NPDES permits, all applicants are required to provide new determinations of compliance with state regulations, as required by 40 CFR 125.60(b)(2). A copy of the letter requesting the required determination may be provided if the determination by the appropriate state agency has not yet been received.

C. Impact on Public Water Supplies [40 CFR 125.61(b)]

1. **Is there a planned or existing public water supply (desalinization facility) intake in the vicinity of the current or modified discharge?**

Guidance for responding to this question is given in Chapter III of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b).

D. Biological Impact of Discharge [40 CFR 125.61(c)]

1. **Does (will) a balanced indigenous population of shellfish, fish, and wildlife exist:**

   - **Immediately beyond the ZID of the current and modified discharge(s)?**
   - **In all other areas beyond the ZID where marine life is actually or potentially affected by the current and modified discharge(s)?**

During the preparation of applications for original Section 301(h) modified permits, many small applicants were able to respond to this question without conducting field studies of biological communities in the vicinity of the discharge. As discussed in Chapter III of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b), those small applicants were required to use existing information to demonstrate that the characteristics of the discharge and receiving environment indicated a very low potential for adverse impacts. In cases where applicants were not required to collect biological information during the term of the existing permit, applicants may continue to use other available information to demonstrate that the characteristics of the discharge and receiving environment indicate a very low potential for adverse impacts. Applicants are reminded, however, that under Subsection 303(a) of the Water Quality Act of 1987, such demonstrations must consider the potential for adverse impacts of the discharge singly and in combination with other discharges (if any exist). The following characteristics indicate a low potential for impact:

- Location of the discharge at water depths greater than 10 m (33 ft)

- Hydrographic conditions that result in low predicted solids accumulation rates on the bottom

- The absence of distinctive habitats of limited distribution and the absence of fisheries in the vicinity of the outfall, when such absences are not a result of anthropogenic stresses

- The absence of known or suspected sources of toxic pollutants and pesticides or low concentrations of these substances in the effluent.

Most small dischargers that were able to demonstrate a low potential for impact previously should be able to do so again. They only need demonstrate that characteristics of the discharge and receiving environment did not change greatly during the term of the existing permit. Monitoring data

collected during the term of the original Section 301(h) modified permit should also be useful for such demonstrations.

Some small dischargers may not be able to demonstrate a low potential for impacts because characteristics of the discharge or receiving environment differ from those listed above. In some cases, the discharge or receiving environment may not have exhibited the aforementioned characteristics at the time the original application for a Section 301(h) modified permit was prepared. In others, characteristics of the discharge or receiving environment may have changed, or additional information may now be available that documents a greater potential for impact than was previously supposed. For example, the composition of the discharge may have changed to include toxic pollutants or pesticides from a new industrial source. Alternatively, a fishery for a previously underutilized species may have developed in the vicinity of the discharge, or research by local scientists may have discovered that the habitat in the vicinity of the outfall is an important nursery ground for a commercially harvested species of fish or shellfish.

When it is apparent for one or more reasons that the discharge or receiving environment does not exhibit characteristics that would indicate a low potential for impacts, the Regions have the discretionary power to require that an applicant for permit reissuance perform a detailed assessment of biological conditions in the vicinity of the outfall. The level of detail that would be expected in such a demonstration would be comparable to that required by large dischargers. Therefore, small applicants should consult the guidance given under Questions II.C.1 and III.D.1 in Chapter IV of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b) (i.e., the Large Applicant Questionnaire) in addition to the guidance provided in the following discussion.

In some cases, the applicant may have been required to monitor one or more biological communities under the conditions of the existing Section 301(h) modified permit. The Region may require the applicant to analyze and discuss those biological monitoring data in response to this question. When biological monitoring data were not collected, but concern exists that the modified discharge has the potential to cause adverse impacts to the biota,

the Region may require the applicant to collect biological data in support of the application for permit reissuance. If the Region requires the collection of additional data, the Region should consult with the applicant well in advance of the application deadline, thereby giving the applicant adequate time to design and execute appropriate studies. Applicants required to perform field surveys of biological communities in the vicinity of the discharge in support of the application for permit reissuance should consult Chapter X of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b) and Tetra Tech (1982a, 1985e, 1986a,c) for guidance on the design and execution of those surveys. To ensure the collection of adequate, high quality data, the Region should work closely with the applicant during all phases of the necessary studies.

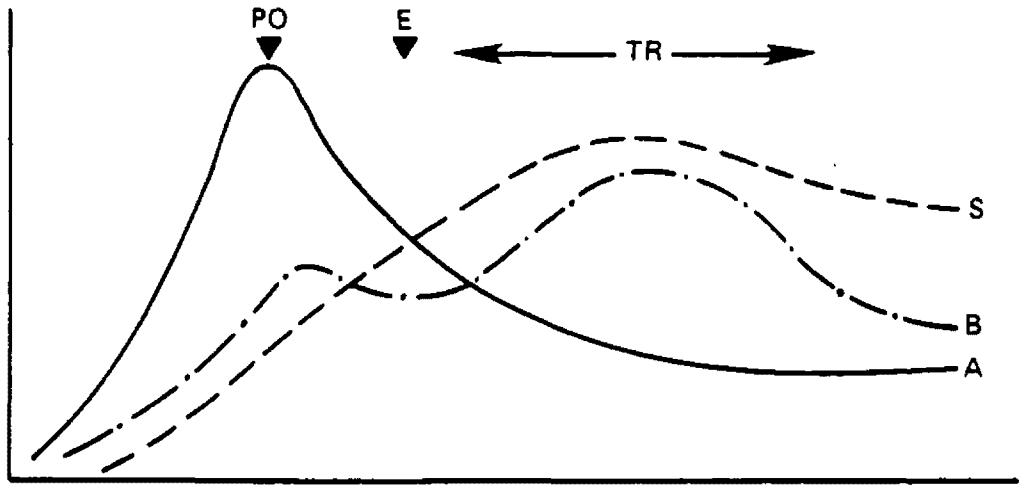
Effective demonstrations that the modified discharge, either singly or in combination with other discharges, does not contribute to adverse biological impacts include comparisons of biological conditions and habitat characteristics among stations or groups of stations. As is apparent from the guidance in the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b) (see especially Chapter VII), the applicant should demonstrate that biological conditions and habitat characteristics do not differ substantially among stations (or groups of stations) in zone of initial dilution (ZID)-boundary, nearfield, farfield, and reference areas.

Numerous variables may be used to describe biological communities and compare them among stations (or groups of stations). Comparisons are commonly made for numbers of species, total abundances of organisms, and abundances of selected pollution-sensitive, pollution-tolerant, and opportunistic species. [See Tetra Tech (1985e) for further guidance on the selection of biological indices.] Physical characteristics of the receiving environment that are often measured include water column characteristics, (e.g., depth, water temperature, salinity, nutrient concentrations, chlorophyll a concentrations) and substrate characteristics (e.g., bottom type and composition). Information on the physical characteristics of the environment may be used to interpret the biological data and to determine whether the applicant's discharge is altering the physical or chemical characteristics of the receiving environment.

Species vary in their sensitivities to pollutants, including organic enrichment. Changes in species composition and abundance begin to occur when the mass emission rates of materials in a sewage discharge are sufficiently high to affect the most sensitive species. As the abundances of pollution-sensitive species decrease or are driven to zero, abundances of opportunistic and pollution-tolerant species are typically enhanced. For this reason, changes in the values of community variables (e.g., numbers of species, total abundances, dominance) are often accompanied by changes in the abundances of opportunistic and pollutiontolerant species.

Because benthic infauna are sedentary and must adapt to pollutant stresses or perish, this assemblage is often used to define the spatial extent and magnitude of pollutant impacts in the vicinity of sewage discharges. The general changes in benthic community structure and function that occur under conditions of organic enrichment of the sediments (such as occur as a result of municipal sewage effluent discharges) have been well documented (Pearson and Rosenberg 1978). Slight to moderate enrichment results in slight increases in numbers of species, abundances, and biomass of benthic communities (Figure 1), while species composition remains unchanged. As enrichment increases, numbers of species decline because less tolerant species are eliminated. The total abundance of organisms increases as a few species adapted to disturbed environments or organically enriched sediments become very abundant. When enrichment levels are optimal for those few species, they become extremely abundant and overwhelmingly dominate the benthic community (corresponding to the "peak of opportunists" shown in Figure 1). Biomass generally decreases, however, because many of those opportunistic species are small. Further organic enrichment of the sediments drastically reduces the number of species and abundances of benthic organisms, as conditions become intolerable for most taxa.

Because the model developed by Pearson and Rosenberg (1978) has been shown to be valid in many (but not all) benthic environments, it is often instructive to examine the abundances of species that the authors identify as opportunistic or pollution-tolerant. Those data, in conjunction with the applicant's data on numbers of species, total abundances, and biomass at



Increasing Organic Input

S = Species numbers
A = Total abundance
B = Total biomass
PO = Peak of opportunists
E = Ecotone point
TR = Transition zone

Reference: Figure 2 of Pearson and Rosenberg (1978).

Figure 1. Generalized depiction of changes in species numbers, total abundance, and total biomass along a gradient of organic enrichment.

stations in the vicinity of the outfall, are often sufficient to determine the relative degree of impact that is occurring within and beyond the ZID.

Comparable models that describe changes in the structure and function of plankton and demersal fish communities in organically enriched receiving environments have not yet been developed. However, it may be instructive to examine the scientific literature that is available for the biogeographic region in which the outfall is located. That literature often contains information describing the responses of the local fauna and flora to organic materials and other pollutants, and identifying opportunistic and pollution-tolerant species. Such information is extremely useful for interpreting data collected in the vicinity of the outfall.

A variety of analytical tools may be used to conduct biological comparisons for Section 301(h) applications. Applicants may analyze the data graphically or statistically, or may use other mathematical tools such as multivariate analyses (i.e., classification and ordination procedures). Graphical analyses can be especially useful for presenting data in an easily understood format. In Figure 2, data on numbers of species in each replicate sample at stations in the vicinity of an outfall have been plotted to show the range of reference values in comparison with values at within-ZID, ZID-boundary, nearfield, and farfield stations. These data may be tested statistically to determine those test stations at which mean values differ from mean values at either or both reference stations. But even without such tests, the data in Figure 2 clearly indicate that a gradient of effects occurs near the outfall. Relative to reference conditions, numbers of species are depressed at the within-ZID and downcurrent ZID-boundary stations, and may be depressed at the nearfield and upcurrent ZID-boundary stations.

Graphical analyses are especially useful for presenting data on the physical characteristics of the habitat. For example, it is often instructive to plot water column or substrate characteristics in relation to distance from the outfall (see Figure 3). Gradients of effects (as in Figure 3-b) are often revealed in such simple presentations. An especially useful method for presenting data on sediment grain size distributions that

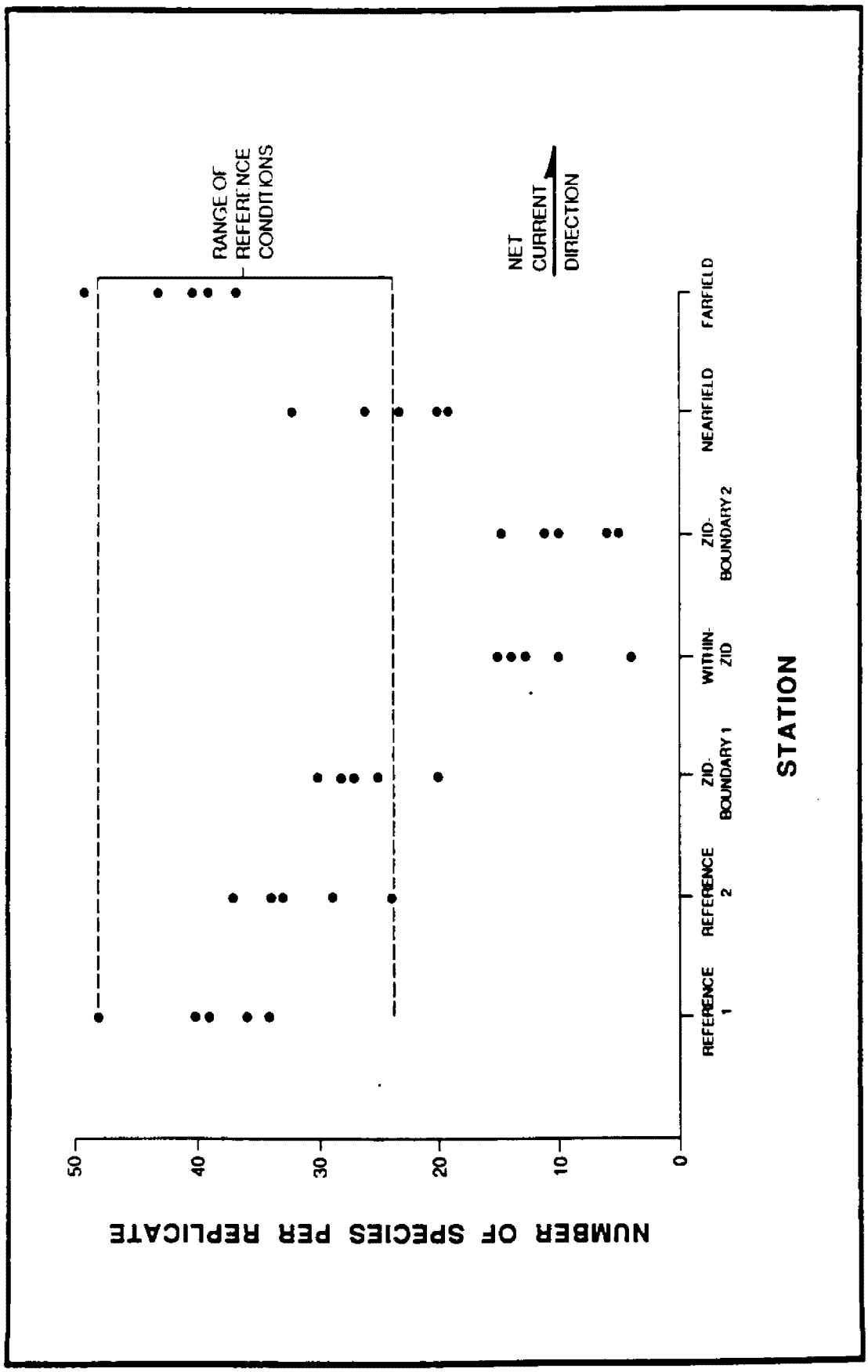


Figure 2. Numbers of species collected in replicate benthic grab samples at stations in the vicinity of an outfall.

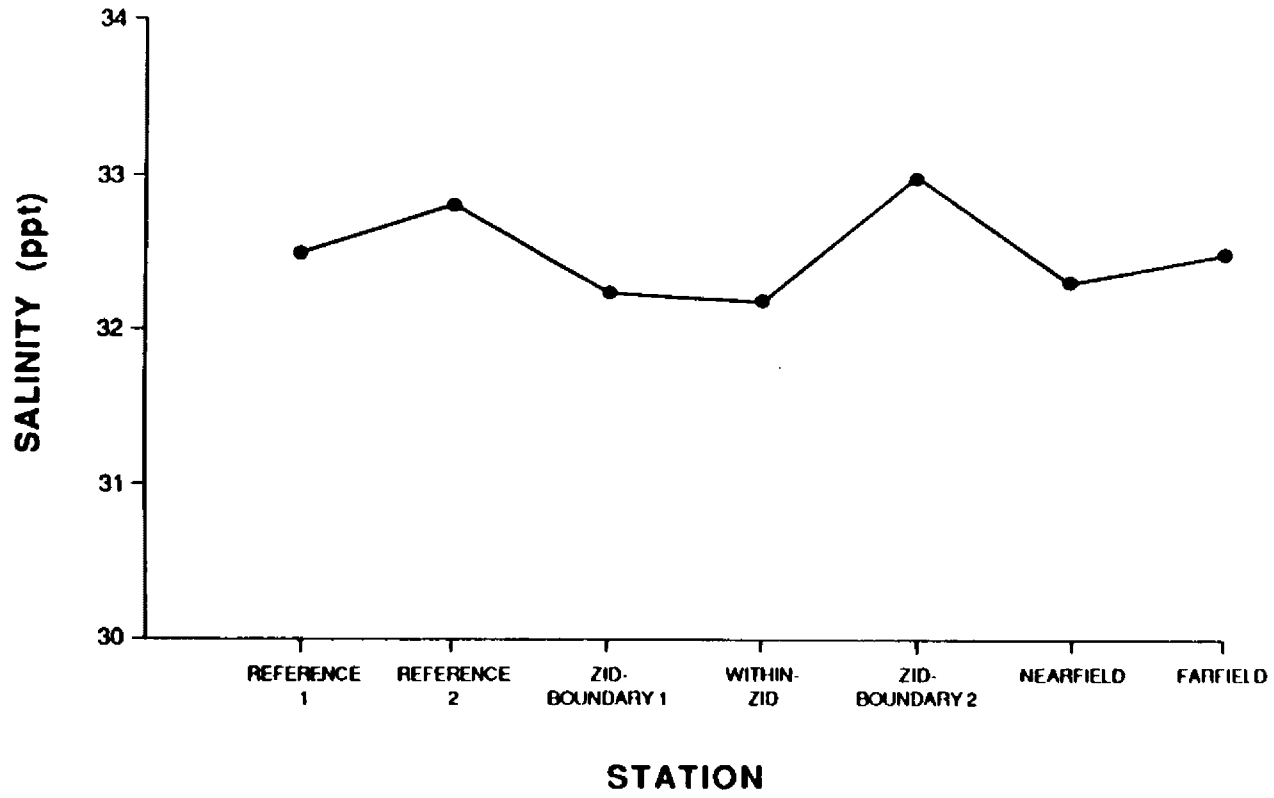


Figure 3a. Salinity at stations in the vicinity of an outfall.

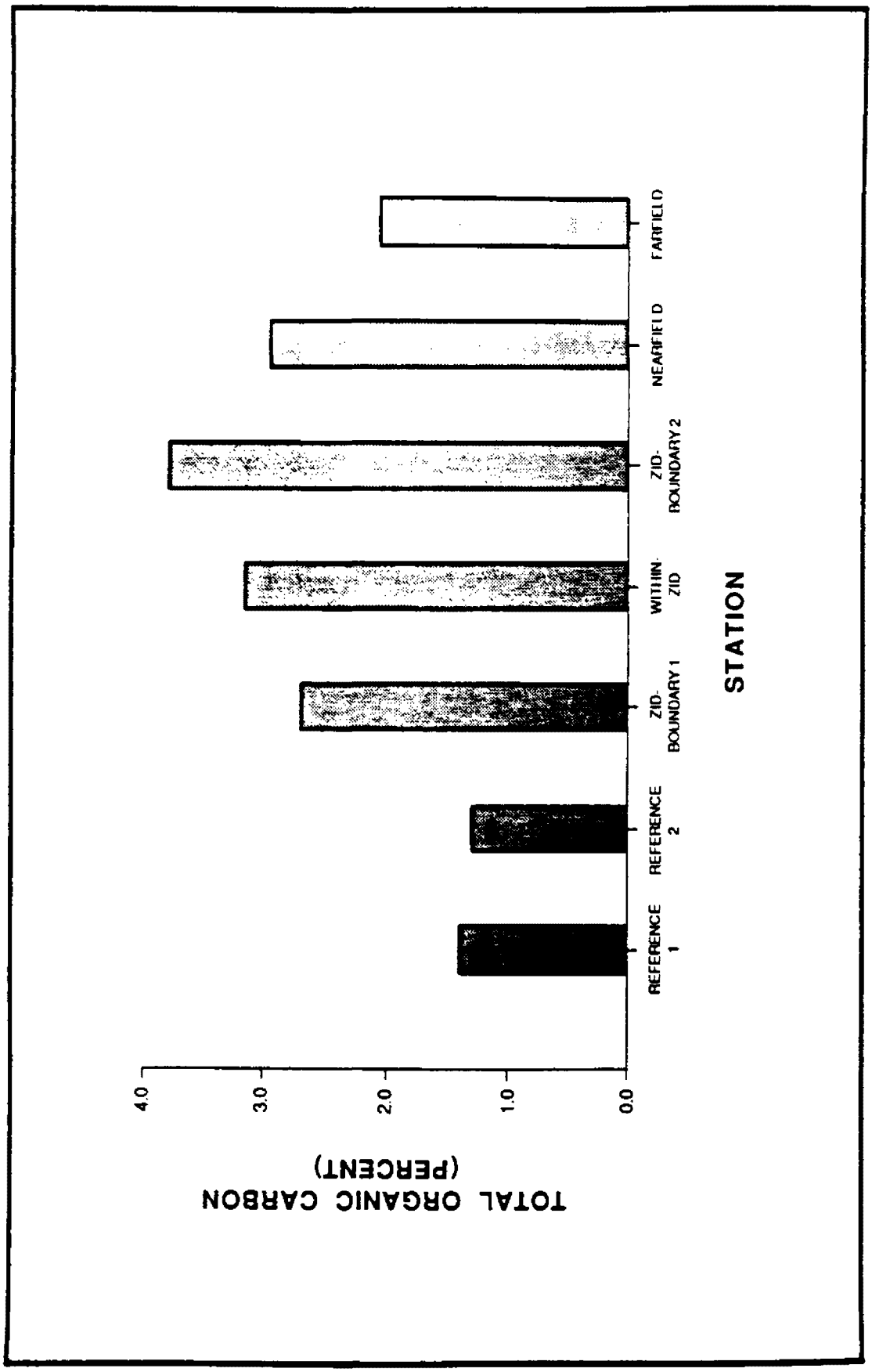


Figure 3b. Total organic carbon content of the sediments at stations in the vicinity of an outfall.

has proven useful in analyses of 301(h) data was developed by Shepard (1954). Sediments are classified by the proportions of their three major grain-size categories (Figure 4). Sand, silt, and clay are often the most useful categories. However, the gravel, sand, and mud (silt plus clay) categories are useful where sediments are relatively coarse. [See Shepard (1963) for information on sediment grain size scales.]

Among the most effective tools for comparing biological communities among stations are statistical tests. A variety of statistical tests are available, the most widely used of which is one way analysis of variance (ANOVA). ANOVA and other statistical tests have been used extensively for biological comparisons in the 301(h) program, but they have often been used improperly. For this reason, procedures for conducting statistical comparisons using biological data are discussed briefly below. Applicants are encouraged to consult references on biostatistics (e.g., Zar 1974; Sokal and Rohlf 1981) for more specific guidance on the application of these procedures.

The use of one way ANOVA for biological comparisons is preferred because ANOVA is an efficient and robust test. ANOVA compares the mean values of a given variable among stations (or groups of stations) for the purpose of detecting significant differences at a predetermined probability level. ANOVA requires a minimum of three replicate values at each station to estimate the mean value and associated variance.

ANOVA is a parametric test that assumes the error of an estimate is a random normal variate, that the data are normally distributed, and that the data exhibit homogeneous variances. Among these three assumptions, the first is not easily corrected for, and can greatly affect the results of the test. Fortunately, error estimates in survey data are usually independent. ANOVA is relatively robust with respect to the assumption that the data are normally distributed. Substantial departures from normality can occur before the value of the F-statistic is affected greatly (Green 1979). For this reason, tests for normality are not usually conducted before data are analyzed using ANOVA. The third assumption, that variances are homogeneous, is critical to execution of ANOVA. Heterogeneous variances can greatly

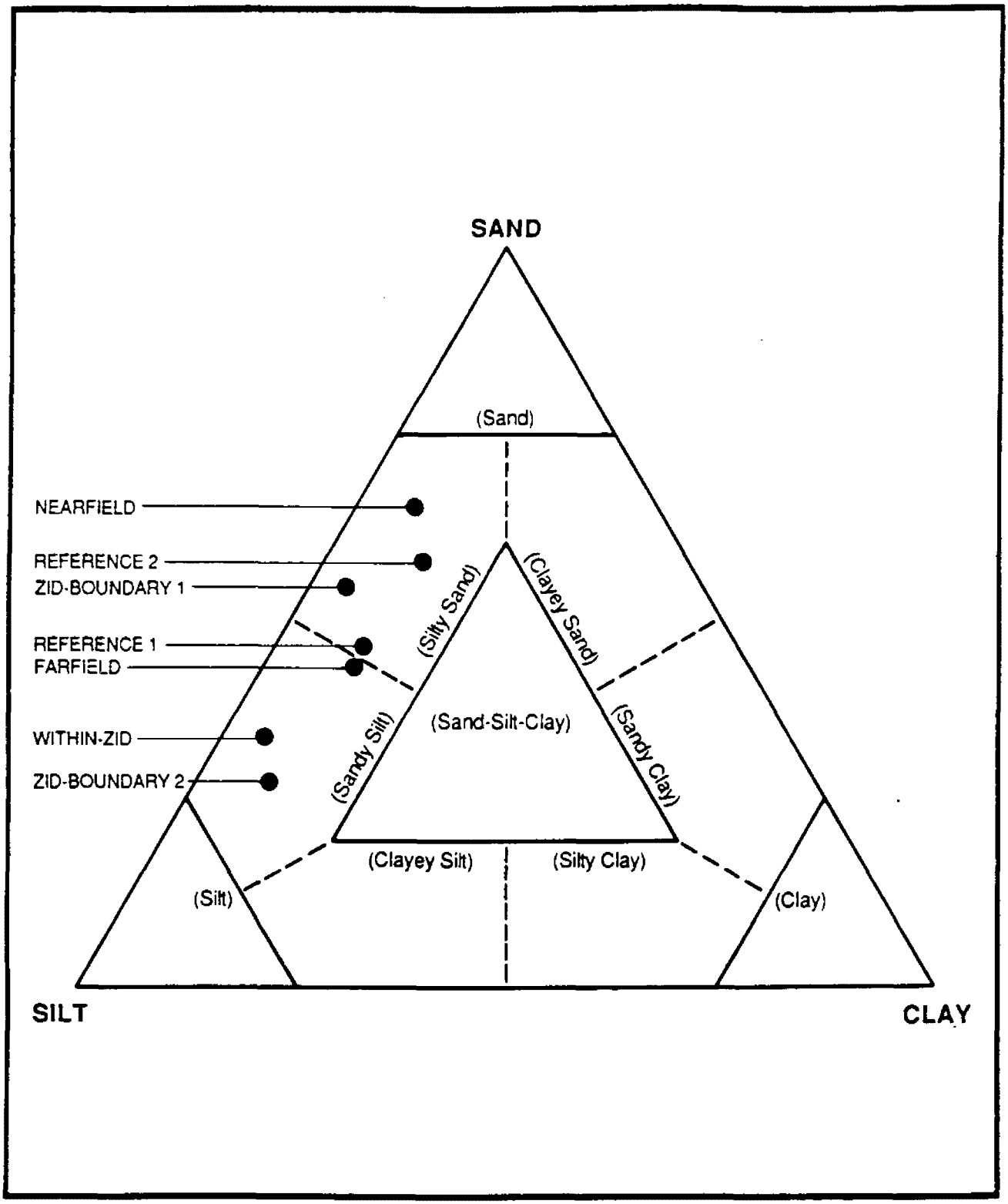


Figure 4. Sediment grain-size characteristics at stations in the vicinity of an outfall.

affect the value of the F-statistic, especially in cases where the statistical design is unbalanced (i.e., where numbers of replicate values vary among the stations or station groups being tested).

Several tests are available to determine whether variances are homogeneous. The Fmax test (see Zar 1974; Sokal and Rohlf 1981) and Cochran's C test (Winer 1971) are both appropriate, although the latter is preferred because it uses more of the information in the data set. Bartlett's test is not recommended because it is overly sensitive to departures from normality (Sokal and Rohlf 1981).

When sample variances are found to differ significantly ($P<0.01$), a transformation should be applied to the data. [A more conservative probability level (e.g., $P<0.05$) should be used when the statistical design is unbalanced. ANOVA is sensitive to unbalanced statistical designs.] Sokal and Rohlf (1981) describe several transformations that may be used. Because ANOVA on transformed data is usually a more efficient test for detecting departures from the null hypothesis than is the Kruskal-Wallis test (the nonparametric analog of ANOVA), the Kruskal-Wallis test should only be used when the appropriate transformation fails to correct for heterogeneous variances (Sokal and Rohlf 1981). The Kruskal-Wallis test requires a minimum of five replicate values per station because it is a test of ranks.

When ANOVA or a Kruskal-Wallis tests are performed, significant differences ($P<0.05$) among individual stations or groups of stations may be determined using the appropriate a posteriori comparison. Of most importance in 301(h) demonstrations are differences among reference stations and stations within the ZID, at the ZID boundary, and beyond the ZID. It is primarily these comparisons upon which determination of the presence or absence of a balanced indigenous population is based.

Classification analyses (i.e., cluster analyses) have also been used extensively in the 301(h) program. In the normal classification mode, stations are grouped by the attributes of the assemblages that occur there (i.e., species composition and abundance). This type of analysis is very useful for determining which stations exhibit the most similar fauna and/or

flora, and which are least similar. Because biological communities respond to organic materials and other pollutants, stations at which pollutant impacts are occurring typically cluster together in interpretable groups. Inverse classification analysis, in which taxa are grouped by the stations at which they co-occur, is also helpful because it defines assemblages that are characteristic of different levels and types of pollutant impacts.

Classification analysis involves two analytical steps: calculation of a matrix of similarity values for all possible station pairs, and grouping of stations based on those between-station similarity values. Many similarity indices and clustering strategies are available to perform these two tasks (see Boesch 1977; Green 1979; Gauch 1982; Pielou 1984; Romesburg 1984). However, only the Bray-Curtis similarity index and either the group average clustering strategy (i.e., the unweighted pair-group method using arithmetic averages) or the flexible sorting strategy have been used commonly in 301(h) demonstrations. Their continued use is recommended. The Bray-Curtis index is easily understood, and has been used widely in ecological studies. Moreover, two comparisons of similarity indices (i.e., Bloom 1981; Hruby 1987) have shown it to be superior to many of the other commonly used resemblance measures. Both the group average clustering strategy and the flexible sorting strategy are recommended because they produce little distortion of the original similarity matrix. [See Tetra Tech (1985e) for additional rationale on the use of these three indices.]

2. **Have distinctive habitats of limited distribution been impacted adversely by the current discharge and will such habitats be impacted adversely by the modified discharge?**

Guidance for responding to this question is given in Chapters III and VII of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b). In responding to this question, applicants should emphasize the physical, chemical, and biological conditions that occurred within the distinctive habitats in the vicinity of the applicant's outfall during the term of the existing Section 301(h) modified permit.

The most effective demonstrations of impacts (or the lack of impacts) include comparisons of potentially impacted areas with reference areas beyond the influence of the discharge. Experience with applications for Section 301(h) modified permits has shown, however, that suitable reference areas for distinctive habitats of limited distribution are often difficult to find. The biota that characterize distinctive habitats often require specific environmental conditions that occur discontinuously within the biogeographic zone, and often only in small areas. When a suitable reference area for a distinctive habitat of limited distribution does not occur in the vicinity of the applicant's outfall, the applicant should present (to the extent possible) detailed information on the typical physical, chemical, and biological characteristics of that distinctive habitat within the biogeographic zone. Information on conditions that are typical for that distinctive habitat should then be used to assess potential impacts of the applicant's discharge on that distinctive habitat in the vicinity of the applicant's outfall. When suitable data are available, applicants should assess potential impacts to distinctive habitats of limited distribution by using the graphical and mathematical tools discussed above under Question III.D.1.

When it appears that an applicant's discharge is causing (or has the potential to cause) impacts to distinctive habitats of limited distribution, the Region may require the applicant to perform a detailed assessment of distinctive habitats in the vicinity of the discharge. Such a detailed assessment would be comparable to that required of large dischargers. Therefore, guidance provided under Questions II.C.2 and III.D.2 in Chapter IV of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b) (i.e., the Large Applicant Questionnaire) and under Question III.D.1 (above) is relevant to the performance of such detailed demonstrations. The Region should notify the applicant well in advance of the application deadline of the need for additional data on distinctive habitats, so as to give the applicant adequate time to design and execute appropriate studies. Moreover, the Region should work closely with the applicant during all phases of the studies to ensure that adequate, high quality data are collected.

3. Have commercial or recreational fisheries been impacted adversely (e.g., warnings, restrictions, closures, or mass mortalities) by the current discharge and will they be impacted adversely by the modified discharge?

Guidance for responding to this question is found in Chapters III and VII of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b).

4. **For discharges into saline estuarine waters:** [40 CFR 125.61 (c)(4)]

   - **Does or will the current or modified discharge cause substantial differences in the benthic population within the ZID and beyond the ZID?**
   - **Does or will the current or modified discharge interfere with migratory pathways within the ZID?**
   - **Does or will the current or modified discharge result in bioaccumulation of toxic pollutants or pesticides at levels which exert adverse effects on the biota within the ZID?**

Guidance for responding to this question is found in Chapter III of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b). Small applicants with discharges into saline estuaries and the Regions should note that, as discussed earlier, the Water Quality Act of 1987 prohibits the issuance of Section 301(h) modified permits for discharges into saline estuaries that:

- Do not support a balanced indigenous population of shellfish, fish, and wildlife
- Do not allow for recreational activities
- Exhibit ambient water quality characteristics that are not adequate to protect public water supplies; protect shellfish,

fish, and wildlife; allow for recreational activities; and comply with standards that assure and protect such uses.

A Section 301(h) modified permit may not be issued if the receiving wate exhibit any of the foregoing conditions, regardless of the causes of an those conditions.

When there is reasonable concern that one or more of the forego conditions has come into existence during the term of the existing Se tion 301(h) modified permit, the Regions should require small applicants discharges into saline estuaries to demonstrate successfully that none the foregoing conditions exists. To do so, applicants may be require perform a detailed biological survey similar to that required of la dischargers. Applicants are advised to consult the information pro under Questions II.C.1 and III.D.1 in Chapter IV of the Revised Sect 301(h) Technical Support Document (Tetra Tech 1982b) (i.e., the Applicant Questionnaire), under Question III.D.1 (above), and in Tetra (1982a) for guidance on the design and execution of detailed biologi surveys. The Regions should notify applicants well in advance o application deadline if a demonstration is required to document the abs of stressed conditions in the receiving environment.

5. **For improved discharges, will the proposed improved charge(s) comply with the requirements of 40 CFR 125.6 through 40 CFR 125.61(d)? [40 CFR 125.61(e)]**

This question requires the applicant to conduct a predictive onstration. The applicant must demonstrate that the proposed improvem the discharge will result in compliance with the provisions of 40 125.61(a)-(d).

Predictive demonstrations may be accomplished by several m Applicants may conduct effluent transport or sediment accumulation anal as described above under Question III.A. The purpose of these a would be to demonstrate that the effluent plume or dissolved and part materials associated with that plume will not (or will have a low po

to) adversely impact the receiving environment and its resident biota. Applicants may also compare attributes of the proposed effluent and the receiving environment with conditions near other outfalls that discharge effluent of similar volume and composition and that are located in similar receiving environments. [Experience with the 301(h) program has shown, however, that such comparisons between discharges are rarely made. Large differences usually exist in the characteristics of the receiving environment or the volume and composition of the effluent discharged at the various outfalls within a biogeographic region.]

Finally, it may be possible to use models that describe cause-and-effect relationships to predict the effects of the proposed improved discharge. Although qualitative, the Pearson and Rosenberg (1978) model that describes the effects of organic enrichnment on benthic communities (Figure 1) has been used to predict the effects of proposed improved discharges on the benthic biota. To date, the only quantitative model that has been developed to describe the cause-and-effect relationship between sewage discharges and a biological community relates the mass emission rate of suspended solids to the biomass and structure of benthic communities in the Southern California Bight (Mearns and Word 1982). (Similar models are now being developed for use in Puget Sound, Washington and New Bedford Harbor, Massachusetts.) Use of this model is limited to that biogeographic region. However, similar models could be developed for other biogeographic regions when sufficient data are available to adequately describe the responses of the resident biota to sewage effluent.

6. For altered discharge(s), will the altered discharge(s) comply with the requirements of 40 CFR 125.61(a) through 125.61(d)? [40 CFR 125.61(e)]

Applicants requesting modifications for altered discharges may use predictive methods similar to those described for improved discharges. However, such applicants must demonstrate that the increased pollutant loading that results from population growth and/or industrial growth within the service area will still enable compliance with 40 CFR 125.61(a)-(d).

These predictions of compliance with 301(h) criteria during the 5-yr permit term may be technically difficult, and may require extensive analyses.

7. **If your current discharge is to stressed waters, does or will your current or modified discharge: [40 CFR 125.61(f)]**

   - **Contribute to, increase, or perpetuate such stressed condition?**
   - **Contribute to further degradation of the biota or water quality if the level of human perturbation from other sources increases?**
   - **Retard the recovery of the biota or water quality if human perturbation from other sources decreases?**

Guidance for responding to this question is provided in Chapter III of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b). Note that under Section 303(e) of the Water Quality Act of 1987, applicants with discharges into saline estuaries are prohibited from applying for a Section 301(h) modified permit if the estuarine receiving waters are stressed.

When it appears that an applicant's receiving waters are or may be stressed, the Region may require that the applicant demonstrate the presence or absence of stressed conditions. If stressed conditions exist, the areal extent and magnitude of those stresses should be documented. Because stressed water determinations are largely based on biological conditions in the receiving environment, applicants may be required by the Regions to perform detailed biological surveys. Such surveys would be similar to those required of large dischargers. Therefore, applicants required to perform detailed biological surveys for the purpose of determining whether stressed waters exist in the receiving environment should consult the guidance provided under Question III.D.7 in Chapter III of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b) (i.e., the Small Applicant Questionnaire), Question III.D.8 in Chapter IV of the Revised Section 301(h) Techincal Support Document (i.e., the Large Applicant Questionnaire), and Question III.D.1 (above). The Regions should notify applicants well in

advance of the application deadline if surveys of the biota are required to determine whether stressed conditions exist in the receiving environment. Moreover, the Regions should work closely with applicants during all phases of the required studies to ensure the collection of adequate, high quality data.

E. Impacts of Discharge on Recreational Activities [40 CFR 125.61(d)]

1. Describe the existing or potential recreational activities likely to be affected by the modified discharge(s) beyond the zone of initial dilution.

Guidance for responding to this question is given in Chapter III of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b).

2. What are the existing and potential impacts of the modified discharge(s) on recreational activities? Your answer should include, but not be limited to, a discussion of fecal coliform bacteria.

Guidance for responding to this question is given in Chapter III of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b). Many states have coliform bacteria standards applicable to nearshore areas. Compliance with such standards may require calculations of the farfield coliform bacteria concentration. Because the coliform bacteria concentration decreases with increasing travel time, the receiving water conditions that permit the shortest travel time from the diffuser to the regulated nearshore area must be estimated. In many instances, the shortest travel time is caused by onshore winds, which transport a surfacing wastefield toward shore at speeds of roughly 0.03 times the surface wind speed (Shemdin 1973). The coliform bacteria concentration at the nearshore area can then be computed by dividing the effluent coliform bacteria concentration by the product of the appropriate initial dilution, the farfield dilution factor [calculated using the method of Brooks (1960)], and the coliform bacteria dieoff factor due to exposure to seawater (see Section III.B.4). Dieoff factors that implicitly

include the effects of combined processes or dieoff due to exposure to sunlight should not be used. The applicant should specify whether or not the effluent is chlorinated, and, if so, specify both the dosage of chlorine used and the effluent coliform bacteria concentration after chlorination.

3. **Are there any Federal, State, or local restrictions on recreational activities in the vicinity of the modified discharge(s)? If yes, describe the restrictions and provide citations to available references.**

Guidance for responding to this question is given in Chapter III of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b).

4. **If recreational restrictions exist, would such restrictions be lifted or modified if you were discharging a secondary treatment effluent?**

Guidance for responding to this question is given in Chapter III of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b).

F. Establishment of a Monitoring Program [40 CFR 125.62]

1. **Describe the biological, water quality, and effluent monitoring programs which you propose to meet the criteria of 40 CFR 125.62.**

2. **Describe the sampling techniques, schedules, and locations, analytical techniques, quality control and verification procedures to be used.**

Guidance for responding to these questions is given in Design of 301(h) Monitoring Programs for Municipal Wastewater Discharges to Marine Waters (Tetra Tech 1982a) and in Chapter III of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b). Applicants are also referred to the following documents for additional guidance on specific topics relevant to the design and execution of 301(h) monitoring programs:

- Tetra Tech (1986a) for information on positioning methods in nearshore marine and estuarine waters

- Tetra Tech (1986c) for information on quality assurance/quality control procedures for field and laboratory methods

- Tetra Tech (1985a,b,c,d) for information on bioaccumulation monitoring studies

- Tetra Tech (1986b) for information on fish liver pathology monitoring studies.

Although applicants should propose a complete, integrated monitoring program in response to this question, the emphasis of the applicant's discussion should be on any proposed changes to the existing monitoring program.

3. **Describe the personnel and financial resources available to implement the monitoring programs upon issuance of a modified permit and to carry it out for the life of the modified permit.**

Guidance for responding to this question is given in Chapter III of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b).

G. Effect of Discharge on Other Point and Nonpoint Sources [40 CFR 125.63]

1. **Does (will) your modified discharge(s) cause additional treatment or control requirements for any other point or nonpoint pollution source(s)?**

2. **Provide the determination required by 40 CFR 125.63(b) or, if the determination has not yet been received, a copy of a letter to the appropriate agency(s) requesting the required determination.**

Guidance for responding to these questions is given in Chapter III of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b).

H. Toxics Control Program [40 CFR 125.64]

1. **Do you have any known or suspected industrial sources of toxic pollutants and pesticides?**

2. **Do you have an approved industrial pretreatment program?**

3. **Describe the public education program you propose to minimize the entrance of nonindustrial toxic pollutants and pesticides into your treatment system.**

4. **Are there any known or suspected water quality, sediment accumulation, or biological problems related to toxic pollutants or pesticides from your modified discharge(s)?**

Guidance for responding to these questions is given in Chapter III of the Revised Section 301(h) Technical Support Document (Tetra Tech 1982b). The U.S. EPA marine water qualtiy criteria are listed in Table 1. When demonstrating that regulated pollutant concentrations following initial dilution satisfy state standards, the applicant should be careful that the initial dilutions used are computed as allowed by the state. At least one state, for example, requires that the initial dilution be computed with zero current speed.

TABLE 1. SUMMARY OF U.S. EPA MARINE WATER QUALITY CRITERIA

Pollutant	Concentrations (ug/L) Acute	Chronic	References (see below)
Acenaphthene	970[a]	710[a]	Goldbook
Acrolein	55[a]	[b]	Goldbook
Acrylonitrile	[b]	[b]	Goldbook
Aldrin	1.3[c]	[b]	Goldbook
Antimony	[d]	[b]	Goldbook
Arsenic			
Pentavalent	2,319[a]	[b]	Goldbook
Trivalent	69[d]	36[e]	Goldbook
Asbestos	[b]	[b]	Goldbook
Benzene	5,100[a]	700[a]	Goldbook
Benzidine	[b]	[b]	Goldbook
Beryllium	[b]	[b]	Goldbook
Cadmium	43[d]	9.3[e]	Goldbook
Carbon tetrachloride	50,000[a]	[b]	Goldbook
Chlordane	0.09[c]	0.004[f]	Goldbook
Chlorinated benzenes	160[a]	129[a]	Goldbook
Chlorinated ethanes			
Dichloroethane 1,2	113,000[a]	[b]	Goldbook
Hexachloroethane	940[a]	[b]	Goldbook
Pentachloroethane	390[a]	281[a]	Goldbook
Tetrachloroethane 1,1,2,2	9,020[a]	[b]	Goldbook
Trichloroethane 1,1,1	31,200[a]	[b]	Goldbook
Chlorinated ethylenes			
Dichloroethylenes	224,000[a]	224,000[a]	Goldbook
Tetrachloroethylene	10,200[d]	450[a]	Goldbook
Trichloroethylene	2,000[a]	[b]	Goldbook

TABLE 1. (Continued)

Pollutant	Concentrations (ug/L) Acute	Chronic	References (see below)
Chlorinated naphthalene	7.5[a]	[b]	Goldbook
Chlorinated phenols			
Chlorophenol 2	[b]	[b]	Goldbook
Chlorophenol 4	29,700[a]	[b]	Goldbook
Pentachlorophenol (penta)	13[d]	7.9[e]	Update No. 2
Tetrachlorophenol 2,3,5,6	440[a]	[b]	Goldbook
Chlorine	13[d]	7.5[e]	
Chloroalkyl ethers	[b]	[b]	Goldbook
Chloroform	[b]	[b]	Goldbook
Chlorpyrifos	0.011[d]	0.0056[e]	Update No. 2
Chromium			
Hexavalent	1,100[d]	50[e]	Goldbook
Trivalent	10,300[a]	[b]	Goldbook
Copper	2.9[d]	2.9[e]	Goldbook
Cyanide	1.0[d]	1.0[e]	Goldbook
DDT	0.13[c]	0.001[f]	Goldbook
DDT Metalbolites			
DDD (TDE)	3.6[a]	[b]	Goldbook
DDE	14[a]	[b]	Goldbook
Demeton	[b]	0.1	Goldbook
Dichlorobenzenes	1,970[a]	[b]	Goldbook
Dichlorobenzidines	[b]	[b]	Goldbook
Dichlorophenol 2,4	[b]	[b]	Goldbook
Dichloropropanes	10,300[a]	3,040[a]	Goldbook
Dichloropropenes	790[a]	[b]	Goldbook
Dieldrin	0.71[c]	0.0019[f]	Goldbook
Dimethylphenol 2,4	[b]	[b]	Goldbook

TABLE 1. (Continued)

Pollutant	Concentrations (ug/L) Acute	Chronic	References (see below)
Dinitrotoluene	590[a]	370[a]	Goldbook
Diphenylhydrazine 1,2	[b]	[b]	Goldbook
Endosulfan	0.034[c]	0.0087[f]	Goldbook
Endrin	0.037[c]	0.0023[f]	Goldbook
Ethylbenzene	430[a]	[a]	Goldbook
Fluoranthene	40[a]	16[a]	Goldbook
Guthion	[b]	0.01	Goldbook
Haloethers	[b]	[b]	Goldbook
Halomethanes	12,000[a]	6,400[a]	Goldbook
Heptachlor	0.053[c]	0.0036[f]	Goldbook
Hexachlorobutadiene	32[a]	[b]	Goldbook
Hexachlorocyclohexane (HCH)			
Lindane (gamma-HCH)	0.16[c]	[b]	Goldbook
HCH (mixture of isomers)	0.34[a]	[b]	Goldbook
Hexachlorocyclopentadiene	7.0[a]	[b]	Goldbook
Isophorone	12,900[a]	[b]	Goldbook
Lead	140[d]	5.6[e]	Goldbook
Malathion	[b]	0.1	Goldbook
Mercury	2.1[d]	0.025[e]	Goldbook
Methoxychlon	[b]	0.03	Goldbook
Mirex	[b]	0.001	Goldbook
Naphthalene	2,350[a]	[b]	Goldbook
Nickel	75[c]	8.3[f]	Update No. 2
Nitrobenzene	6,680[a]	[b]	Goldbook

TABLE 1. (Continued)

Pollutant	Concentrations (ug/L) Acute	Chronic	References (see below)
Nitrophenols	4,850[a]	[b]	Goldbook
Nitrosamines	3,300,000[a]	[b]	Goldbook
Parathion	[b]	[b]	Update No. 2
Phenol	5,800[a]	[b]	Goldbook
Phosphorous (elemental)	[b]	0.1	
Phthalate esters	2,944[a]	3.4[a]	Goldbook
Polychlorinated biphenyls	10[a]	0.03[f]	Goldbook
Polynuclear aromatic hydrocarbons	300[a]	[b]	Goldbook
Selenium (inorganic selenite)	410[c]	54[f]	Goldbook
Silver	2.3[c]	[b]	Goldbook
Sulfur (hydrogen sulfide, H_2S)	[b]	2[f]	Goldbook
Thallium	2,130[a]	[b]	Goldbook
Toluene	6,300[a]	5,000[a]	Goldbook
Toxaphene	0.21[d]	0.0002[e]	Update No. 2
Vinyl chloride	[b]	[b]	Goldbook
Zinc	95[d]	86[e]	Update No. 2

[a] Data insufficient to derive criteria. Value presented is the lowest observed effect level (LOEL). These concentrations represent apparent threshold levels for acute and/or chronic toxic affects, and are intended to convey information about the degree of toxicity of a pollutant in the absence of established criteria.

[b] Criterion has not been established for marine water quality.

[c] Not to be exceeded at any time.

[d] Maximum 1-h average. Not to be exceeded more than once every 3 yr on the average.

TABLE 1. (Continued)

[e] Maximum 96-h (4 day) average. Not to be exceeded more than once every 3 yr.

[f] Maximum 24-h average. Not to be exceeded more than once every 3 yr.

References: Goldbook=U.S. EPA 1986; Update No. 2=U.S. EPA 1987.

EVALUATIONS OF COMPLIANCE BY U.S. EPA

DETERMINATIONS OF COMPLIANCE WITH SECTION 301(h) MODIFIED PERMIT CONDITIONS

POTWs holding Section 301(h) modified permits must comply with Section 301(h) criteria and regulations, applicable state water quality standards and regulations, and federal water quality criteria (U.S. EPA 1986a). Conditions specified in Section 301(h) modified permits are designed primarily to ensure compliance with Section 301(h) criteria and regulations, and applicable state water quality standards and regulations. They may not have been designed to meet federal water quality criteria because compliance with those criteria was mandated only recently in the Water Quality Act of 1987 [see Subsection 303(d)(1) of the Water Quality Act of 1987 and the discussion given under Questions II.D.1-II.D.4 of the Small Applicant Questionnaire (above) for further information on these water quality criteria]. It is anticipated, however, that most small dischargers holding Section 301(h) modified permits will meet the newly mandated federal water quality criteria because they discharge little or no industrial influent. One exception would be in those few cases where small dischargers receive a substantial proportion of their influent from industrial sources. In those cases, conditions specified in the existing Section 301(h) modified permits may not be adequate to meet federal water quality criteria.

The following discussion presents general guidance for assessing whether a permittee's demonstration of compliance with the conditions specified in the Section 301(h) modified permit is reasonable. As discussed under Questions II.D.1-II.D.4 of the Small Applicant Questionnaire (above), the newly mandated federal water quality criteria place additional requirements on all Section 301(h) dischargers. These federal water quality criteria expand the scope of the water quality demonstrations that must be made by each Section 301(h) discharger to include more variables, but do not create a fundamentally different, or new, class of criteria or requirements that must be met. Therefore, the general guidance provided below is also relevant to determinations

of compliance with the newly mandated federal water quality criteria that will be performed by the Regions.

The first step in evaluating a permittee's demonstration of compliance with applicable criteria and regulations, or in determining compliance with criteria and regulations when monitoring data are examined by the Regions, is to compare the data that were submitted by the permittee with the data that were required to be collected under the conditions of the existing Section 301(h) modified permit. The following two key questions should be addressed:

- Were all physical, chemical, and biological variables required by the Section 301(h) modified permit measured?

- Was each required variable measured at the specified locations and at the specified frequency required by the Section 301(h) modified permit?

If either question cannot be answered in the affirmative, the applicant should be considered not to have complied with the terms of the existing Section 301(h) modified permit.

In cases of apparent noncompliance, the Regions have the option of denying the application for reissuance of the modified permit without further examination of the monitoring data. However, the Regions are strongly advised to ask the applicant (if no explanation of the apparent deficiencies was previously made by the applicant) the reasons for the apparent noncompliance. Unforeseen events or conditions beyond the control of the applicant may have been responsible for failures to execute the conditions of the modified permit.

Having received all the appropriate data from the applicant, the Region's second step in assessing the applicant's demonstration of compliance, or in examining the data submitted by the applicant to arrive at a tentative decision regarding permit reissuance, is to evaluate the technical merit and (as warranted) the applicant's interpretation of those data. Three major issues should be addressed during that evaluation:

- Data quality
- Execution of the analyses
- Interpretation of the analytical results.

Successful demonstrations of compliance should provide sufficient information for the Region to document that data quality is high, analyses were properly executed, and the applicant's interpretation of the analytical results is reasonable.

To determine whether the applicant's data were collected properly, the Regions are referred to guidance given in Tetra Tech (1982a,b; 1986c) and under the appropriate questions in the Small Applicant Questionnaire (especially Questions III.F.1-III.F.2). Of critical importance to the collection of data on any variable is whether appropriate field and laboratory methods were used to collect the data, and whether appropriate quality assurance/quality control procedures were followed. Data are of little value if they were collected using inappropriate methods, or if the collection process was so poorly executed that their accuracy is in doubt.

As is true for data collection methods, data analysis methods vary greatly among the various types of physical, chemical, and biological variables. Again, the Regions are referred to the aforementioned documents. The following general questions should be addressed during the evaluation of the data analyses:

- Have appropriate units been used for each variable?
- Are the analytical methods appropriate for the type of data being analyzed?
- Do the mathematical or graphical analyses illustrate what is being discussed in the text of the application?

- Are calculations correct, and have data points been plotted correctly?

Provided that the foregoing questions (and other questions related to data analysis that may be relevant in specific instances) are answered in the affirmative, the Region should determine whether the applicant's data and the results of analyses of those data support the applicant's conclusions. If the Region determines otherwise, alternative conclusions must be developed by the Region for use in determining whether the applicant's existing or proposed discharge contributes to adverse impacts on the receiving environment or biota.

DETERMINATIONS OF COMPLIANCE WITH 301(h) CRITERIA

When the permittee's monitoring data indicate that impacts to water quality, sediment quality, or biota are occurring as a result of the permittee's discharge, it will be necessary for the Regions to determine whether such impacts are adverse. (Impacts are considered herein to be any changes in the receiving environment or biota that are directly attributable to the applicant's discharge of sewage effluent.) Determinations of adverse impacts are reasonably straightforward for many physical and chemical criteria (e.g., dissolved oxygen concentrations, concentrations of toxic substances in the water column after initial dilution) because such criteria are quantitative, and because determinations of compliance rely primarily on the results of well-documented mathematical calculations. Providing that the physical and chemical data were properly collected and analyzed, the resultant values for each physical and chemical variable need only be compared with applicable Section 301(h) criteria, state standards, and federal water quality criteria (as appropriate). Results of those comparisons can be used to determine whether an adverse impact is occurring that would result in the applicant not meeting Section 301(h) criteria.

When the values of one or more physical or chemical variables consistently fall outside the ranges specified by the foregoing criteria, the discharge can be inferred (by definition) to be causing adverse impacts to the physical or chemical characteristics of the receiving environment,

thereby resulting in noncompliance with Section 301(h) criteria. In those cases, the Regions have the option of denying the request for reissuance of the Section 301(h) modified permit, or requesting that the applicant make improvements to the outfall or treatment system such that compliance with applicable criteria is assured. In most cases, applicants proposing improvements will be required to predict the values of the previously noncompliant variables following implementation of the proposed improvements.

Determinations of the presence or absence of adverse environmental impacts that result in noncompliance with Section 301(h) criteria are more difficult for biological criteria because adverse impacts are not defined quantitatively. Some extreme adverse impacts may be assessed more easily because they are defined specifically in the 301(h) regulations, and because they are endpoints in a spectrum of possible biological conditions that may result from the discharge of sewage effluent. For example, the 301(h) regulations state that conditions within the ZID must not contribute to extremely adverse biological impacts, including the following conditions:

- Destruction of distinctive habitats of limited distribution
- Presence of disease epicenters
- Stimulation of phytoplankton blooms that have adverse impacts beyond the ZID
- Conditions that result in mass mortalities of fish and invertebrates.

The Regions should deny applications for reissuance of Section 301(h) modified permits where such impacts have been demonstrated to occur over the life of the existing permit, or are expected to occur over the life of the reissued permit. The Regions may consider applications that propose improvements to eliminate any of the foregoing adverse impacts. But because all of these impacts are considered extremely adverse, it would be difficult to demonstrate that a balanced indigenous population will become reestablished following improvements to the treatment plant or outfall.

Many biological impact assessments that are required under the 301(h) regulations necessitate determinations of degrees of impact relative to unstressed conditions, and subsequent judgments as to whether the documented changes are in compliance with 301(h) criteria. These assessments rely largely on comparisons of biological conditions between reference areas and potentially impacted areas to determine the locations of the changes along theoretically or empirically derived gradients of impacts. Quantitative comparisons between reference and potentially impacted areas may be made using various types of biological data [e.g., numbers of individuals per unit area, values of the Infaunal Index (Word 1978, 1980)] and various analytical tools (e.g., normal classification analysis), as discussed under Question III.D.1 (above). However, no quantitative biological criteria have been established by which the results of these analyses may be judged. Therefore, determinations of whether changes in, or differences among, biological communities constitute noncompliance with Section 301(h) criteria require careful consideration of the types of responses that are manifested by the pollutant stress, as well as their spatial extents and magnitudes.

Three approaches have been used in the 301(h) program to determine whether a specified degree of change in the biota (and associated receiving environment) should be considered to be in compliance with 301(h) criteria. The first is to determine whether the observed change represents a reduction in the areal extent or health of a community or ecosystem. This approach has most often been used in cases where the major taxa that characterize the community greatly modify the environment, thereby creating habitat for other species. Examples primarily include distinctive habitats of limited distribution such as kelp communities, coral reefs, and seagrass beds. Because most of the taxa in these communities are highly dependent on the major taxa that characterize the community (and create habitat niches), the loss of those major taxa due to pollutant impacts results in destruction of the community. Unlike some other communities (such as benthic infauna), one assemblage of organisms is not replaced by another in which the species belong to the same, or similar, major taxonomic groups, and in which the new taxa are able to tolerate, and in many cases thrive, in the modified environment. Clearly, in cases where a community or ecosystem is highly dependent on a limited

number of major taxa to provide habitat for a wide variety of dependent species, any loss or decline in the health of those major taxa is an adverse impact, and is therefore not in compliance with 301(h) criteria.

In communities where pollutant impacts result in changes in species composition and abundance, but not in the destruction of the habitat, it is more difficult to determine whether such changes constitute noncompliance with Section 301(h) criteria. However, two approaches to the problem have been used in the past in the 301(h) program. The first is based on the assumption that a major change in the function of a community (e.g., benthic infauna, demersal fishes) constitutes noncompliance with Section 301(h) criteria because it affects, or has the potential to affect, all of the major elements of the ecosystem. The second is a corollary of the first. It assumes that a major change in the structure (i.e., species composition and abundance) of a community constitutes noncompliance with Section 301(h) criteria because a change in the function of that community has occurred, regardless of whether a change in function can be demonstrated. Because a change in the structure of a community is usually much easier to document than is a change in the function of a community, the second approach has been used most commonly in the 301(h) program.

Benthic infauna are used in the following example to demonstrate how the functional and structural approaches may be implemented. The generalized model developed by Pearson and Rosenberg (1978) for changes in benthic communities along a gradient of organic enrichment (see Figure 1) has been used extensively in the 301(h) program, and has been successfully applied to a variety of soft-bottom benthic communities in temperate and tropical latitudes. At low to moderate levels of organic enrichment (i.e., the "transition zone" in Figure 1), biomass increases moderately and numbers of species increase slightly. Abundances do not increase greatly until the "ecotone point" is approached. In the "transition zone," there is simply an enhancement of the community that is typical of the biogeographic region, with the addition of a few new species. There are no major functional or structural changes. Providing that there are no major problems with other aspects of the benthic infauna (e.g., bioaccumulation of toxic substances), the impact to benthic

infauna may not be considered to be out of compliance with Section 301(h) criteria.

At and beyond the "peak of opportunists" as shown in Figure 1, Pearson and Rosenberg (1978) document that species composition and abundance of the benthic infauna change substantially. The fauna becomes dominated by a few opportunistic or pollution-tolerant species whose abundances increase dramatically in response to increased organic loading. Most of these species are surface or subsurface deposit feeders. Suspension feeders and surface detrital feeders typically decrease in abundance, or are eliminated. Hence, the structure (i.e., species composition and abundance) and function (i.e., trophic relationships) of the benthic infauna are altered substantially.

In most cases, information is not available to demonstrate that major changes in the structure and function of a particular benthic community affect other biological communities (e.g., demersal fishes). However, many cases of prey specificity by demersal fishes and large epibenthic invertebrates that prey on benthic infauna have been recorded in the scientific literature. Hence, there is a sound scientific basis for assuming that major changes in the structure and function of benthic communities as a result of organic enrichment can induce changes in the species composition and abundance of predators on infauna, most of which are demersal fishes and large epibenthic invertebrates. Therefore, major changes in the structure and function of the benthic infaunal community have often been considered to constitute noncompliance with Section 301(h) criteria.

Decisions regarding adverse impacts should be based on the results of the biological demonstrations required of the applicant in the various parts of the Small Applicant Questionnaire. Those biological demonstrations should include monitoring data collected over the term of the existing modified permit. The Regions are referred to discussions under relevant questions in the Small Applicant Questionnaire (above) for guidance on data analysis and interpretation.

If a Region decides that an existing discharge may be causing an adverse impact to the biota, or that the proposed discharge will likely cause an

adverse impact to the biota, that Region should require that applicant to perform detailed biological demonstrations in support of the application. The required demonstrations may be from either the Small Applicant Questionnaire or the Large Applicant Questionnaire, as is deemed necessary by the Region. Such demonstrations would most likely be required in cases where possible adverse impacts would result in noncompliance with Section 301(h) criteria, such as adverse impacts to distinctive habitats of limited distribution, discharges into estuarine waters, and discharges into stressed waters. It is important that the Region work closely with the applicant over the term of the existing permit, so that possible adverse impacts or conditions that would result in noncompliance with Section 301(h) criteria are identified well in advance of the application deadline. Early notification of potential adverse impacts will ensure that the applicant has sufficient time to design and execute appropriate studies. The Region should also work closely with the applicant during all phases of survey design and execution to ensure the collection of adequate, high quality data.

EVALUATIONS OF PREDICTED CONDITIONS AND PREDICTED CONTINUED COMPLIANCE

POTWS were allowed to apply for first-time Section 301(h) modified permits based on current, improved, or altered discharges. A current discharge is defined in 40 CFR 125 Subpart G, as a discharge that has a similar volume, composition, and location to that discharged any time between 27 December 1977 and 29 December 1982, as specified by the applicant. An improved discharge may include planned improvements in the outfall, the level of treatment, discharge characteristics, operation and maintenance, or controls on the introduction of pollutants into the treatment system. An altered discharge is defined as any discharge other than a current discharge or an improved discharge as defined in 40 CFR 125.58.

For improved and altered discharges, applicants were required to predict conditions that would occur in the receiving environment following implementation of the proposed improvements or alterations. Section 301(h) modified permits were issued upon a satisfactory demonstration that the predicted conditions were reasonable and would satisfy Section 301(h) criteria and regulations. For dischargers whose original Section 301(h) modified permit was issued

based in part on predictions of conditions that would occur after proposed improvements or alterations were implemented, it is necessary to evaluate whether the predicted conditions have been realized. Because the Regions should receive monitoring data collected during the term of the existing permit in support of the application for permit reissuance, evaluations of the applicant's original predictions of compliance is not unlike other determinations of compliance. Therefore, the Regions should conduct those evaluations as discussed above in the two previous sections of this chapter, entitled "Determinations of Compliance with Section 301(h) Modified Permit Conditions" and "Determinations of Adverse Impacts."

As was permitted for original Section 301(h) applications, applications for reissuance of Section 301(h) modified permits may propose improved levels of sewage treatment, either in response to comments by the U.S. EPA, or at the permittee's initiative. Applications for permit reissuance that are based on altered discharges are also permitted when downgrading of effluent quality is attributable entirely to population growth or industrial growth within the service area. Proposals for improved and altered discharges mandate that the permittee predict the physical, chemical, and biological conditions that will occur in the receiving environment. In such cases [as in the original Section 301(h) applications], it will be necessary for the Regions to evaluate whether the permittee's predictions are reasonable, and whether the predicted conditions would satisfy Section 301(h) criteria and regulations.

Evaluations of applicant's predictions should include the following assessments:

- Appropriateness of the models used to generate the predictions
- Data quality
- Execution of the analyses
- Interpretation of the analytical results.

It is essential that the applicant conduct each of these steps in the predictive process properly. Otherwise, the validity of the results and compliance with applicable regulations and criteria are suspect.

To predict conditions that will occur as a result of a proposed discharge, applicants may compare attributes of the proposed discharge (e.g., volume and composition) and receiving environment with conditions near other outfalls that discharge effluent of similar volume and composition and in similar receiving environments. The validity of such comparisons rests on the similarity of the discharges and the similarity of the receiving environments. Substantial differences in the volumes of the two discharges or the mass emission rates of pollutants from the two discharges would render such comparisons questionable, especially for biological variables. For physical and chemical variables, it might be possible to compensate mathematically for such differences. However, biological responses to pollutants cannot be assumed to be linear. Therefore, the validity of predictions involving comparisons between substantially different discharges are very tenuous unless the response patterns of the biota within the biogeographic region are well known.

Similarity of the receiving environments is also critical to such comparisons. It is important that both discharges be located within the same biogeographic zone because responses to pollutants vary among species. Species in one biogeographic zone may respond somewhat differently to a given pollutant than do species in another biogeographic zone. For that reason, it may be possible to predict the general types of changes that may occur as a result of the proposed discharge, but it will not generally be possible to predict accurately the areal extent or magnitude of such changes. It is also important that the physical and chemical characteristics of both receiving environments be similar. For example, discharges into open coastal areas should not be compared with discharges in embayments. The more similar the two receiving environments are to each other, the more reliable the applicant's predictions may be assumed to be.

Applicants may also use models that describe cause-and-effect relationships to predict impacts of the proposed discharge. Such models would be

especially helpful for physical and chemical variables (e.g., deposition of suspended solids in the receiving environment, concentrations of toxic substances at the ZID boundary). The appropriateness of such models should be judged on their prior use in the 301(h) program, their acceptance or recommendation by the U.S. EPA, and their acceptance by the scientific community. Models that have not been evaluated previously or that have not been received favorably should be avoided.

Having determined that the applicant used appropriate models to predict conditions in the receiving environment and biota, the Region should address the issues of data quality, execution of analyses, and interpretation of analytical results. These issues should be addressed in a manner similar to that described above for determining compliance with Section 301(h) modified permit conditions.

REISSUANCE OR TERMINATION OF SECTION 301(h) MODIFIED PERMITS

As stated in 40 CFR 125.59(g)(6), Section 301(h) modified permits "may be renewed under the applicable procedures of 40 CFR Part 124." Relevant subparts are 40 CFR 124 Subparts A (General Program Requirements) and D (Specific Procedures Applicable to NPDES Permits). These subparts provide an outline of the mechanics of the permit decision-making process, including review of applications for completeness, conditions for permit reissuance and termination, and special procedures applicable to Section 301(h) modified permits. Important sections of these subparts are discussed briefly below.

In addition, 40 CFR Part 124 provides procedures for public notification, public hearings, the issuance of draft permits, and keeping of the administrative record (Subparts A and D); procedures governing evidentiary hearings for U.S. EPA-issued NPDES permits (Subpart E); and procedures governing nonadversary panel hearings (Subpart F). These procedures are not discussed below as they are beyond the scope of this document.

PROCEDURES FOR REGULATORY ACTION

Part 124 contains U.S. EPA procedures for issuing, modifying, revoking and reissuing, and terminating all NPDES permits. Other types of permits are also included. Regulatory terms used in Part 124 are defined in Section 124.2. All definitions in this subsection remain applicable to applicants for reissuance of Section 301(h) modified permits.

Subpart D of 40 CFR 124 establishes decision-making procedures that are specific to NPDES permits. All tentative decision documents for 301(h) permit renewals must be signed by the appropriate Regional Administrator. A tentative decision document may go to the checklist procedure recommended for original 301(h) decisions, or may simply be represented by a cover sheet referencing the fact sheet and draft permit.

Special procedures relevant to applications for Section 301(h) modified permits are set forth in Section 124.65. These procedures were also applicable to original Section 301(h) applications, and remain applicable to applications for reissuance of Section 301(h) modified permits. When an applicant fails to meet Section 301(h) requirements, the Region must deny the request. Information collected during monitoring studies and other studies conducted during the term of the existing Section 301(h) modified permit will be critical to this determination. According to 40 CFR 124.65(d), the U.S. EPA may not issue a Section 301(h) modified permit unless the state has concurred or waived concurrence. It also specifies actions that may be taken by the State Director in states with approved NPDES permit programs (discussed earlier).

REGULATORY OPTIONS

Depending on the Region's decision regarding reissuance of a Section 301(h) modified permit, the applicant's permit may be reissued with changes, reissued without changes, or terminated. Administrative procedures that should be followed by the Regions when permits are reissued or terminated are set forth in Section 124.5, and are not discussed herein. However, the conditions under which each of these two regulatory options apply are relevant to the decision-making process. These conditions, set forth in 40 CFR 122.62-122.64, are discussed below.

Section 301(h) modified permits may be terminated during the term of the permit, or may be denied during the permit reissuance process for the following reasons, which are set forth in Section 122.64:

- Noncompliance with the conditions of the modified permit
- Failure to provide all relevant information or misrepresentation of relevant information
- A determination that the modified discharge endangers human health or the environment, and that such adverse impacts can

be reduced to acceptable levels through permit modification or termination

- Any condition that results in a temporary or permanent cessation of the discharge, such as the consolidation of two POTWs that results in elimination of the permittee's discharge.

All terminations of permits must be made in accordance with procedures specified in 40 CFR Part 124.

When it is evident for reasons specified in Section 122.64 that termination of a Section 301(h) modified permit is warranted, the Regions may terminate the Section 301(h) modified permit under applicable procedures of 40 CFR Part 124. Section 301(h) modified permits may be reissued under the provisions of Subsection 122.62(b). Because no specific guidance is given as to which of these two regulatory options is appropriate under different conditions, the Regions have considerable discretionary authority over the reissuance or termination of a Section 301(h) modified permit that has not been in compliance with all of the 301(h) regulations. In cases where it does not appear that the applicant will be able to satisfy the conditions of the 301(h) regulations while holding a Section 301(h) modified permit, the modified permit should be terminated or allowed to expire without reissuance. However, in cases where conditions of the permit may be adjusted to achieve compliance with the 301(h) regulations, the Region may modify the permit with different permit specifications, as necessary. Effective adjustments of the permit conditions will require careful examination of all available data and accurate predictions of the conditions that will result as a consequence of those adjustments.

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