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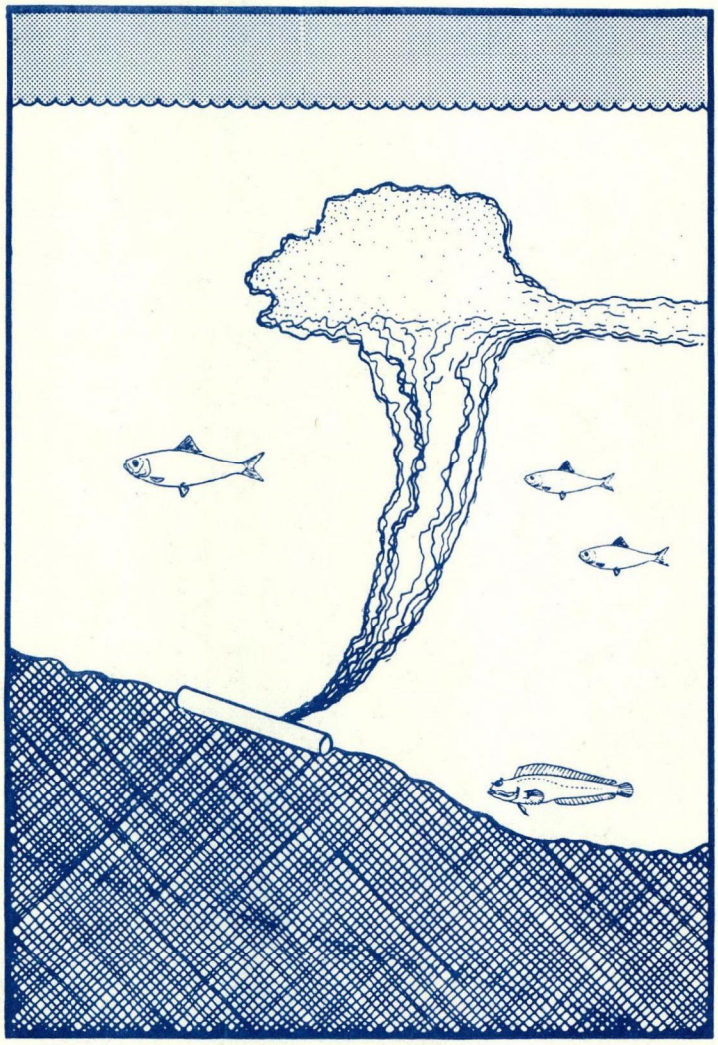
EPA

Report on the Implementation of Section 301(h)



Report on the Implementation of Section 301(h)

August, 1984

Office of Water Program Operations
Office of Water
U.S. Environmental Protection Agency
Washington, D.C. 20460

PREFACE

Section 301(h) of the Clean Water Act, as amended, provides for case-by-case modification of secondary treatment requirements for discharges into marine waters by publicly owned treatment works (POTWs) which demonstrate their compliance with the 301(h) criteria.

Since the enactment of section 301(h), the Environmental Protection Agency (EPA) has developed the essential regulations and documentation for policy, program and technical guidance to implement section 301(h) and has provided input to Congress on future amendments to the Act based upon our experience to date.

This Report on the Implementation of Section 301(h) summarizes program activities--administrative, legal, technical, and decisionmaking--conducted by EPA to fulfill the intent of Section 301(h), from 1978 to mid 1984.

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EXECUTIVE SUMMARY

The Federal Water Pollution Control Act Amendments of 1972 required all publicly owned treatment works (POTWs) by July 1, 1977, to achieve minimum effluent limits based upon capabilities of secondary treatment. Secondary treatment has been defined by EPA in terms of three conventional parameters: 1) biochemical oxygen demand (BOD); 2) suspended solids (SS); and 3) acidity/alkalinity (pH) [40 CFR Part 133]. Large municipalities discharging municipal wastes to the ocean maintained that secondary treatment was not necessary in deep oceanic waters where tidal movement and/or swift currents provided high dilutions and rapid dispersion of pollutants. Congress added section 301(h) to the Clean Water Act (CWA) in 1977 (P.L. 95-217) to provide for case-by-case modifications of the secondary treatment requirements for POTW's discharging into marine waters.

The section 301(h) regulations were promulgated in June, 1979. Seventy (70) final applications were filed under the regulatory deadline. These applications consist of a wide range of discharge characteristics, geographic and hydrographic locations, and receiving water conditions. Thirty (30) of the largest discharges accounted for 96 percent of the total design flow and were chosen as the first applications to be reviewed by EPA.

Congress amended section 301(h) in 1981 and, among other things, extended the application deadline to December 29, 1982. In response, the 301(h) regulations were amended in 1982, incorporating Agency experience gained from review of the 1979 applications. 138 new applications were received under the 1982 deadline and authority for 301(h) decisionmaking was delegated to the EPA Regional Offices. Geographic locations of the 208 municipal wastewater discharges which applied for 301(h) modified permits are shown in FIGURE 1.

As of June 1984, EPA has made 94 tentative decisions (FIGURE 2). Thus tentative decisions have been made on 45 percent of all 1979 and 1982 applications. These tentative decisions represent approximately 72 percent of the total flow. Approximately half of the applicants which have received tentative decisions thus far have indicated their intent to use their one-time option to submit revised applications. Eighty percent of these intents to revise are from applicants issued tentative denials. For the 94 tentative decisions, 23 final denials and 5 final 301(h) modified permits have been issued.

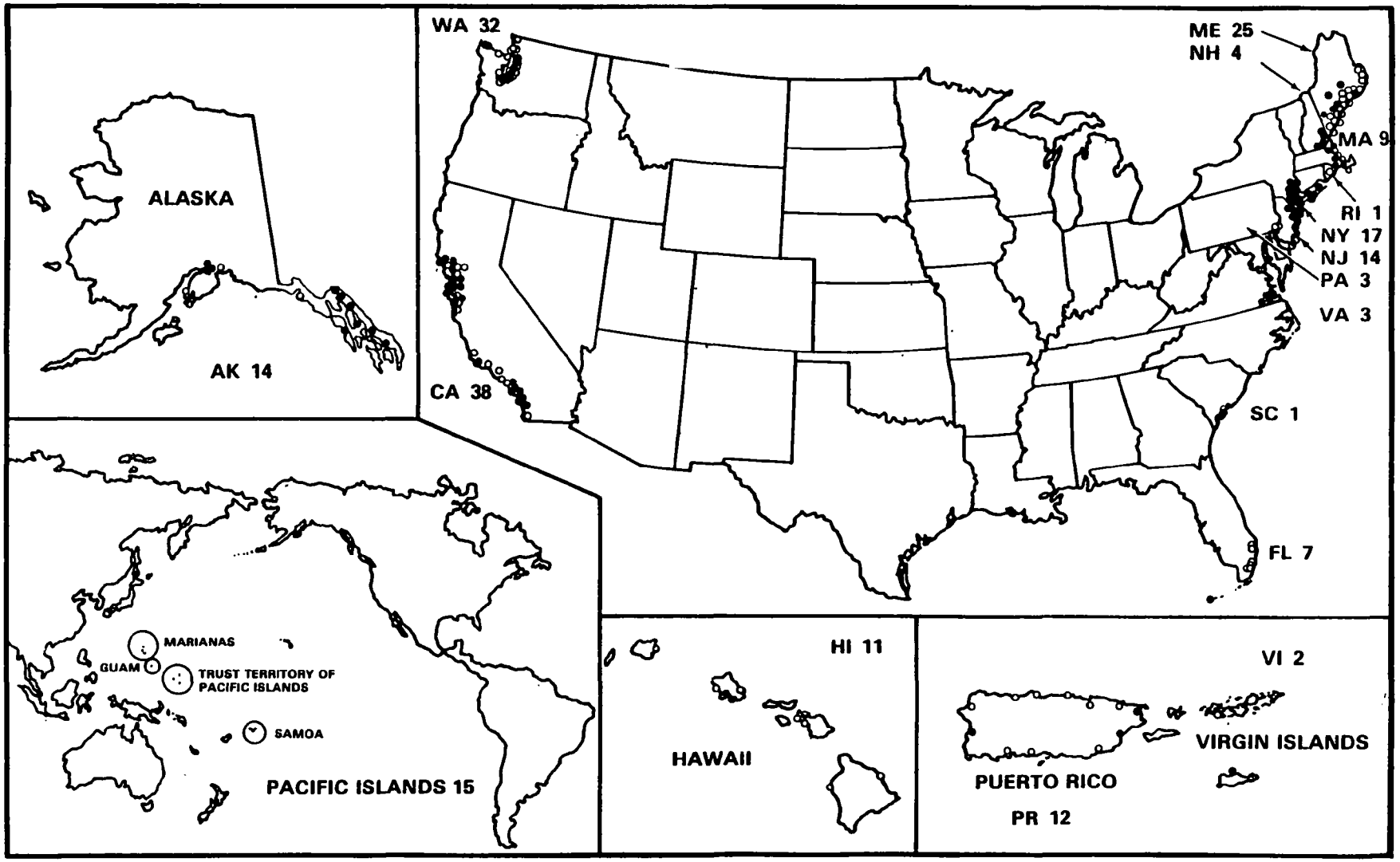

Figure 1. Location of 1979 and 1982 301(h) applicants.

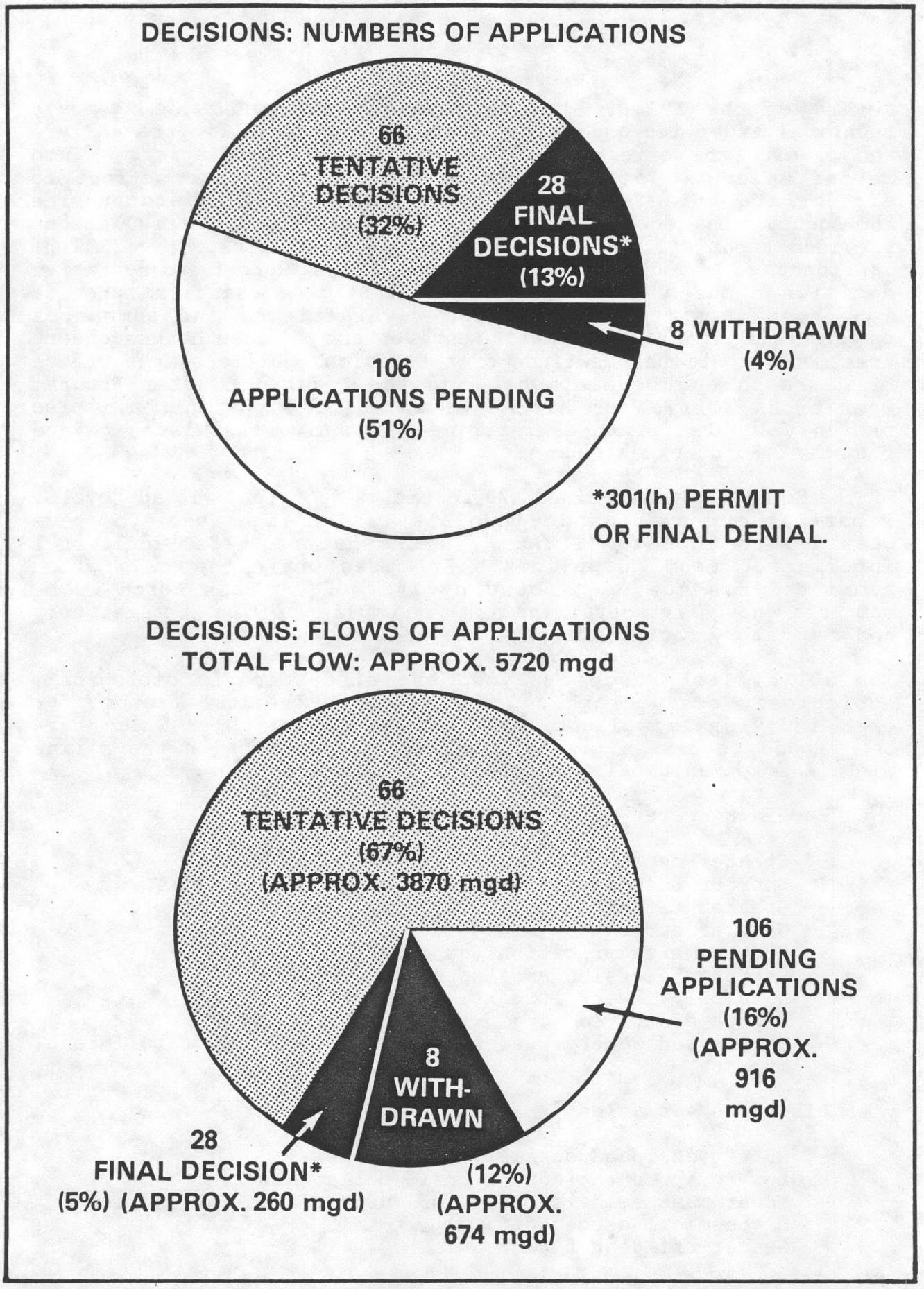

Figure 2. 301(h) Decision status (June 1984).

Review of the 301(h) applications has increased the Agency's technical expertise and improved the program's ability to analyze and predict the effects of municipal wastewater discharges into marine waters. The 301(h) program has made a major effort to disseminate this technical knowledge both inside and outside the Agency. Two documents issued to accompany the 1982 regulations provided technical assistance and guidance to prospective 301(h) applicants. In addition, the Technical Review Report and tentative decision document for each of the tentative decisions provide important technical information, evaluations, and summaries on potential impacts on the marine environment of less-than-secondary treatment. National meetings of the Regional Offices, the Office of Research and Development, and the Office of Water Program Operations (Office of Marine Discharge Evaluation) have also proven valuable for dissemination of technical knowledge gained from Task Force experience.

Of the 30 major applications, 25 tentative decisions (15 approvals, 1 partial approval, and 9 denials) and 1 final decision have been issued to date (TABLE 1). EPA has requested additional information from 5 applicants in cases where the information submitted has not been found by the 301(h) Task Force to be complete enough for determination of compliance with the statutory and regulatory requirements.

The 301(h) Task Force analyzed the site-specific biological, ecological, oceanographic, physical, and chemical factors for each individual application. In general, variables which have been found to lessen or eliminate adverse impacts on the marine biota due to municipal wastewater discharges include:

- Receiving water variables
  - Greater depth
  - Shorter residence times
  - Greater flushing and circulation; greater mixing
  - Greater currents
  - Reduced stratification (generally)
  - Better dispersion and lesser accumulation
  - Naturally lower biological activity
  - Higher dissolved oxygen
  - Unstressed waters, fewer additional sources of pollutant impacts
- Discharge variables
  - Better designed outfall and diffuser
  - Lower concentrations of toxic pollutants
  - Lower mass emission rates of suspended solids and biochemical oxygen demand
  - Lesser effluent flow

TABLE 1. REVIEW STATUS FOR 30 MAJOR APPLICANTS

TENTATIVE APPROVAL	TENTATIVE DENIAL	INFORMATION REQUEST
Lynn, MA	Boston (MDC), MA	Arecibo, PR
South Essex, MA	New Bedford, MA	Bayamon, PR
Goleta, CA	New York (Newtown Creek), NY	Carolina, PR
Los Angeles City (Hyperion), CA	Westchester (Mamaroneck), NY	Guayama, PR
Los Angeles County (JWPCP), CA	Hampton Roads (Chesapeake-Elizabeth), VA	San Francisco, CA
Monterey, CA[a]	Hampton Roads (Lamberts Point), VA	
Orange County, CA	Seattle (Duwamish), WA[c]	
Oxnard (Ventura), CA	Tacoma (Central), WA	
San Diego, CA	Tacoma (North End), WA	
Santa Cruz, CA		
Honolulu (Honouliuli), HI[b]		
Honolulu (Sand Island), HI		
Anchorage, AK		
Seattle (Richmond Beach), WA		
Seattle (West Point), WA		
Tacoma (Western Slopes), WA		
TOTAL: 16	TOTAL: 9	TOTAL: 5

[a] Application subsequently withdrawn.

[b] Biochemical oxygen demand (BOD) only.

[c] Final decision (denial).

- Greater treatment level
- Lesser nutrient load
- Greater initial dilution

The technical findings for each of the 25 tentative decisions on the major applications are summarized in TABLE 2. This matrix lists compliance determinations for the statutory and regulatory requirements for each of the major proposed discharges.

Improvements to their existing discharges were proposed by all 25 applicants. The most common proposed improvements included:

- o toxic control programs, proposed by 100 percent,
- o improved treatment, proposed by 56 percent,
- o diffuser additions, proposed by 56 percent,
- o outfall extension/relocation, proposed by 40 percent, and
- o cessation of sludge discharge proposed by 20 percent

Characteristics common to the nine proposed discharges receiving tentative denials are:

- o Vast majority propose to discharge into estuaries.
- o Important fisheries (commercial and/or recreational) are located in the discharge areas.
- o Receiving waters are characterized by poor mixing, insufficient flushing and/or poor transport and dispersion.
- o Vast majority propose to discharge into waters already exhibiting widespread adverse environmental conditions, such as shellfish closures or diseased fish.
- o Many propose to discharge into receiving waters with multiple sources of pollutant impacts.
- o Discharge areas suffer from low dissolved oxygen.
- o Organisms in the discharge areas show bioaccumulation or there is a high potential for adverse bioaccumulation or other problems related to toxic pollutants.
- o Most propose increased loadings over current discharge levels.

TABLE 2. 301(h) TENTATIVE DECISION MATRIX

301(h) APPLICANT	STATUTORY AND REGULATORY CRITERIA									
	TENTATIVELY GRANT WAIVER	MEET STATE WATER QUALITY STANDARDS		NON-INTERFERENCE WITH			NO IMPACT ON OTHER SOURCES	ESTABLISHMENT OF PROGRAMS FOR		
		D.O.	S.S.1/	BALANCED INDIGENOUS POPULATION	RECREATIONAL ACTIVITIES	PUBLIC WATER SUPPLIES		PRETREATMENT	NON-INDUSTRIAL SOURCE	MONITOR IMPACT OF DISCHARGE
Anchorage, AK	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR
Seattle (West Point), WA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR
Goleta, CA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR
Sand Island, HI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR
Honouliuli, HI	Yes(FW)	Yes	No	No	No	Yes	Yes	NR	NR	NR
San Diego, CA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR
Seattle (Duwamish), WA	No	No	No	No	No	Yes	No	Yes	NR	NR
Chesapeake-Elizabeth, VA	No	No	No	No	No	No	No	NR	NR	NR
L.A. County, CA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR
L.A. City (Hyperion), CA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR
Orange County, CA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR
Oxnard, CA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR
Richmond Beach, WA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR
Tacoma (Central), WA	No	No	Yes	No	No	Yes	No	NR	NR	NR
Tacoma (North End), WA	No	2/	Yes	No	No	Yes	Yes	NR	NR	NR
Tacoma (Western Slopes), WA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR

TABLE 2. 301(h) TENTATIVE DECISION MATRIX (Continued)

301(h) APPLICANT	STATUTORY AND REGULATORY CRITERIA									
	TENTATIVELY GRANT WAIVER	MEET STATE WATER QUALITY STANDARDS		NON-INTERFERENCE WITH			NO IMPACT ON OTHER SOURCES	ESTABLISHMENT OF PROGRAMS FOR		
		D.O.	S.S.[1]	BALANCED INDIGENOUS POPULATION	RECREATIONAL ACTIVITIES	PUBLIC WATER SUPPLIES		PRETREATMENT	NON-INDUSTRIAL SOURCE	MONITOR IMPACT OF DISCHARGE
Lynn, MA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR
New Bedford, MA	No	No	Yes	No	No	Yes	Yes	NR	NR	NR
South Essex, MA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR
Mamaroneck, NY	No	No[3]	4/	No	No	Yes	No	NR	NR	NR
Newtown Creek, NY	No	No[5]	4/	No	No	Yes	No	NR	NR	NR
Lamberts Point, VA	No	No	No	No	No	Yes	No	Yes	NR	NR
Monterey, CA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR
Santa Cruz, CA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR
Boston, MA	No	No	Yes	No	No	Yes	Yes	Yes	NR	NR

Yes = Criterion Satisfied
No = Criterion Not Satisfied
NR = Needs Revisions
PW = Partial Waiver for BOD

1/ None of the states in which the applicants are located has quantative standards for suspended solids in receiving waters. However, turbidity is used as a surrogate and for California and Washington quantative limits exist.
2/ Compliance with DO standards cannot be determined without State's interpretation.
3/ According to New York State Department of Environmental Conservation, the proposed Mamaroneck discharge would be in compliance. However, the 301(h) Task Force and the Interstate Sanitary Commission do not agree with this view.
4/ The applicant has not demonstrated that the proposed discharge will comply with the New York standard for turbidity.
5/ According to New York State Department of Environmental Conservation, the proposed discharge would be in compliance. However, the 301(h) Task Force does not agree with this view.

Most significantly, the majority of the denials involve estuarine receiving waters which currently exhibit adverse pollution effects.

Proposed discharges for applicants receiving tentative approval are expected to comply with the 301(h) statutory and regulatory criteria and to:

- o comply with water quality standards,
- o allow for a balanced indigenous population, and
- o allow for recreational activities.

In many cases, significant improvements have been proposed by applicants receiving tentative approvals, such as toxic control programs, improved treatment, diffuser additions, outfall extensions, and discharge relocation. In comparison to the existing discharge loading, although the combined influent loadings of all dischargers receiving tentative approvals are expected to increase in the future, the proposed effluent discharges are expected to decrease. Thus, the combined loadings of these proposed discharges represent a significant decrease in mass emission rates to the environment for both biochemical oxygen demand and suspended solids, resulting from improvements proposed by the applicants receiving tentative approvals. These treatment improvements will result in benefits to the environment; for example, in the case of four southern California discharges, the total area of benthos[1] altered is expected to decrease from approximately 52 square miles (mi^2) to 9 mi^2.

Although 301(h) analysis is based upon environmental factors rather than cost analysis, substantial dollar savings can result for approved 301(h) applications. An estimated $842 million savings in potential capital construction funding required to achieve secondary treatment and $40 million savings in annual operation and maintenance costs is expected to be realized for these 16 applicants receiving tentative approvals.

Technical knowledge gained from review of the major applications will be used in the technical review and decisionmaking for the remaining 301(h) applications. Information derived from the monitoring programs and from research will further enhance the Agency's ability to assess and predict environmental impacts of municipal wastewater discharges.

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[1]Organisms occurring on or in the bottom of a body of water.

Therefore, the following approach is recommended for the future 301(h) program:

- o Regions are to continue application review and decisionmaking. Headquarters is to provide overview for consistency.

- o 301(h) program emphasis is to shift to monitoring data analysis and compliance determination as the number of 301(h) permits increase.

- o The program is to collaborate with local, state, and other Federal agencies to better define environmental baseline conditions in marine waters.

- o Research is to be supported to bridge information gaps while dealing with state-of-the-art issues.

  - Development of quantitative cause-effect relationships of causative agents associated with sewage discharges, environmental factors, and biological responses.

  - Methodology for prediction of particulate distributions near outfalls to determine the extent of sewage dispersion and solids deposition.

  - Evaluation of processes (physical/chemical) affecting particle settling characteristics for prediction of the initial distribution of particulates near the outfalls.

- o The 301(h) regulations are more stringent with regard to proposed discharges into saline estuarine waters than for proposed discharges to open ocean waters.

  - EPA review of applications which propose discharge into saline estuaries is to continue to take into account the major ecological significance of estuaries and the fragile nature of the estuarine environment.

  - Rigorous review of potential adverse impacts due to discharges with less-than-secondary treatment on these valuable resources will be conducted in accordance with the stringent 301(h) regulatory criteria for saline estuaries.

  - Review of these applications will also emphasize protection of these valuable resources through assessment of the potential of combined effects from other pollutant sources on the estuarine environment.

REPORT ON THE IMPLEMENTATION OF SECTION 301(h)

CHAPTER I. INTRODUCTION

This report provides information on EPA's accomplishments in implementing section 301(h) of the Clean Water Act and summarizes the technical findings resulting from review of the 301(h) 1979 applications from the 25 largest dischargers. Background information on section 301h) and recommendations for future program direction are also provided. The report is organized chronologically and discusses the activities which have taken place in the 301(h) program as follows:

Chapter I: INTRODUCTION

Chapter II: TECHNICAL FINDINGS ON THE MAJOR 1979 APPLICATIONS

Chapter III: RESULTS OF THE MUNICIPAL WASTEWATER TREATMENT CONSTRUCTION GRANT AMENDMENTS (1981) AND THE REVISED 301(h) REGULATIONS (1982)

Chapter IV: ACCOMPLISHMENTS TO DATE

Chapter V: PROGRAM RECOMMENDATIONS

(1) ORIGINS OF SECTION 301(h) OF THE CLEAN WATER ACT

The Federal Water Pollution Control Act Amendments of 1972 resulted in a shift in environmental philosophy away from water quality based standards toward a combination of water quality and technology based effluent standards in order to lessen inconsistent requirements and to increase effective administration and regulation. The Act required publicly owned treatment works (POTWs) to achieve the technology based standards of secondary treatment by July 1977.

Some large municipalities which discharged to the ocean objected to the switch from water quality based discharge limits to uniform, technology based effluent standards. They argued that the secondary treatment limits were defined in terms of parameters which are important to freshwater ecology but are not significant factors in an ocean environment. In addition, these POTWs argued that implementing secondary treatment was not the most cost-effective means for controlling pollutants which have the potential to cause adverse environment impacts in the ocean. They believed

that where deep waters, tidal movement, or swift currents provided high dilution and rapid dispersion of pollutants, secondary treatment was not necessary. They urged that effluent limits for POTW discharges to the ocean should be determined on a case-by-case basis. In response to their arguments, when Congress passed the Clean Water Act in 1977 (P.L. 95-217), section 301(h) was included to provide for case-by-case modifications of the secondary treatment requirements for POTW discharges into marine waters. This allowed POTW's whose applications are approved by EPA under section 301(h) to meet increased effluent limits for biochemical oxygen demand (BOD), suspended solids (SS) and pH (a measure of acidity/alkalinity).

Section 301(h) of the Clean Water Act of 1977 established eight criteria which the POTW must demonstrate will be met in order to obtain a 301(h) modified NPDES permit:

1) Existence of applicable water quality standard specific to the pollutants for which the modification is sought[2];

2) Attainment of water quality which protects public water supplies, a balanced indigenous population of shellfish, fish and wildlife, and allows recreational activities;

3) Establishment of a system to monitor impacts on biota, to the extent practicable;

4) No increased treatment requirements on other point or nonpoint sources will result;

5) Applicable pretreatment requirements will be enforced;

6) Establishment of a schedule of activities to eliminate introduction of toxics from nonindustrial sources, to the extent practicable;

7) No new or substantially increased discharge above volume specified in the permit; and

8) Title II funds will be used to achieve compliance with section 301(h) or section 301(b)(2)(B).

The statute limited the opportunity to apply to municipalities with pre-existing discharges to marine waters and required applications by September 25, 1978.

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[2]BOD and SS or their equivalents, and pH.

(2) 1979 REGULATIONS

EPA issued proposed regulations implementing section 301(h) on April 25, 1978, and required preliminary applications to be submitted by the statutory deadline of September 25, 1978. Final regulations and the accompanying Technical Support Document were issued by EPA on June 15, 1979. The Technical Support Document provided further explanation and guidance on the technical requirements and the rationale behind these requirements. Final 301(h) applications were required by EPA no later than September 13, 1979.

In brief, the 1979 regulations provided definitions for the statutory criteria and delineated the procedures for determination of compliance with each criterion for issuance of 301(h) modified NPDES permits. A single application format was established for use by all 301(h) applicants.

(3) IMPLEMENTATION OF 1979 REGULATIONS

Preliminary applications filed by the statutory deadline numbered two hundred twenty-seven (227). After examining these preliminary applications, EPA published a policy in the Federal Register that Native Alaskan villages and certain other types of remote communities need not submit 301(h) applications and that discretion would be used in determining their wastewater treatment needs with emphasis placed upon immediate public health needs. This policy eliminated the need for final 301(h) applications from 50 percent of the preliminary applicants.

Seventy (70) final applications were filed under the 1979 regulations. The applications included a wide range of discharge characteristics, geographic and hydrographic locations, and receiving water conditions. Thirty (30) of these 70 applications accounted for 96 percent of the total design flow. To implement the program in the most efficient and environmentally protective manner, Agency resources were initially allocated to evaluate these 30 applications. This group included the largest dischargers which applied in 1979 and also included some smaller dischargers selected for review due to their geographic proximity to the large discharges. This grouping enabled the Agency to gain experience in determining regional impacts as well as in determining information needs for discharges of various sizes.

The Agency has issued tentative decisions on 25 of these major 301(h) applications; this report is based primarily on the findings of these 25 decisions. EPA has tentatively approved 16 of these 301(h) applications[3] and tentatively denied 9 (TABLE 3). Of

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[3]Including one partial approval for biochemical oxygen demand.

TABLE 3. REVIEW STATUS FOR 30 MAJOR APPLICANTS

TENTATIVE APPROVAL	TENTATIVE DENIAL	INFORMATION REQUEST
Lynn, MA	Boston (MDC), MA	Arecibo, PR
South Essex, MA	New Bedford, MA	Bayamon, PR
Goleta, CA	New York (Newtown Creek), NY	Carolina, PR
Los Angeles City (Hyperion), CA	Westchester (Mamaroneck), NY	Guayama, PR
Los Angeles County (JWPCP), CA	Hampton Roads (Chesapeake-Elizabeth), VA	San Francisco, CA
Monterey, CA[a]	Hampton Roads (Lamberts Point), VA	
Orange County, CA	Seattle (Duwamish), WA[c]	
Oxnard (Ventura), CA	Tacoma (Central), WA	
San Diego, CA	Tacoma (North End), WA	
Santa Cruz, CA		
Honolulu (Honouliuli), HI[b]		
Honolulu (Sand Island), HI		
Anchorage, AK		
Seattle (Richmond Beach), WA		
Seattle (West Point), WA		
Tacoma (Western Slopes), WA		
TOTAL: 16	TOTAL: 9	TOTAL: 5

[a] Application subsequently withdrawn.

[b] Biochemical oxygen demand (BOD) only

[c] Final decision (denial).

the 9 tentative denials, 1 has received a final denial. Additional information was requested from 5 remaining applicants, as the information submitted in the applications was not complete enough to enable a determination of compliance with the statutory and regulatory requirements.

The primary decisionmaking steps and products of the 301(h) review process leading to the tentative decisions for the major 1979 applications are delineated in FIGURE 3. EPA awarded a technical support contract in September 1979 to provide technical assistance for the Agency review process. The technical support contractor conducted a technical evaluation for each of the applications and presented these findings in separate Technical Evaluation Reports (TERs). The TERs and applications were then extensively reviewed by the 301(h) Task Force, a national, multi-disciplinary group of biologists, oceanographers, marine scientists, engineers, and attorneys. The Task Force represented the Office of Water, three laboratories of the Office of Research and Development, the Office of General Counsel, and each of the five affected Regional Offices[4]. Using an integrated approach for each tentative decision, the Task Force applied regulatory/statutory criteria and prepared a recommended tentative decision document addressing the technical and legal issues, for the EPA Administrator's tentative decision.

The major applications reviewed first are from diverse geographical and physical locations, as can be seen from the map in FIGURE 4. They include applications filed from Alaska, Hawaii, Puerto Rico, and the continental East and West Coasts. The discharges are located in estuaries, along open coastlines, and in coastal embayments.

In addition to diverse geographic and physical locations, discharge characteristics of the 25 discharges for which tentative decisions have been made are quite varied (TABLE 4). For example, for the proposed discharges:

- Average flows range from 2 million gallons per day (mgd) to 515 mgd.
- Discharge depths range from 8 feet to 235 feet.
- Biochemical oxygen demand (BOD) mass emission rates range from 2,900 lb/day to 494,200 lb/day.
- Suspended solids mass emission rates range from 1,300 lb/day to 369,600 lb/day.

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[4]For 1979 applications, these are Regions I-Boston, II-New York, III-Philadelphia, IX-San Francisco, and X-Seattle.

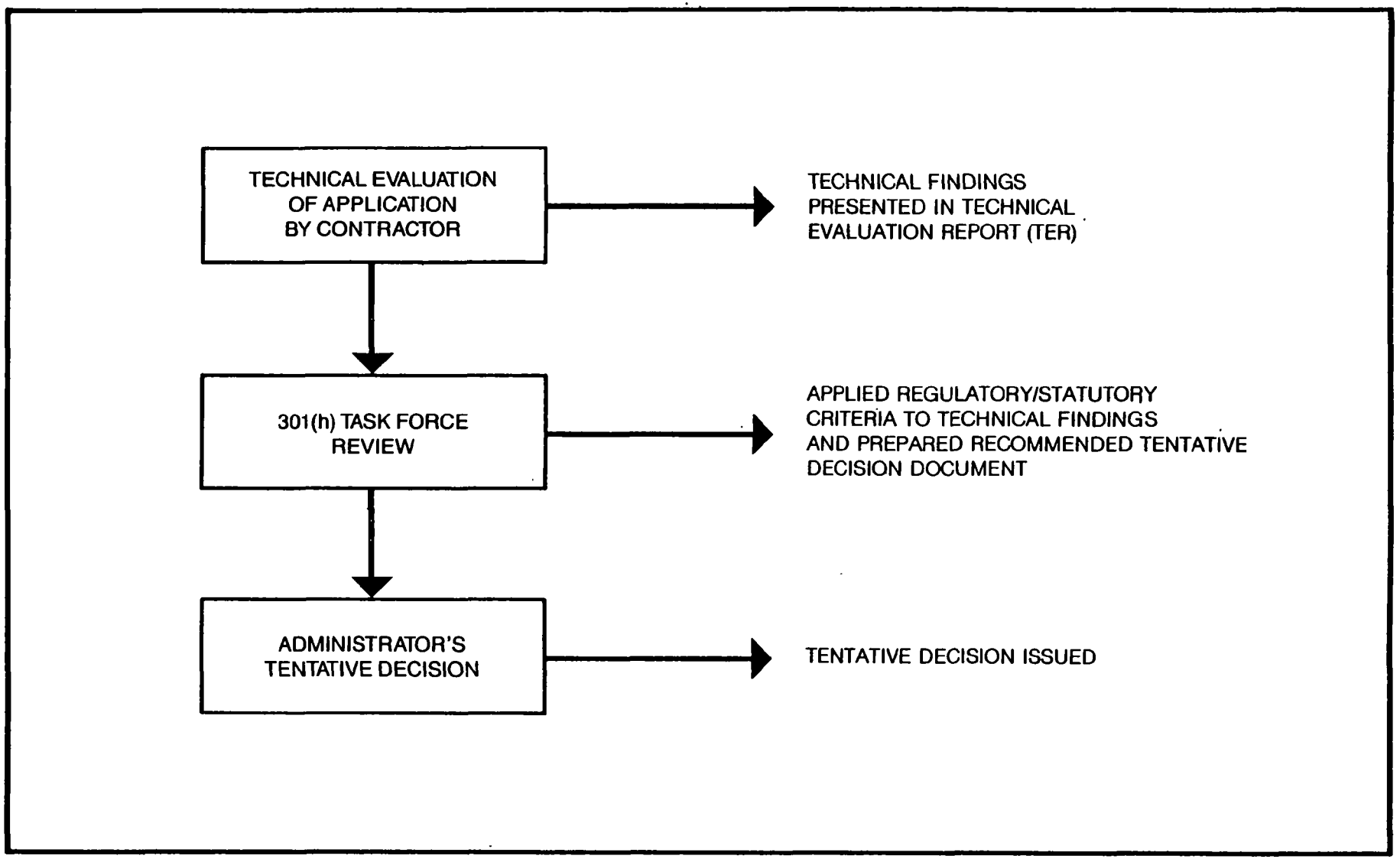

Figure 3. Review process leading to the tentative decisions for the major 301(h) applications.

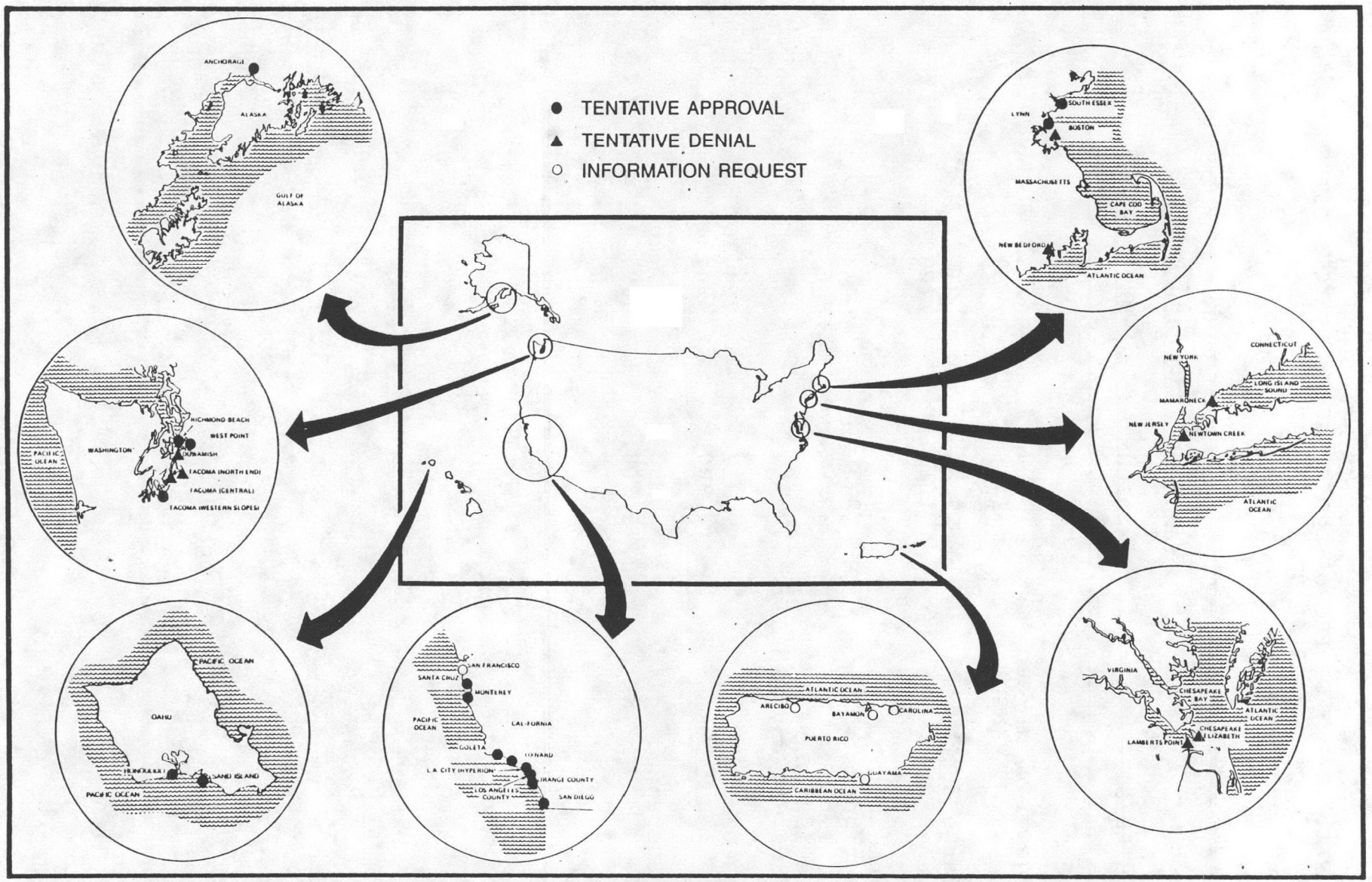

Figure 4. Locations of the major 301(h) applicants.

TABLE 4. RANGE OF PROPOSED DISCHARGE CHARACTERISTICS OF THE 25 MAJOR 301(h) APPLICATIONS

CHARACTERISTIC	RANGE OF CHARACTERISTICS MINIMUM	MAXIMUM
Average flow, m^3/sec (MGD)	0.08 (1.8)	22.56 (515)
Discharge depth, m (ft)	2.4 (8)	71.6 (235)
Minimum initial dilution	2.3	176
Mass emission rate limits, kg/day (lb/day)		
BOD	1,317 (2,900)	224,367 (494,200)
Suspended solids	590 (1,300)	167,800 (369,600)

Thus, the 301(h) applications from the major cities for which EPA has issued tentative decisions represent a wide variety of physical conditions and characteristics. The diversity of physical characteristics, both of the discharges and of the receiving waters, dictates in turn a diversity of ecological conditions. Environmental impacts of the proposed discharge on the organisms in the receiving waters (and ultimately on man) are pivotal in the determination of compliance with the 301(h) criteria. Task Force analysis utilized an ecological approach, combining physical, chemical, and biological determinations and predictions in case-by-case analysis of environmental conditions. Consequently, analysis by the Task Force of a diversity of discharge and receiving environment characteristics has led to a more thorough technical understanding of the impacts of less-than-secondary treatment on the marine environment in a variety of conditions. This increased technical knowledge not only has relevance for the 301(h) program in processing the remaining applications but also has relevance to other determinations of similar pollutant impacts in the marine environment.

Approval or denial of an application for a 301(h) variance is based upon the scientific, legal, and administrative findings regarding compliance with the 301(h) criteria, and addresses such issues as:

- Existence of and compliance with water quality standards
- Protection and propagation of a balanced indigenous population
- Allowance of recreational activities
- Establishment of a monitoring program
- Satisfactory toxics control programs
- No additional treatment requirements on other sources
- Acceptable discharge volume and pollutant limits
- Protection of public water supplies

Evaluation of each of these objectives is discussed under its appropriate heading in Chapter II: Technical Findings on the Major 1979 Applications.

(4) SUMMARY OF TECHNICAL FINDINGS

The technical findings for the 25 tentative decisions on the major applications are summarized in TABLE 5. This matrix lists compliance determinations for the statutory and regulatory requirements for each of the major proposed discharges.

TABLE 5. 301(h) TENTATIVE DECISION MATRIX

301(h) APPLICANT	TENTATIVELY GRANT WAIVER	STATUTORY AND REGULATORY CRITERIA: MEET STATE WATER QUALITY STANDARDS		NON-INTERFERENCE WITH			NO IMPACT ON OTHER SOURCES	ESTABLISHMENT OF PROGRAMS FOR		
		D.O.	S.S.[1/]	BALANCED INDIGENOUS POPULATION	RECREATIONAL ACTIVITIES	PUBLIC WATER SUPPLIES		PRETREATMENT	NON-INDUSTRIAL SOURCE	MONITOR IMPACT OF DISCHARGE
Anchorage, AK	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR
Seattle (West Point), WA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR
Goleta, CA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR
Sand Island, HI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR
Honouliuli, HI	Yes(FW)	Yes	No	No	No	Yes	Yes	NR	NR	NR
San Diego, CA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR
Seattle (Duwamish), WA	No	No	No	No	No	Yes	No	Yes	NR	NR
Chesapeake-Elizabeth, VA	No	No	No	No	No	No	No	NR	NR	NR
L.A. County, CA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR
L.A. City (Hyperion), CA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR
Orange County, CA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR
Oxnard, CA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR
Richmond Beach, WA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR
Tacoma (Central), WA	No	No	Yes	No	No	Yes	No	NR	NR	NR
Tacoma (North End), WA	No	2/	Yes	No	No	Yes	Yes	NR	NR	NR
Tacoma (Western Slopes), WA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR

TABLE 5. 301(h) TENTATIVE DECISION MATRIX (Continued)

301(h) APPLICANT	STATUTORY AND REGULATORY CRITERIA									
	TENTATIVELY GRANT WAIVER	MEET STATE WATER QUALITY STANDARDS		NON-INTERFERENCE WITH			NO IMPACT ON OTHER SOURCES	ESTABLISHMENT OF PROGRAMS FOR		
		D.O.	S.S.[1/]	BALANCED INDIGENOUS POPULATION	RECREATIONAL ACTIVITIES	PUBLIC WATER SUPPLIES		PRETREATMENT	NON-INDUSTRIAL SOURCE	MONITOR IMPACT OF DISCHARGE
Lynn, MA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR
New Bedford, MA	No	No	Yes	No	No	Yes	Yes	NR	NR	NR
South Essex, MA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR
Mamaroneck, NY	No	No[3/]	.[4/]	No	No	Yes	No	NR	NR	NR
Newtown Creek, NY	No	No[5/]	4/	No	No	Yes	No	NR	NR	NR
Lamberts Point, VA	No	No	No	No	No	Yes	No	Yes	NR	NR
Monterey, CA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR
Santa Cruz, CA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	NR	NR
Boston, MA	No	No	Yes	No	No	Yes	Yes	Yes	NR	NR

Yes = Criterion Satisfied
No = Criterion Not Satisfied
NR = Needs Revisions
PW = Partial Waiver for BOD

1/ None of the states in which the applicants are located has quantative standards for suspended solids in receiving waters. However, turbidity is used as a surrogate and for California and Washington quantative limits exist.
2/ Compliance with DO standards cannot be determined without State's interpretation.
3/ According to New York State Department of Environmental Conservation, the proposed Mamaroneck discharge would be in compliance. However, the 301(h) Task Force and the Interstate Sanitary Commission do not agree with this view.
4/ The applicant has not demonstrated that the proposed discharge will comply with the New York standard for turbidity.
5/ According to New York State Department of Environmental Conservation, the proposed discharge would be in compliance. However, the 301(h) Task Force does not agree with this view.

Proposed discharges for applicants receiving tentative approval are expected to comply with the 301(h) statutory and regulatory criteria and to:

- o comply with water quality standards,
- o allow for a balanced indigenous population, and
- o allow for recreational activities.

Proposed discharges for applicants receiving tentative denials will generally not comply with the above. Additional characteristics common to the nine proposed discharges receiving tentative denials are:

- o Vast majority propose to discharge into estuaries.
- o Important fisheries (commercial and/or recreational) are located in the discharge areas.
- o Receiving waters are characterized by poor mixing, insufficient flushing and/or poor transport and dispersion.
- o Vast majority propose to discharge into waters already exhibiting widespread adverse environmental conditions, such as shellfish closures or diseased fish.
- o Many propose to discharge into receiving waters with multiple sources of pollutant impacts.
- o Discharge areas suffer from low dissolved oxygen.
- o Organisms in the discharge areas show bioaccumulation or there is a high potential for adverse bioaccumulation or other problems related to toxic pollutants.
- o Most propose increased loadings over current discharge levels.

Most significantly, the majority of the denials involve estuarine receiving waters which currently exhibit adverse pollution effects.

Task Force analyses of the physical and chemical discharge characteristics, marine biological communities, and receiving ocean and estuarine environments are presented in Chapter II: Technical Findings on the Major 1979 Applications.

CHAPTER II. TECHNICAL FINDINGS ON THE MAJOR 1979 APPLICATIONS

(1) INTRODUCTION

Preparation of the tentative decision for each major application required complex technical and legal analyses in evaluating compliance with the 301(h) criteria. Certain basic trends related to the impacts of sewage discharges on the marine environment became apparent during this review. A discussion of the technical findings for the 25 tentative decisions is presented below.

(2) OCEANOGRAPHIC CONDITIONS

Dilution, transport, and dispersion of wastewater in marine waters is an important consideration in evaluating the potential for environmental impacts. Wastewater effluent discharged through a submerged marine outfall rises toward the surface in a buoyant plume (FIGURE 5). Initial dilution, which occurs within minutes of discharge, rapidly mixes the effluent with surrounding seawater until neutral buoyancy is obtained or the plume reaches the surface. When the plume ceases to rise, the mixture disperses horizontally at a much slower rate.

After initial dilution, the fate of effluent through transport and dispersion depends primarily upon currents and circulation patterns, which may differ for open ocean receiving waters or for estuaries. The shoreline configuration in open coastal receiving waters (typical of the major southern West Coast applicants) usually enhances dispersion of pollutants, although there may be a potential for onshore winds to drive effluent shoreward. Seasonal variations in prevailing currents and climatic conditions are important; for example, sediments can build up during seasons of stationary conditions. Physical and mathematical models are used to predict the distribution or fate of pollutants and the areas of sediment deposition for demonstration of compliance with 301(h) criteria.

Significant features which affect potential impacts on an estuary are the degree of vertical mixing, circulation within side embayments and channels, depth, seasonal current variations, and tidal current speed. Mixing is caused by wind, tidal currents, and the amount of freshwater inflow. A simplified example of tidal currents and circulation patterns in an estuarine environment is shown in FIGURE 6. The variability of estuarine features makes it more difficult to model, predict, or generalize pollutant assimilation capacity; detailed investigation is needed for each individual situation in order to estimate effluent effects.

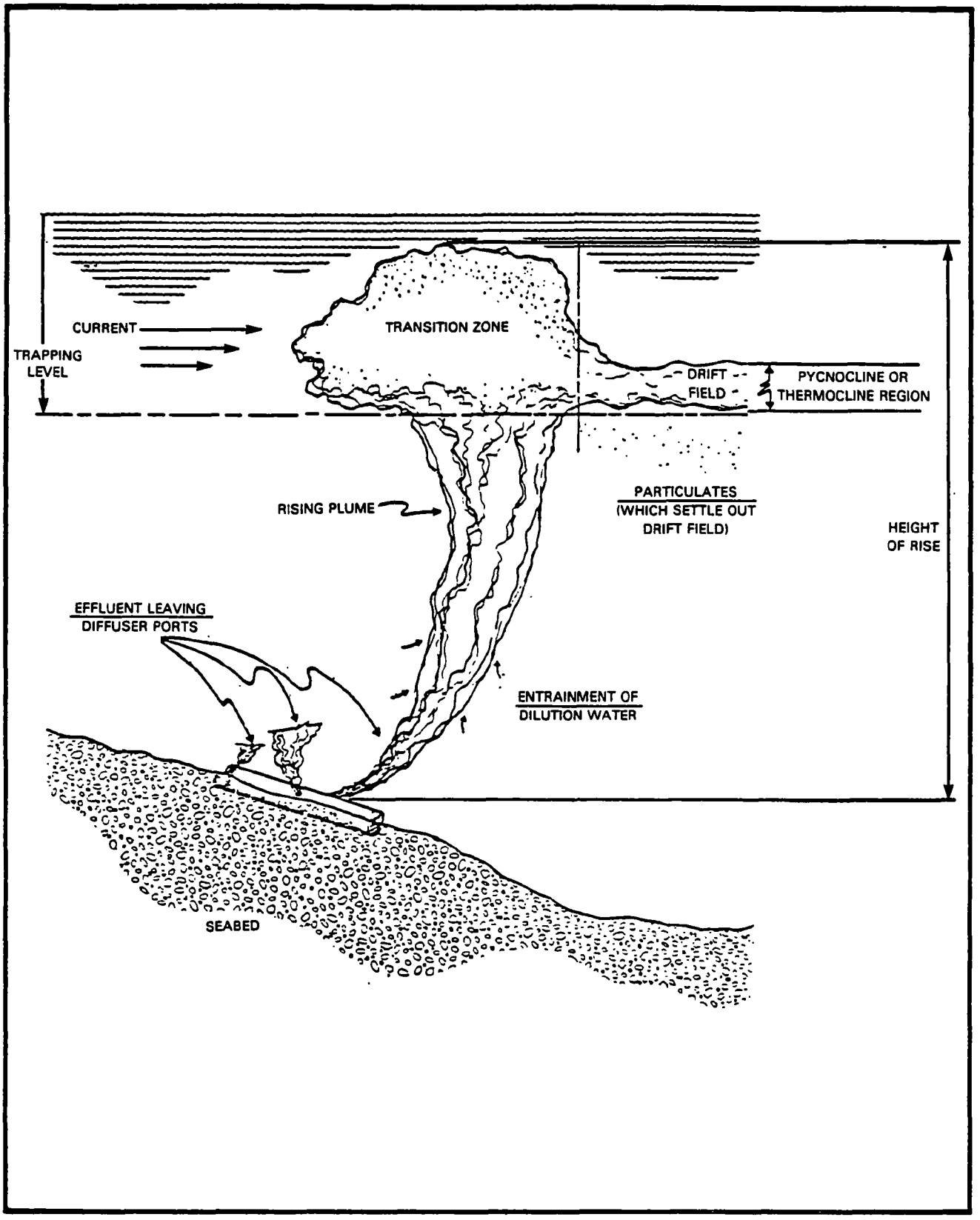

Figure 5. Plume characteristics.

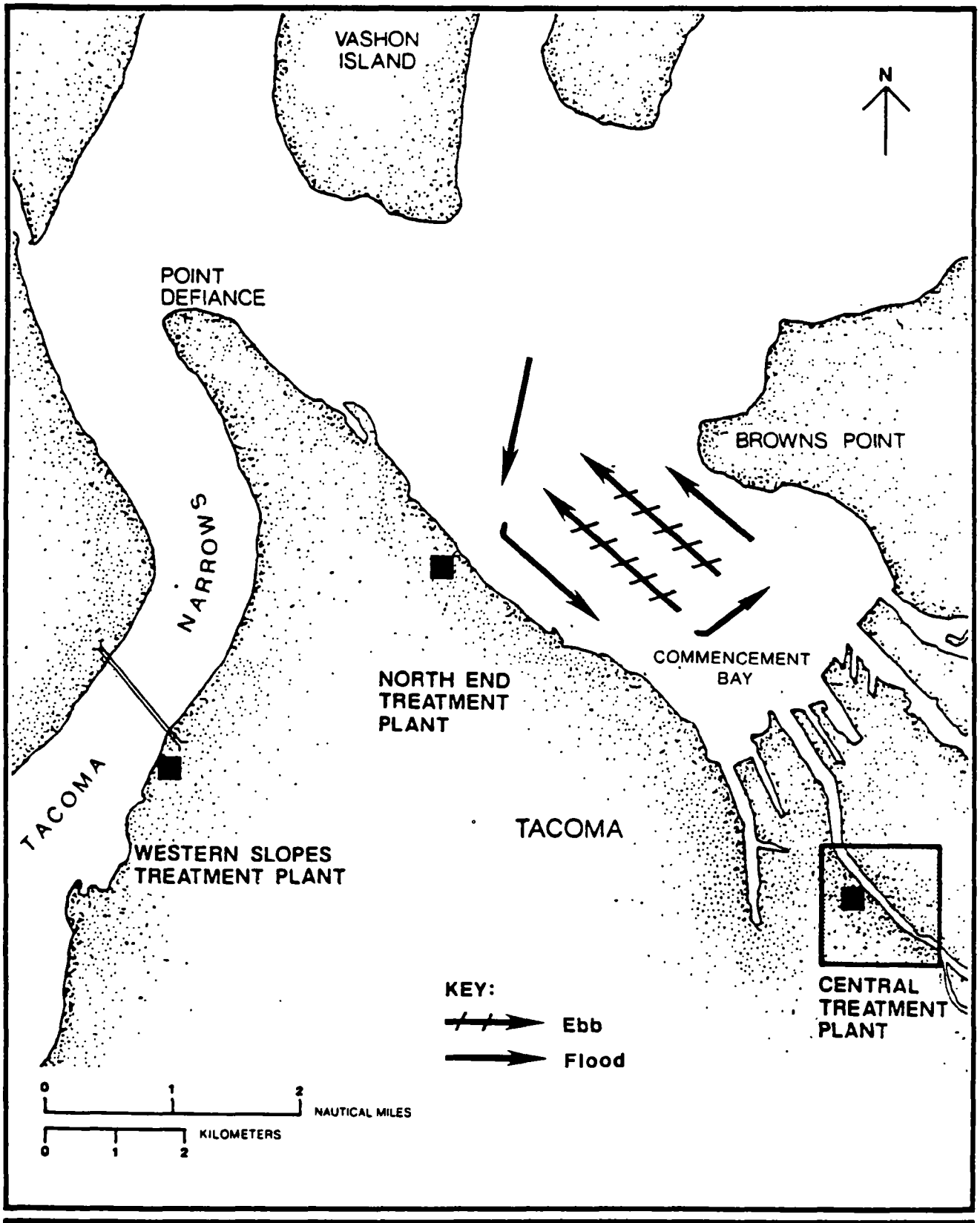

Figure 6. Simplified estuarine tidal circulation pattern.

In general, receiving water conditions which have been found to lessen or eliminate the potential for adverse impacts on the marine biota due to less-than-secondary treated discharges include:

- Greater depth
- Shorter residence times
- Greater flushing and circulation; greater mixing
- Greater currents
- Reduced stratification (generally)
- Better dispersion and lesser accumulation
- Naturally lower biological activity
- Higher dissolved oxygen
- Unstressed waters, fewer additional sources of pollutant impacts

(3) SOLIDS ACCUMULATION IN THE MARINE ENVIRONMENT

The evaluation of potential bottom accumulation of organic matter is important for determination of compliance with 301(h) criteria. The accumulated material may result in direct impacts on bottom-dwelling organisms, including alterations in diversity or abundance of benthos or fishes. Additionally, accumulation of toxic pollutants and pesticides along with the sediment may result in an increased potential for adverse bioaccumulation or other chronic or acute impacts on marine biota.

The heavier particulates in municipal wastewater are more dense than seawater and tend to settle to the sea floor upon discharge from an ocean outfall. In the receiving water these particles migrate downward at a settling rate related to their individual density, size, and shape. Some of the smaller and lighter particles combine to form heavier particulates whose size and settling velocities may be much greater than that of individual particles. Due to the rapid settling of heavier particulates, a significant fraction of the discharged material may reach the sea floor in the immediate vicinity of the outfall. A simplified example of predicted steady-state sediment accumulation around a marine discharge is presented in FIGURE 7. Smaller, lighter particles tend to be carried further by water currents, usually away from the discharge location in areas of good circulation.

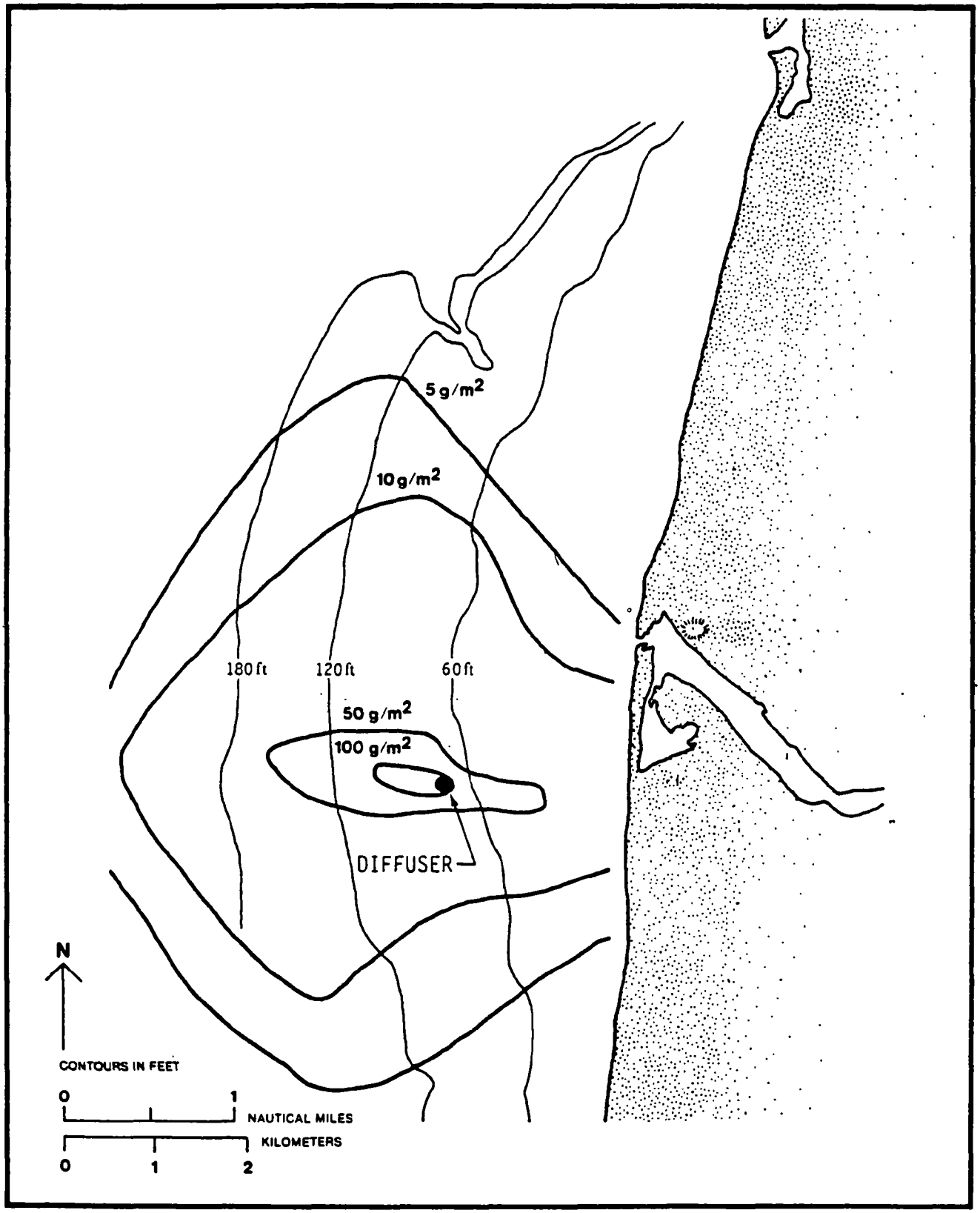

Figure 7. A simplified example of predicted steady-state sediment accumulation around a marine discharge.

The probability of a particle reaching the sea floor and the settling location are dependent on a number of parameters, such as:

- o density, size, and shape of the particulate,
- o elevation above the sea floor when the settling begins,
- o location and occurrence of pycnocline and/or thermocline and density of the receiving water,
- o velocity of the discharge, and
- o currents and tidal movement.

After deposition, resuspension and transport may also be induced by currents.

(4) DISCHARGE CHARACTERISTICS

The 25 discharges are an important source of mass emissions of biochemical oxygen demand (BOD) and suspended solids. Total influent loading into the plants for all 25 proposed discharges will be approximately 2,200 tons per day of BOD and 2,500 tons per day of suspended solids. After treatment, the total effluent mass emission rate of the proposed discharges will be less than 1,200 tons per day of BOD and 850 tons per day of suspended solids. This treatment represents a reduction in total annual loading of 46 percent for BOD and 66 percent for suspended solids. The removal efficiencies for each of the proposed 25 discharges are variable. However, the majority of the applicants proposed to remove 60-80 percent of the suspended solids and 20-60 percent of the BOD before discharging into the marine environment (FIGURE 8).

Physical characteristics of the 25 major existing and proposed discharges cover a wide range of values, for example:

- o The effluent suspended solids concentrations range from 25 to 200 mg/l for existing and from 30 to 125 mg/l for proposed discharges, and
- o Effluent BOD concentrations range from 16 to 200 mg/l for existing and from 40 to 234 mg/l for proposed discharges.

Some of the key characteristics of the 25 proposed discharges are listed in TABLE 4. For example:

- o Proposed mass emission rates for BOD range from 2,900 lb/day to 494,200 lb/day.

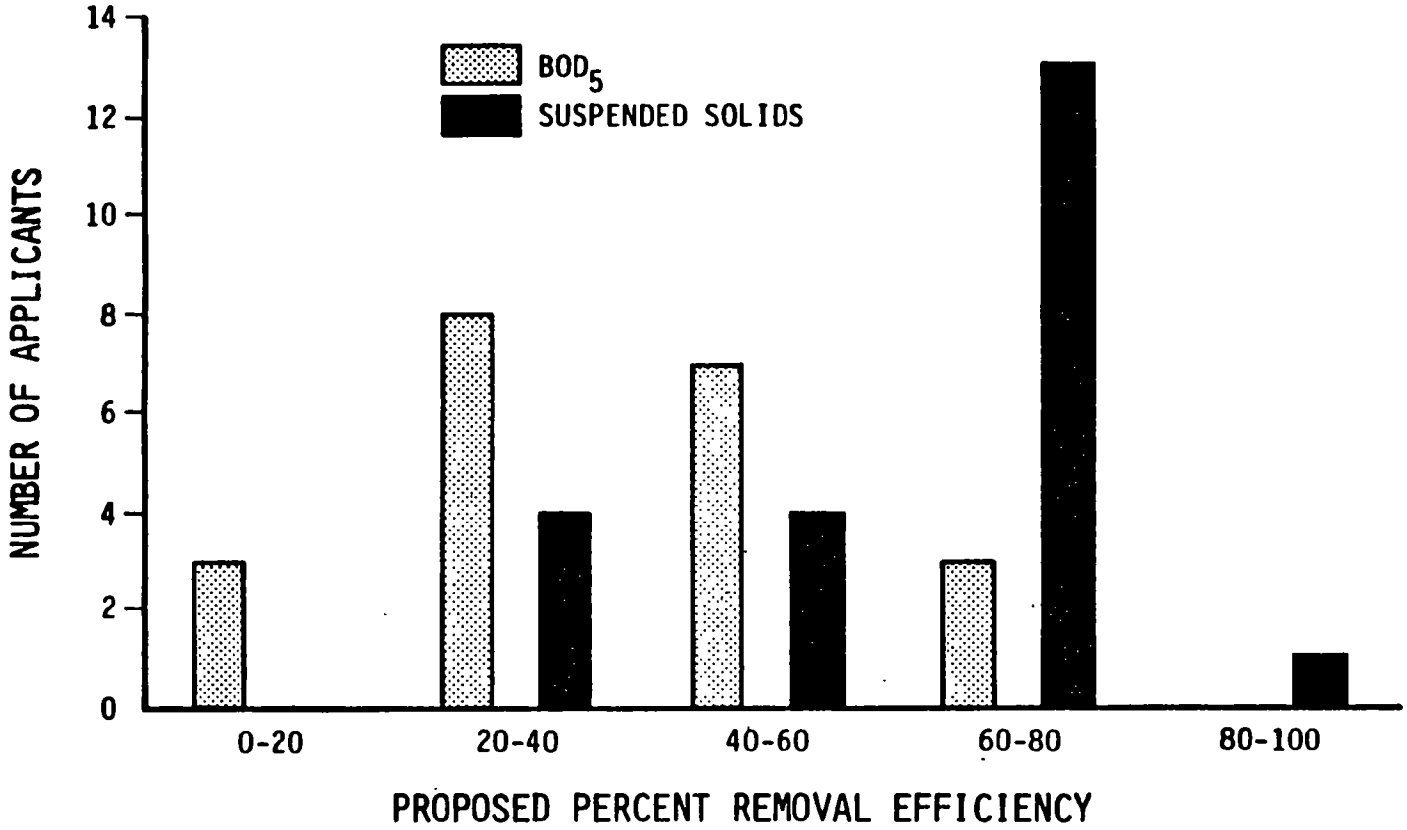

Figure 8. Proposed percent removal efficiency for the 25 major 301(h) applications.

- o Proposed mass emission rates for suspended solids range from 1,300 lb/day to 369,600 lb/day.

Comparison of the nine tentatively denied discharges to the tentatively approved discharges (TABLE 6) show these tentatively denied discharges to have, on average:

- o lower critical initial dilution,
- o shallower discharge depth, and
- o closer distance to shore.

Even though most of the applicants proposed improvements in treatment processes or outfall design and location, the Task Force concluded that for dischargers receiving tentative denials the proposed improvements were not sufficient to alleviate the observed or predicted ecological impacts to the point of compliance with the 301(h) criteria.

In comparison to the existing discharge loading, both the combined total influent loading and the combined total effluent loading of dischargers receiving tentative denials would be expected to increase in the future (FIGURE 9). Thus, the combined loadings for all the proposed discharges receiving tentative denials would represent an increase to the environment for both biochemical oxygen demand and suspended solids, even after proposed improvements.

Discharge characteristics which have been found to lessen or eliminate adverse impacts on the marine environment include:

- Better designed outfall and diffuser
- Lower concentrations of toxic pollutants
- Lower mass emission rates of suspended solids and biochemical oxygen demand
- Lesser effluent flow
- Greater treatment level
- Lesser nutrient load
- Greater initial dilution

Although the combined influent loadings of all dischargers receiving tentative approvals are expected to increase in the future, the proposed effluent loadings are expected to decrease in comparison to the existing discharge loading. Thus, the combined loadings for the proposed discharges receiving tentative approvals represent a significant decrease in mass emission rates to the environment

TABLE 6. PHYSICAL CHARACTERISTICS OF APPROVED AND DENIED (PROPOSED) DISCHARGES

PARAMETER	TENTATIVE APPROVALS	TENTATIVE DENIALS
Median suspended solids removal, %	75	60
Range of suspended solids removal, %	45-84	50-70
Median critical initial dilution	98	28
Range of critical initial dilution	41-176	2.3-133
Average discharge depth, ft.	139	80
Range of average discharge depth, ft.	50-235	8-200
Average outfall length from shore, ft.	11,480	9,190
Range of outfall length from shore, ft.	1,640-26,250	460-24,610

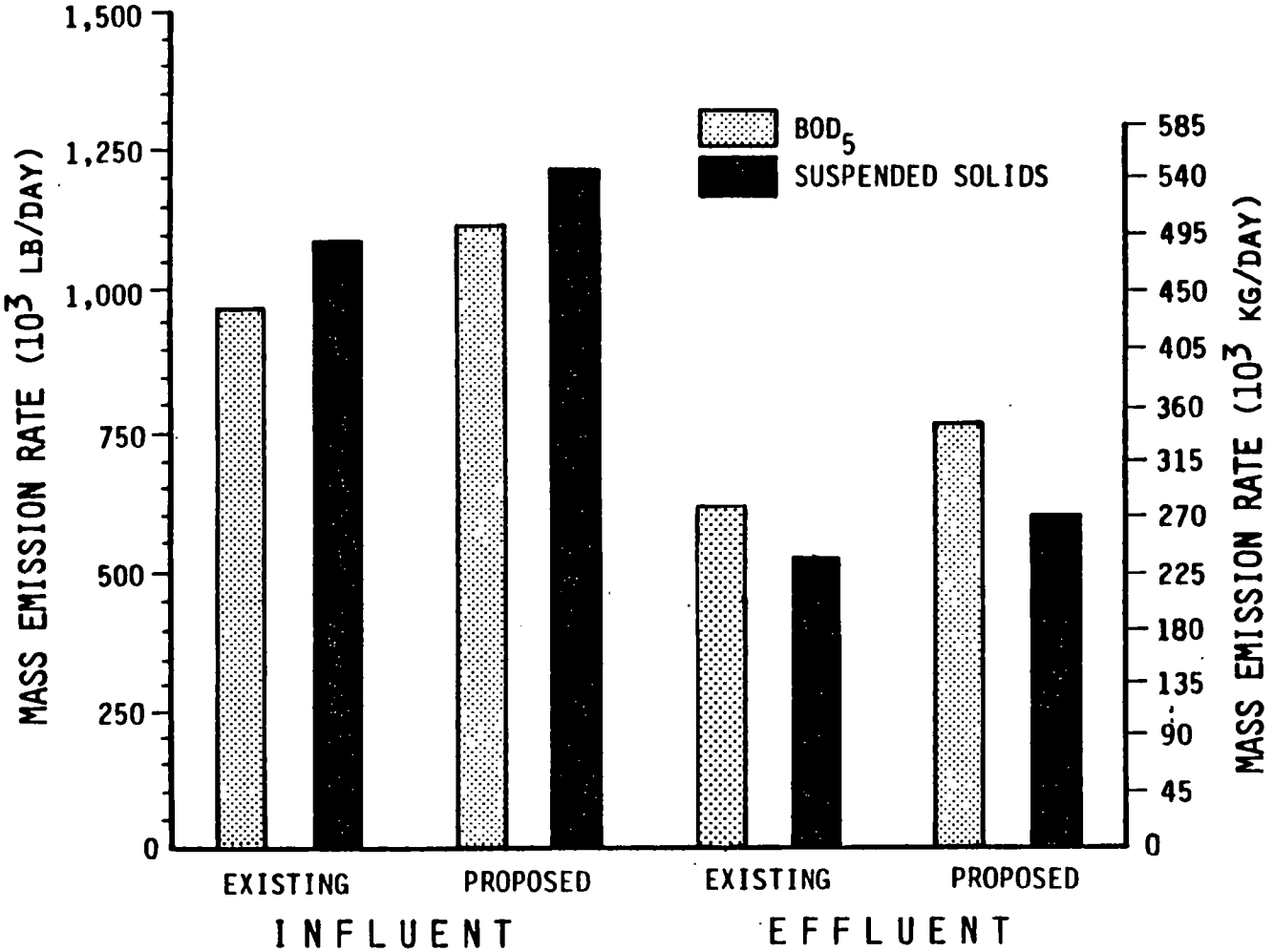

Figure 9. Average annual mass emission rates for tentatively denied applications.

for both biochemical oxygen demand and suspended solids, resulting from improvements proposed by the applicants receiving tentative approvals (FIGURE 10). These treatment improvements will result in benefits to the environment; for example, in the case of four southern California discharges, the area of benthos[5] altered will decrease from 52 square miles (mi^2) to 9 mi^2.

(5) WATER QUALITY STANDARDS

Applicants must demonstrate that their proposed discharge will meet the applicable water quality standards for:

- o biological oxygen demand (BOD), or dissolved oxygen (DO);
- o suspended solids (SS) or surrogates; and
- o pH.

Dissolved Oxygen (DO)

Compliance with State DO standards may be determined by:

1) DO depletion immediately after initial mixing of the waste plume (nearfield)

2) depletion due to BOD exertion in the water column as the wastefield is dispersed (farfield), and

3) sediment demand:

   - depletion in the bottom waters due to the steady demand of effluent related sediments (bottom)
   - depletion due to the abrupt resuspension of effluent related sediments.

Results are then compared to DO concentrations or depressions as specified by the State water quality standards.

Natural upwelling occurring at coastal discharge locations makes DO analysis more difficult. In the natural upwelling process, deeper water which is lower in DO moves upward to replace upper surface waters moved away by the winds. The plume rising from a wastewater discharge will also entrain water with lower DO, resulting in lower DO in the plume (FIGURE 11). Where relevant

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[5]Organisms occurring on or in the bottom of a body of water.

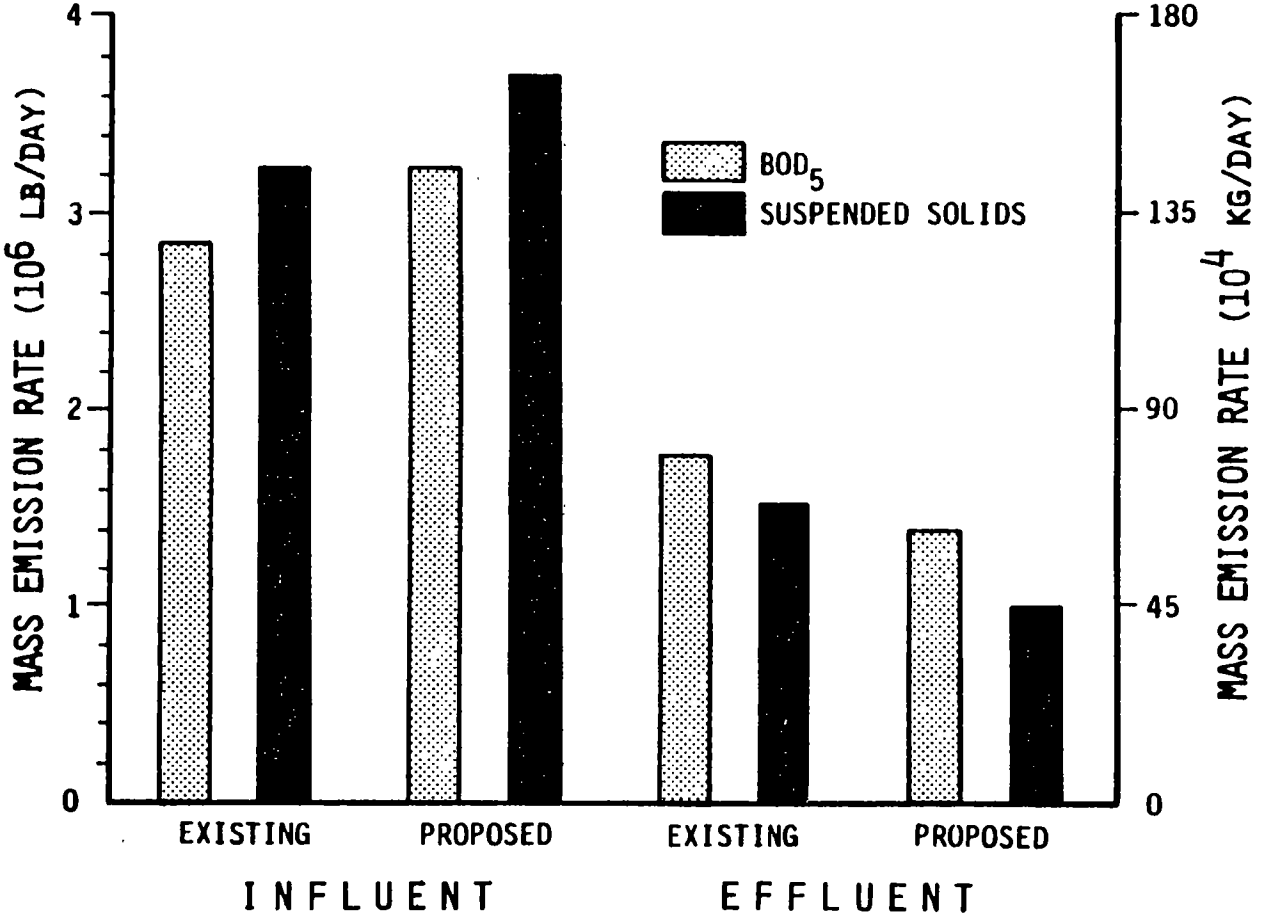

Figure 10. Average annual mass emission rates for tentatively approved applications.

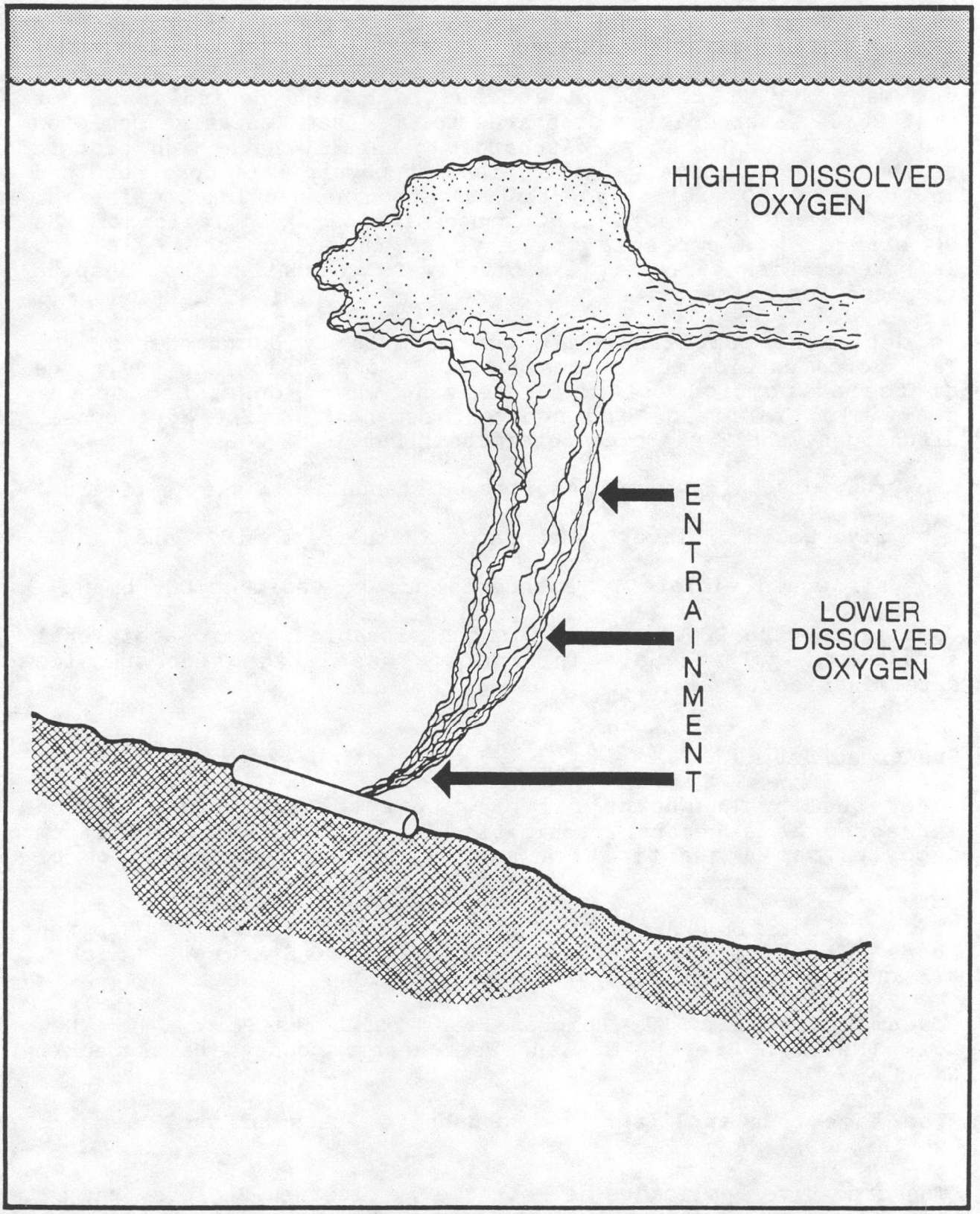

Figure 11. Entrainment of deeper water with low dissolved oxygen concentrations.

to determination of compliance with the State DO standard, this phenomenon was taken into account by the Task Force.

The majority of the applications which were denied would not meet State water quality standards for DO (see Tentative Decision Matrix, TABLE 5). These discharges generally have high organic sediment accumulation. Combinations of physical factors resulted in potential DO violations, the most prominent being low initial dilution and low ambient DO concentrations. Violation of the DO standard is probable for five of the discharges[6] located in waters which currently exhibit low DO concentrations, despite proposed improvements.

To determine compliance with water quality DO standards, the Task Force considered DO demand (and DO depression) in the three different portions of the receiving water described above: nearfield, farfield, and sediment demand. Of the 25 proposed discharges, the Task Force determined that:

- o four discharges would violate DO standards in the nearfield[7],
- o five would violate DO standards in the farfield[8], and
- o six would violate DO standards due to sediment DO demand[9].

Compliance with DO standards was questionable for two additional applicants and adequate information was lacking for specific determinations.[10]

Suspended Solids

Water quality standards relating to suspended solids may be expressed as a general prohibition against turbidity or bottom deposits, as a quantitative suspended solids concentration or

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[6]Tacoma (Central), WA; Hampton Roads (Lamberts Point), VA; Hampton Roads (Chesapeake-Elizabeth), VA; New York (Newtown Creek), NY; and Westchester County (Mamaroneck), NY.

[7]Tacoma (Central), WA; Hampton Roads (Lamberts Point), VA; New York (Newtown Creek), NY; and Westchester County (Mamaroneck), NY.

[8]The same four applicants as Footnote 6, plus Boston (Deer and Nut Islands), MA.

[9]The same five applicants as Footnote 7, plus New Bedford, MA.

[10]Seattle (Duwamish), WA; and Tacoma (North End), WA.

as a surrogate parameter such as percentage of light transmittance, turbidity, Secchi disc depth readings, or extinction coefficient. Compliance with suspended solid standards is usually based on a determination of the suspended solids concentration following initial dilution for comparison to background levels. Of the nine tentative denials, six applicants did not demonstrate that the water quality standards for suspended solids would be met (TABLE 5).

pH

To determine compliance with pH standards, the pH following initial dilution is estimated (TABLE 5). None of the 25 major discharges applied for 301(h) modifications of the pH standard.

(6) ADDITIONAL CONSIDERATIONS

Three important concepts may affect the overall 301(h) evaluation and require additional consideration during the analysis and decisionmaking process. They are: 1) improved discharges, 2) stressed waters, and 3) saline estuarine waters.

Improved Discharge

"Improved discharge" means the volume, composition, and location of an applicant's discharge following:

1) Construction of planned outfall improvements, including outfall relocation, outfall repair, or diffuser modification; or

2) Construction of planned treatment system improvements to treatment levels or discharge characteristics; or

3) Implementation of a planned program to improve operation and maintenance of an existing treatment system or to eliminate or control the introduction of pollutants into the applicant's treatment works.

All 25 major applicants intended to implement industrial pretreatment and nonindustrial source control programs. Twenty-three (23) of these 25 applications provided for other improvements for the proposed discharges, ranging from outfall relocation to improved removal rates.

The most common proposed improvements included:

- toxic control programs, proposed by 100 percent,

- o improved treatment, proposed by 56 percent,
- o diffuser additions, proposed by 56 percent,
- o outfall extension/relocation, proposed by 40 percent, and
- o cessation of sludge discharge proposed by 20 percent.

Proposed changes in diffuser and outfall configurations and relocations would generally result in discharge to deeper, less impacted waters, and increased initial dilutions.

Adverse environmental impacts were not detected in the vicinity of six of the existing discharges. The improvements proposed at each of these discharges should further reduce any impact potential. At all of the remaining existing discharges, there were ecological impacts of varying severity. Some of the more severe impacts included interference with the maintenance of the biota, occurrence of diseased organisms, bioaccumulation of toxic pollutants, and interference with species of commercial or recreational importance. Improved receiving water quality due to improvements proposed by the applicants was predicted to result in substantial reduction in these ecological impacts for nine of the proposed improved discharges and to allow for a balanced indigenous population, as well as for recreational activities. The improvements expected to occur in the receiving water quality included reduced coliform bacteria concentrations in the discharge vicinity and the nearshore area, reduced shoreward transport of pollutants, and decreased concentrations of toxic pollutants and suspended solids. Taken as a whole, in comparison to the existing discharge loading, although the combined influent loadings of all dischargers receiving tentative approvals are expected to increase in the future, the proposed effluent loadings are expected to decrease (FIGURE 10). Thus, the combined loadings for the proposed discharges receiving tentative approvals represent a significant decrease in mass emission rates to the environment for both biochemical oxygen demand and suspended solids, resulting from improvements proposed by the applicants receiving tentative approvals.

Continued or increased degradation of the receiving water was predicted at the nine proposed discharge locations of applications which were tentatively denied, despite proposed improvements. Proposed improvements in these cases were not sufficient to allow for compliance with the 301(h) criteria, including maintenance of the balanced indigenous population, recreational activities, and/or State water quality standards.

Stressed Waters

The second significant concept, "stressed waters," generally refers to waters which receive multiple pollutant loadings and which exhibit signs of adverse environmental impacts.

If the applicant claims that it will discharge into stressed waters, the applicant must demonstrate that the modified discharge will not:

- o contribute to, increase, or perpetuate stressed conditions,
- o contribute to further degradation if perturbations from other sources increase, or
- o retard recovery if perturbations from other sources decrease.

This demonstration requires difficult predictions of water quality conditions and biological trends which are considerably more complex than predictions required for discharges into unstressed waters.

- o In order to document differences between the stressed biological communities and those communities that would occur in the absence of pollutant stress, biological conditions in the polluted receiving water body are compared to biological conditions at unstressed control stations (or in some cases, to historical data on biological conditions predating the pollutant stresses).
- o The additional contribution of the applicant's discharge to existing pollutant stresses is then evaluated by comparing biological communities near the discharge with those at other stressed sites within the receiving water body, further from the discharge.
- o Determination of the effect of the discharge on the receiving environment if the perturbations from other sources change (increase or decrease) involves complex predictive analysis of biological response to future trends in water quality conditions.

Among the 25 major applicants, four proposed modified discharges[11] to stressed receiving waters.

Los Angeles County (JWPCP), CA, and Los Angeles City (Hyperion), CA, were tentatively approved. In Santa Monica Bay, biological

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[11]Los Angeles County (JWPCP), CA; Los Angeles City (Hyperion), CA; New York (Newtown Creek), NY; and Westchester County (Mamaroneck), NY.

communities were stressed by pollutant inputs from Los Angeles City's (Hyperion) five-mile effluent outfall and seven-mile sludge outfall, as well as by advected pollutants from Los Angeles County's (JWPCP) outfalls on the nearby Palos Verdes shelf. Both Hyperion and JWPCP have demonstrated that with significant improvement of their proposed discharge, the reduced pollutant loading will alleviate the existing stress and lead toward recovery of the balanced indigenous population.

Westchester County (Mamaroneck), NY, and New York (Newtown Creek), NY, applications were tentatively denied. In western Long Island Sound although the major source of pollutant stress is the input from the polluted East River, the Mamaroneck discharge has also contributed to the stressed conditions. As the Newtown Creek treatment plant is one of the major contributors to the stress in the East River, sources of pollutant stresses to these stressed waters are varied and complex.

Saline Estuaries

The third significant consideration is for "saline estuarine" waters. Saline estuaries are defined in the 301(h) regulations as semi-enclosed coastal waters which have a free connection to the territorial sea, undergo net seaward exchange with ocean waters, and have salinities comparable to those of the ocean. Generally, these waters are near the mouth of estuaries and have cross-sectional annual mean salinities greater than twenty-five parts per thousand. Two examples of large saline estuaries are Chesapeake Bay and Puget Sound.

Saline estuaries are a unique biological and economic resource. They are extremely productive ecosystems for the feeding, protection, and nursery grounds of many species of fish and shellfish. However, the physical and biological characteristics that make estuaries so valuable also act to make them ecologically vulnerable. Their tendency for retention and rapid recycling of nutrients makes estuaries susceptible to pollution effects, as toxic pollutants can become trapped along with useful nutrients. Also, additional biochemical oxygen demand introduced into the estuarine system can result in lower levels in an area already prone to low dissolved oxygen and can result in adverse impacts on aquatic biota requiring this oxygen.

In addition to meeting the other 301(h) criteria, applicants proposing to discharge into saline estuaries must also demonstrate that within the zone of initial dilution (ZID) immediately surrounding the discharge:

- benthic populations will not differ substantially from the balanced indigenous benthic populations immediately beyond the ZID,

- o the discharge will not interfere with estuarine migratory pathways, and

- o the discharge will not result in the accumulation of toxic pollutants or pesticides at levels which exert adverse effects on the biota.

Twelve of the major 25 applicants proposed to discharge into saline estuaries (FIGURE 12). Eight of these applications were tentatively denied. The estuarine nature of the receiving water bodies was a contributing factor in each of these denials. The relatively shallow discharge depth limited the initial dilution of the wastes in the water (predicted critical initial dilutions for these eight applicants ranged from 2.3:1 to 59:1) and contributed to their inability to meet various State water quality standards (e.g., dissolved oxygen, turbidity, and suspended solids). Other contributing factors included poor mixing, insufficient flushing, and lack of adequate dilution water. Most of the receiving waters for these applicants were also influenced by pollutants from numerous sources in addition to the applicants' discharges.

The proposed estuarine discharges whose applications were denied shared a number of predicted ecological impacts including:

- o substantial alterations in benthic communities within and beyond the zone of initial dilution (often leading to dominance by pollution-tolerant taxa),

- o high prevalences of diseases among fishes and invertebrates,

- o adverse bioaccumulation of toxic pollutants,

- o fish kills associated with low dissolved oxygen conditions, and

- o adverse impacts on species of commercial and recreational importance.

Proposed improvements in treatment processes or outfall configuration were determined to be insufficient to alleviate these impacts.

(7) BALANCED INDIGENOUS POPULATION (BIP)

Section 301(h) of the Clean Water Act provides that applicants are to demonstrate that the "modified requirements will not interfere with the attainment or maintenance of that water quality which assures the protection and propagation of a balanced indigenous population of shellfish, fish, and wildlife." A balanced indigenous

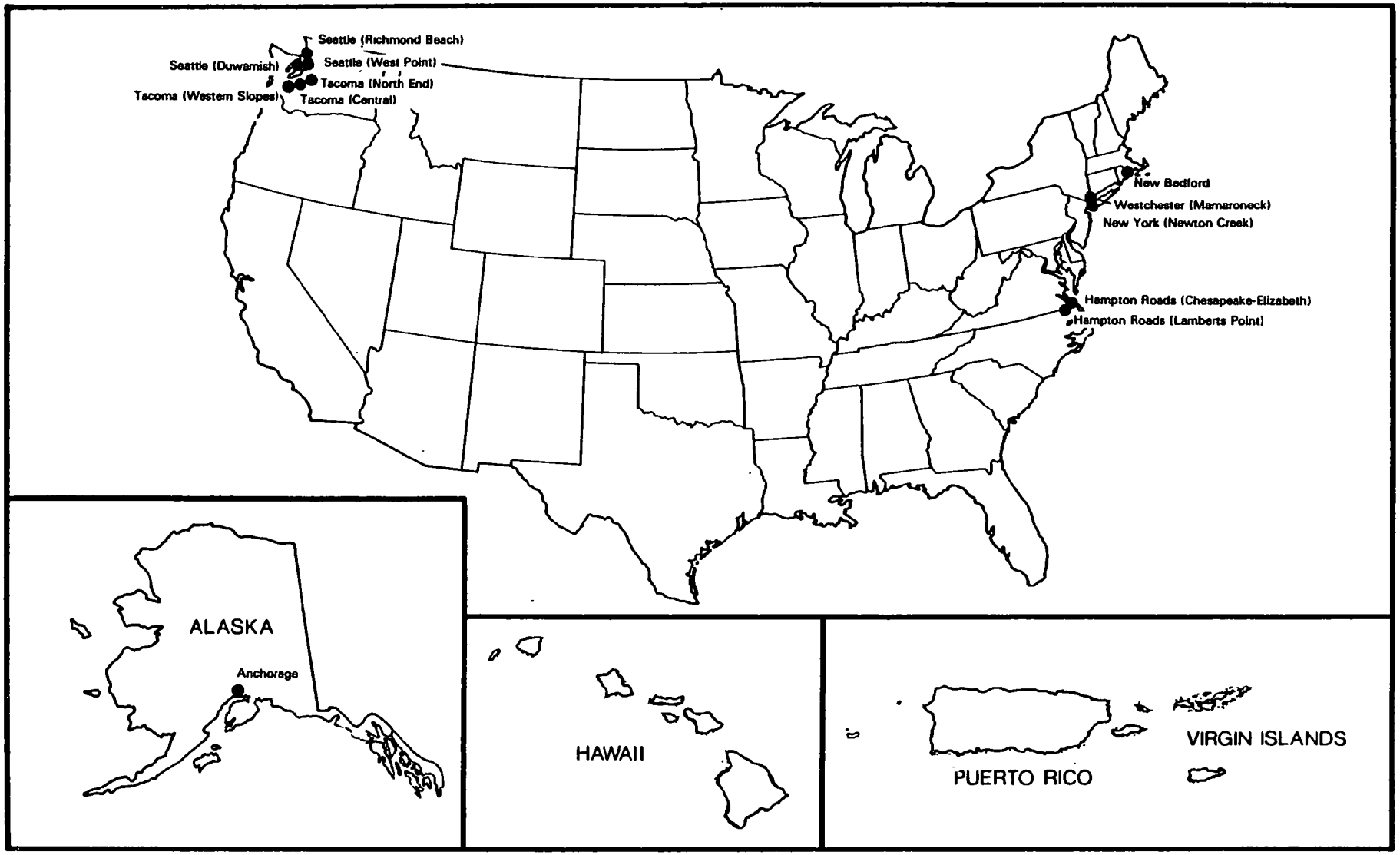

Figure 12. Major applicants proposing to discharge into a saline estuary.

population (BIP) is defined in the 301(h) regulations as "an ecological community which:

(1) Exhibits characteristics similar to those of nearby, healthy communities existing under comparable but unpolluted environmental conditions; or

(2) May reasonably be expected to become re-established in the polluted water body segment from adjacent waters if sources of pollution were removed."

Task Force analysis of the BIP included the evaluation of the effect of alterations of a particular community (e.g., the benthos) to impacts on other forms of marine life (e.g., fishes). For example, biological effects on a particular marine community that result in substantial secondary effects on another community, or that result in a potential for adverse effects in humans (e.g., bioaccumulation of toxic substances in fish or shellfish at levels injurious to humans), are likely to interfere with the BIP. Receiving water conditions and discharge characteristics influence the extent and significance of any biological impacts related to the discharge of municipal wastewater. The 301(h) Task Force analyzed the site-specific oceanographic, hydrographic, physical, chemical, and biological factors for each individual application.

Important biological variables incorporated into the BIP analysis include:

- Community structure:

  Species number, diversity, evenness, dominance
  Individual abundance
  Biomass
  Infaunal Index

- Pollution-tolerant and pollution-sensitive indicator species

- Abundance and importance of species or major groups

- Community interactions

- Bioaccumulation and concentrations of toxic substances

- Disease prevalence

Potential effects of municipal wastewater discharges on the biological communities are illustrated in FIGURE 13. The potential for impacts on the biological communities may occur away from the discharge (farfield) as well as immediately near the discharge (nearfield). Additionally, impacts on biological communities may result from substances and alterations within the receiving

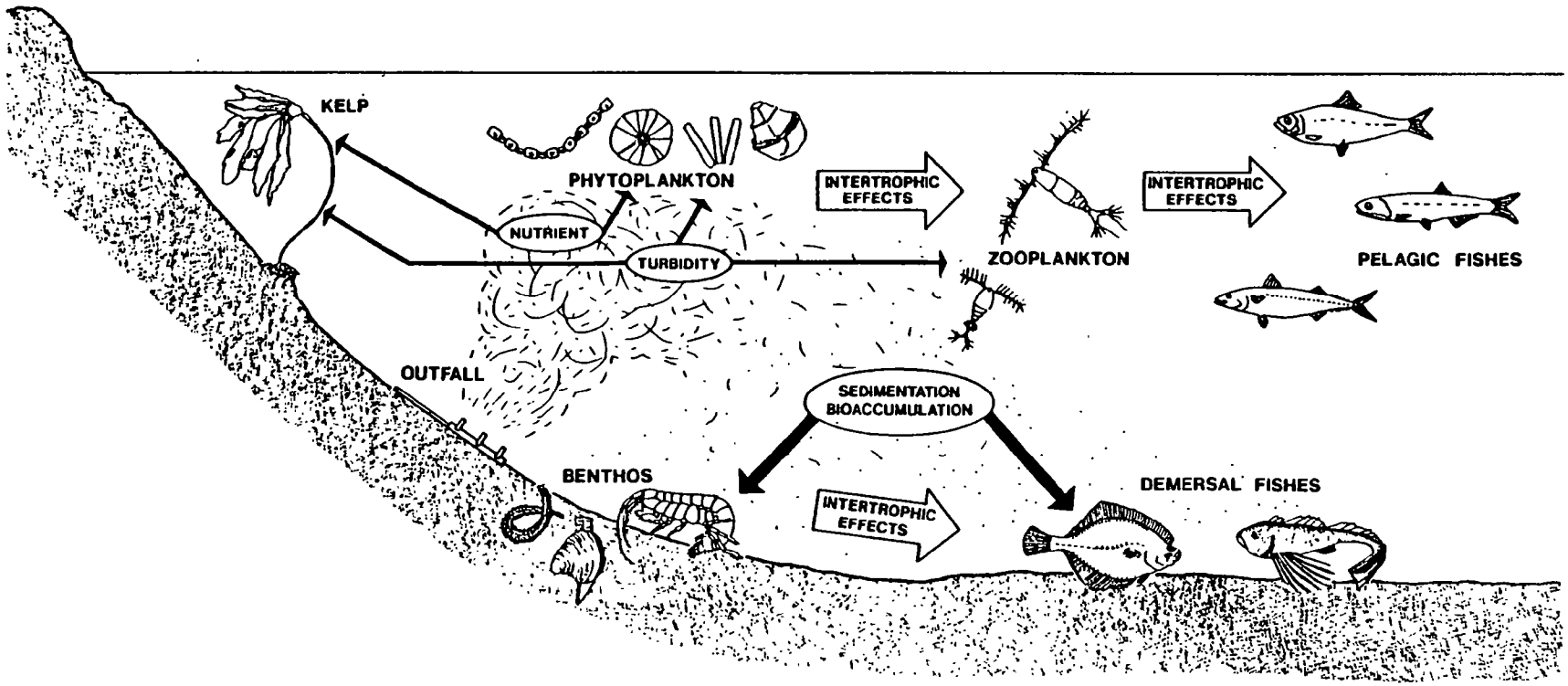

Figure 13. Potential biological effects of municipal wastewater discharges.

water and/or the bottom sediments. Many observed biological impacts are connected with sedimentation and accumulation of discharged particulate matter as shown in this Figure.

As the impacts of sediment enrichment (by organic particles) and of sediment contamination (by toxic pollutants) are closely linked, they are generally manifested in the same biotic groups. An important example of this interrelationship is the potential for impact on bottom-dwelling marine organisms (e.g., benthic macroinvertebrates such as shellfish and bottom-feeding fishes such as sole and flounder). As these organisms live in or on the sediments and also feed there, bottom-dwelling animals are susceptible to sediment composition changes, trophic modifications resulting in food changes, and uptake or contact with toxic pollutants in the sediments and water.

Impacts due to discharged solids may be compounded because many of the toxic pollutants in municipal effluents are associated with solids. Consequently, it is especially important to understand the physical/oceanographic factors which govern the transport, sedimentation, and accumulation of suspended solids in the vicinity of an outfall (discussed above under Oceanographic Conditions and under Solids Accumulation in the Marine Environment).

The natural biological productivity of the receiving waters, unperturbed by pollution sources, is another important factor to be considered in the BIP analysis. As an example, receiving waters with very low natural biological activity occur in the waters of Knik Arm at Anchorage, Alaska. Natural turbidity of the waters is so high that the euphotic zone is limited to the uppermost inches of the water column; consequently, natural phytoplankton production is extremely low. Zooplankton (which consume phytoplankton) are also low in abundance and of low diversity. Intertidal communities are sparsely populated and the subtidal fauna is almost nonexistent, due to strong currents and lack of suitable substrate. Anadromous fish transit the area on their migrations but other fish populations are sparse. This low biological productivity is the natural condition of these waters not affected by pollutant sources.

On the other end of the spectrum, Chesapeake Bay is widely recognized as an extremely productive estuarine environment. For example, the area on the south side of the mouth of the Bay near the Hampton Roads (Chesapeake-Elizabeth), VA, outfall is an important spawning and overwintering ground for the commercially and recreationally important blue crab. Nearly one-half billion pounds of fish and shellfish are harvested annually from Chesapeake Bay. Large numbers of commercially and recreationally valuable fishes including spot, croaker, and weakfish occur in the summer. The Bay is also a major spawning area for striped bass. However, the decline of striped bass is a matter of growing national and local concern. The effects of pollution input are widespread

in the Chesapeake Bay, and Congress recently reauthorized the Chesapeake Bay study to further address this problem. Anchorage, AK, received a tentative approval, and Chesapeake-Elizabeth received a tentative denial.

Potential impacts on specific components of the BIP and results of the biological analyses of the first 25 major applications are presented below.

Phytoplankton[12]

Summaries of some of the major results of the 301(h) analysis by the Task Force for phytoplankton are presented in TABLE 7. Observed effects of sewage discharges on phytoplankton included: 1) increased abundances of pollution-tolerant or nuisance species; 2) toxic inhibition; and 3) localized increases in production or biomass.

Stimulation of phytoplankton nuisance species was observed exclusively at Atlantic estuarine sites. The receiving waters where stimulation of a nuisance species was observed receive a variety of municipal and industrial pollutants. Additionally, these estuarine receiving waters displayed relatively poor flushing and dispersion characteristics. The occurrence of small phytoplankton cells was indicative of organic pollutant stress. Herbivores (e.g., zooplankton or clams) are not effective in filtering these small cells, and this species shift can thus interfere with trophic pathways.

Toxic inhibition was recorded at the existing Los Angeles County (JWPCP) discharge. In addition, Task Force analysis predicted that Tacoma's Central and North End proposed discharges are also likely to cause nearfield toxic inhibition of phytoplankton. Tacoma's Central plant, in particular, is characterized by a relatively high industrial contribution to the total flow (34 percent of the existing discharge).

Implementation of proposed improvements is not likely to alleviate the potential for adverse impacts on phytoplankton for eight of the applicants (TABLE 7)[13]. Most of these discharges are located in saline estuarine environments with poor flushing characteristics, and five show evidence of severe impacts on phytoplankton. These applications have been tentatively denied.

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[12]Phytoplankton are minute plants which passively float in a body of water.

[13]Insufficient data was provided for predictions on phytoplankton for one discharge.

TABLE 7. OBSERVED AND PREDICTED EFFECTS ON PHYTOPLANKTON BY THE 25 MAJOR DISCHARGES (EXISTING AND PROPOSED)

	EXISTING DISCHARGE				PROPOSED DISCHARGE	
	No Reported Adverse Effects	Increased Production or Biomass*	Toxic Inhibition	Increased Abundances of Pollution-Tolerant or Nuisance Species	Adverse Impacts Likely to Occur	Adverse Impacts Will Not Occur**
Boston (Deer and Nut Island), MA	A	-	-	-	X	-
Lynn, MA	X	-	-	-	-	X
New Bedford, MA	-	X	-	X	X	-
South Essex, MA	X	-	-	-	-	X
Westchester County (Mamaroneck), NY	-	-	-	X	X	-
New York (Newtown Creek), NY	-	-	-	X	X	-
Hampton Roads (Chesapeake-Elizabeth), VA	-	-	-	X	X	-
Hampton Roads (Lamberts Point), VA	-	-	-	X	X	-
Goleta, CA	X	-	-	-	-	X
Los Angeles City (Hyperion), CA	X	X	-	-	-	X
Los Angeles County (JWPCP), CA	-	X	X	-	-	X
Monterey, CA	X	X	-	-	-	X
Orange County, CA	X	-	-	-	-	X
Oxnard (Ventura), CA	X	X	-	-	-	X
San Diego, CA	X	X	-	-	-	X
Santa Cruz, CA	X	-	-	-	-	X
Honolulu (Honouliuli), HI	A	-	-	-	A	A
Honolulu (Sand Island), HI	X	X	-	-	-	X
Anchorage, AK	X	-	-	-	-	X
Seattle (Duwamish), WA	A	-	-	-	A	A
Seattle (Richmond Beach), WA	X	-	-	-	-	X
Seattle (West Point), WA	X	-	-	-	-	X
Tacoma (Central), WA	A	-	-	-	X	-
Tacoma (North End), WA	A	-	-	-	X	-
Tacoma (Western Slopes), WA	X	-	-	-	-	X

* Increased production or biomass is not necessarily considered an adverse effect.

** Already low impact potential will be minimized or adverse effects will be eliminated.

A Insufficient data provided.

Adverse impacts on phytoplankton are not anticipated at fifteen of the proposed discharges[14] (TABLE 7). These fifteen discharges, which were tentatively approved, include some of the largest applicants and are located in estuarine and in oceanic receiving waters. Flushing characteristics rapidly disperse diluted effluent from the vicinity of the outfalls. Fourteen of these reported no adverse effects at the existing discharge area; the fifteenth had a low impact potential on phytoplankton which would be expected to be minimized after proposed improvements. Although localized stimulation of phytoplankton was detected at seven of these discharges, this did not result in changes in phytoplankton community structure and therefore is not classified as an adverse impact. This localized stimulation of phytoplankton production or biomass was detected primarily near large discharges in the open ocean along the Pacific Coast but was also found near a smaller discharge located in a less dispersive area on the Atlantic Coast (TABLE 7). Discharge improvements in the form of outfall relocation or increased treatment level are expected to alleviate this localized phytoplankton stimulation.

Zooplankton[15]

Site-specific information on zooplankton was presented by only a few of the 25 major applicants. As zooplankton are generally transient in the discharge vicinity, remaining in the area only for a short part of their life cycle, impacts on zooplankton are not as common as on phytoplankton.

Review of available information on zooplankton led the Task Force to conclude that significant impacts were currently present only in the general vicinity of the largest discharge, Boston (MDC), MA. Although a "reasonably normal assemblage" of zooplankton species was found in Boston Harbor, abundance and diversity were apparently depressed. This effect was attributed to the heavy discharge of pollutants to the Harbor from multiple sources, of which the Deer Island and Nut Island (MDC) discharges represent the major point sources.

Although there were suggestions of impacts on zooplankton at a few of the other discharges, the information was inadequate for a conclusive demonstration of causes and effects, due either to the highly variable nature of the zooplankton data or to the limited sampling program. The transient nature of zooplankton

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[14]Insufficient data was provided for predictions on phytoplankton for one discharge.

[15]Zooplankton are minute animals which passively float or weakly swim in a body of water.

communities and their limited residence in areas influenced by the discharges generally results in a low likelihood of significant impacts on the zooplankton community.

Benthos[16]

Macrobenthic[17] communities are especially significant in the analysis of the balanced indigenous population. This is because benthic animals tend to be relatively long-lived, permanent residents of an area. They are sensitive to both sediments and bottom water quality and reflect the integrated effects of long-term environmental conditions. Benthic communities adjacent to pollution sources can generally provide useful information on the spatial extent and magnitude of the impact, as many benthic organisms are sedentary or relatively immobile and therefore may be continually exposed to the pollution. Benthic organisms are an essential component of the marine ecosystem. Higher organisms, including some important commercial and recreational fish, depend on these bottom-dwelling organisms for food.

Changes in the benthos associated with increasing organic loading (from sewage discharges or other sources) onto marine and estuarine sediments are presented in FIGURE 14. As shown in this Figure, as organic sediment deposition increases, the species which are sensitive to pollution are replaced by an increase in pollutant-responsive species (both the numbers and types of these species may increase in this "transition zone"). If the amount of organic sedimentation increases even more these species are in turn replaced by a small number of pollution-tolerant species, resulting in a sparse benthic population and a decreased food supply for fish. If enough organic sediments are added, all benthic macrofauna will eventually disappear, leaving the area denuded. The stage of the benthic community may be determined by the occurrence and abundance of certain benthic species, known as "indicator species"; some of these "indicator" genera are also listed in FIGURE 14.

A quantitative extension of this concept has been developed for southern California and is under development for Puget Sound in the northwest United States. The Infaunal Index is an indicator of change in the marine environment through a characterization of the benthic community. The index has been shown (Word and

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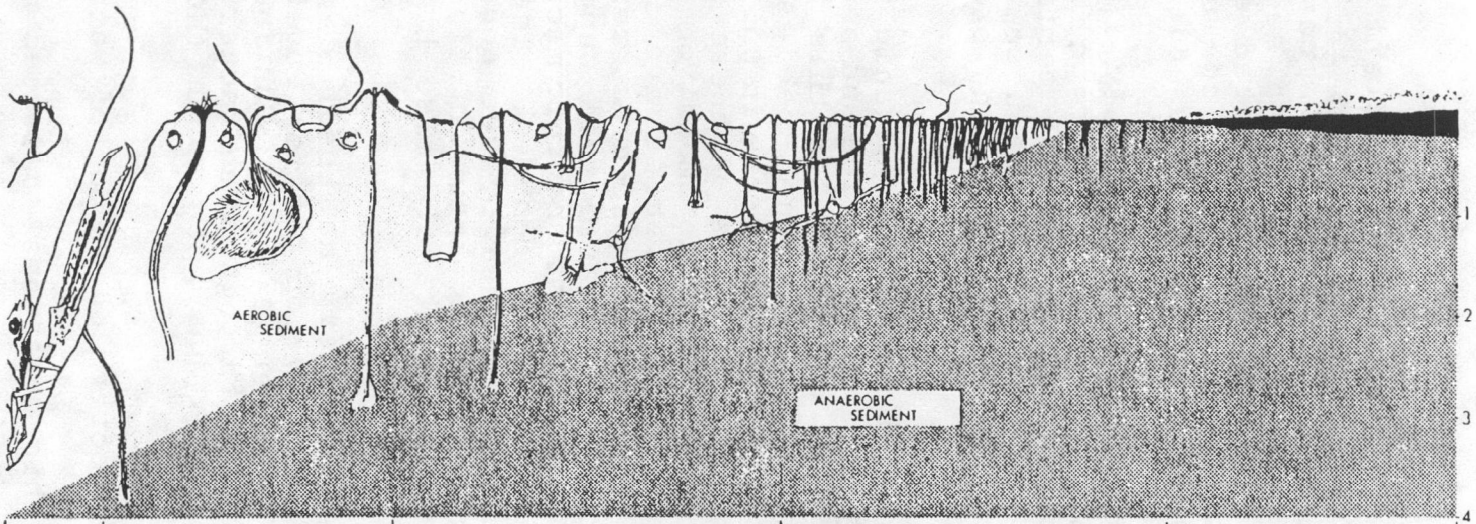
[16]Organisms occurring on or in the bottom of a body of water.

[17]Macrobenthic organisms are benthic organisms collected by grab sampling which are greater than 0.5 to 1.0 mm in size.



ZONE	NORMAL	TRANSITORY		POLLUTED	GROSSLY POLLUTED
TYPICAL MACRO-FAUNA DOMI-NANTS	Nucula Amphiura Terebellides Rhodine Echinocardium Nephrops	Labidoplax Corbula Goniada Thyasira Pholoe	Chaetozone Anaitides Pectinaria Myriochele Ophiodromus	Capitella Scolelepis	No MACROFAUNA Surface covered by Fiber blanket

REFERENCE: Pearson and Rosenberg 1978

Figure 14. Benthic faunal changes associated with increasing organic loading of marine and estuarine sediments.

Mearns, 1979) to be sensitive to shifts in the relative abundance of species groups defined by feeding strategy. The numerical value of the Infaunal Index is negatively correlated with the effects of sediment organic levels. In the southern California Bight, areas unaffected by sewage discharges typically have Infaunal Index values of 69 to 100. Infaunal Index values less than 30 indicate that benthic communities are highly modified by accumulation of organic solids. As an example, the application of the Infaunal Index to a large southern California discharge is shown in FIGURE 15 (Orange County, California, prior to proposed improvements). In general, as the deposition of suspended solids increases the area of impact of the benthos also increases. This relationship is shown graphically for certain southern California areas in FIGURE 16.

Characteristics of benthic communities which can be correlated with organic enrichment such as that due to sewage discharges include changes in biomass, total abundance, species number, prey availability, and percent of pollution-tolerant species. Effects observed at the major discharges are listed in TABLE 8. In summary, the following impacts were found near the existing discharges:

- Decreased numbers of species (six discharges).
- Increased numbers of species (one discharge).
- Increased abundances of organisms (six discharges).
- Decreased abundances of organisms (seven discharges).
- Decreased diversity (six discharges).
- Enhanced abundances of pollution-tolerant species (eleven discharges).
- Decreased Infaunal Index (four discharges).
- Increased Infaunal Index (one discharge).
- Increased biomass (three discharges).

For seven of the discharges whose applications were tentatively denied, proposed improvements were not expected to alleviate predicted or observed adverse impacts on the benthos. In fact, although adverse impacts on the benthos were not reported at the existing discharge for one of these tentative denials[18], proposed improvements in hydraulic capacity, solids handling,

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[18]Hampton Roads (Chesapeake Elizabeth), VA.

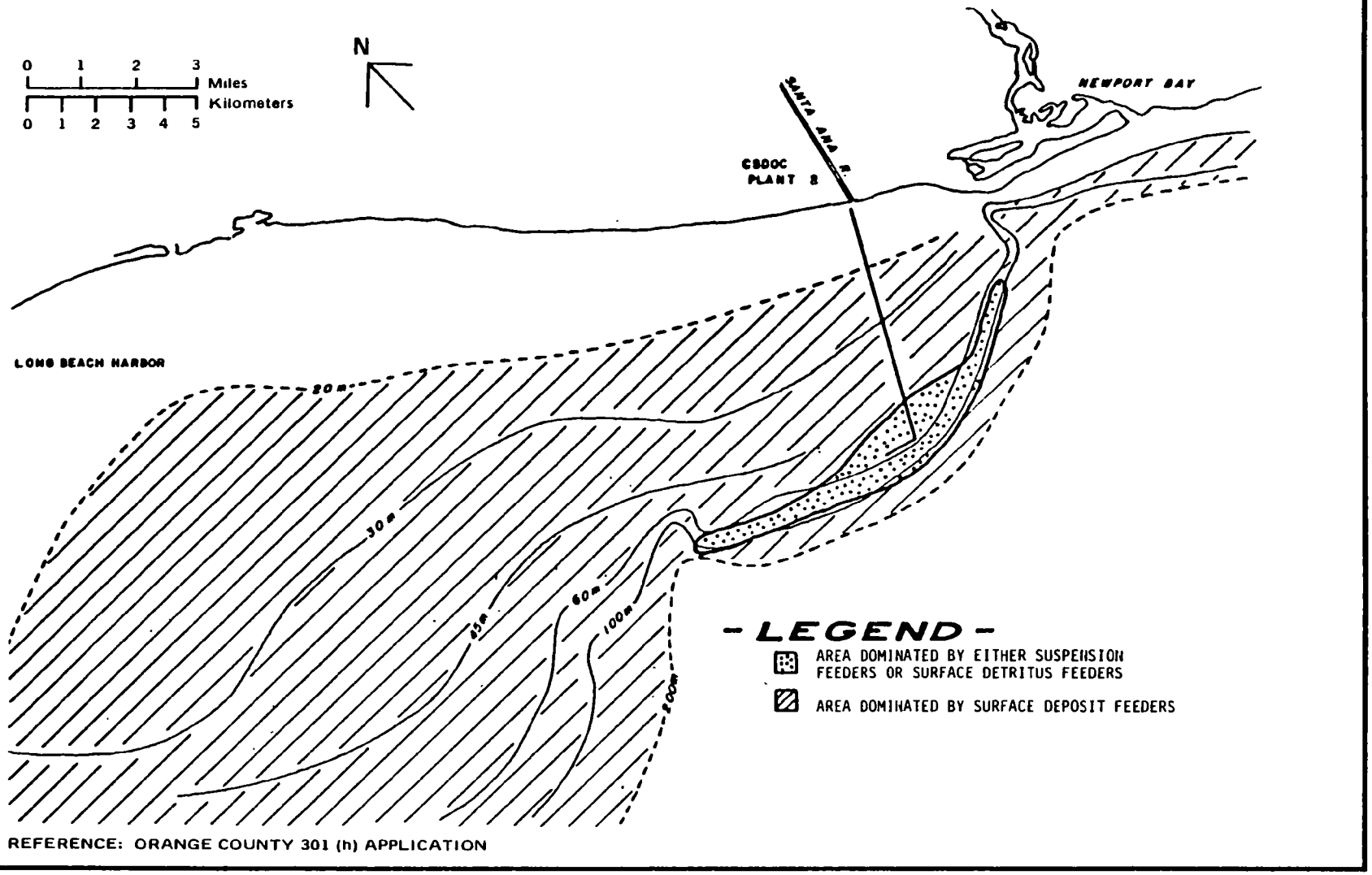
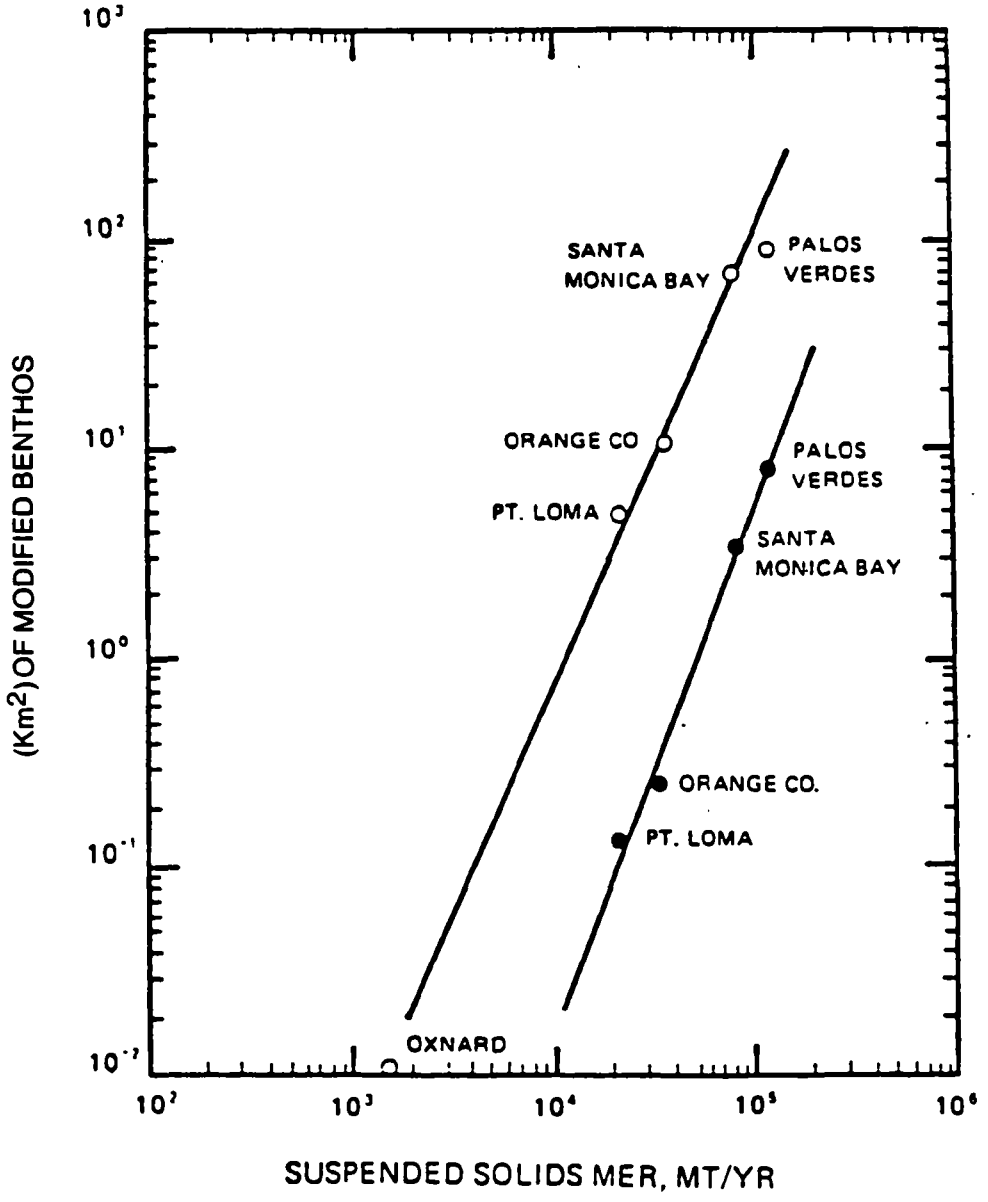


Figure 15. Benthic response to organic enrichment: Areas of "normal and "changed" Infaunal Index values near the Combined Sewer Discharges of Orange County, as defined by Bascom, et al., 1978.



○ AREA DOMINATED BY SUBSURFACE DEPOSIT FEEDING ORGANISMS (I I < 30)

● AREA DOMINATED BY SURFACE AND SUBSURFACE DEPOSIT FEEDING ORGANISMS (I I < 60)

REFERENCE: Mearns and Word 1982

Figure 16. Relationships between mass emission rates of suspended solids and the areas occupied by modified macrobenthic assemblages.

TABLE 8. OBSERVED EFFECTS OF 25 EXISTING SEWAGE DISCHARGES ON BENTHOS

	Decreased Numbers of Species	Increased Abundances	Decreased Diversity	Enhanced Abundances of Pollution-Tolerant Species	Decreased II	Increased Biomass	Increased Numbers of Species	Increased II	Decreased Abundances	No Effects Detected
Boston (Deer and Nut Island), MA	-	X	-	X	-	-	-	-	-	-
Lynn, MA	X	-	-	X	-	-	-	-	X	-
New Bedford, MA	X	-	X	X	-	-	-	-	X	-
South Essex, MA	-	-	X	X	-	-	-	-	X	-
Westchester County (Mamaroneck), NY	-	X	X	-	-	-	-	-	-	-
New York (Newtown Creek), NY	-	-	-	-	-	-	-	-	-	A
Hampton Roads (Chesapeake-Elizabeth), VA	-	-	-	-	-	-	-	-	-	X
Hampton Roads (Lamberts Point), VA	X	-	X	X	-	-	-	-	X	-
Goleta, CA	-	-	-	-	-	-	-	-	-	X
Los Angeles City (Hyperion), CA	-	X	-	-	X	X	-	-	-	-
Los Angeles County (JWPCP), CA	-	X	X	X	X	X	-	-	-	-
Monterey, CA	X	-	-	X	-	-	-	-	X	-
Orange County, CA	-	X	-	X	X	-	-	-	-	-
Oxnard (Ventura), CA	-	-	-	-	-	-	-	-	-	X
San Diego, CA	-	-	-	X	X	X	-	-	-	-
Santa Cruz, CA	X	-	X	-	-	-	-	-	X	-
Honolulu (Honouliuli), HI	-	-	-	-	-	-	-	-	-	A
Honolulu (Sand Island), HI	-	-	-	-	-	-	-	-	-	X
Anchorage, AK	-	-	-	-	-	-	-	-	-	X
Seattle (Duwamish), WA	-	-	-	-	-	-	-	-	-	A
Seattle (Richmond Beach), WA	-	-	-	-	-	-	-	-	-	X
Seattle (West Point), WA	-	-	-	-	-	-	-	X	X	-
Tacoma (Central), WA	X	-	-	X	-	-	-	-	-	-
Tacoma (North End), WA	-	X	-	X	-	-	X	-	-	-
Tacoma (Western Slopes), WA	-	-	-	-	-	-	-	-	-	X

A = Insufficient information to assess effects of the exising discharges

and solids removal would actually increase mass emission rates for suspended solids in the effluent, and would likely result in the degradation of biological communities near the proposed discharge. Insufficient evidence was available to make precise predictions on benthic impacts for three of the ten discharges whose applications for modified suspended solids limits were tentatively denied[19].

Adverse impacts on the benthos resulting from municipal sewage discharges were not observed at seven of the 25 major existing discharges. For six of these applicants, proposed improvements are expected to further minimize the potential for any future alterations of benthic communities by the proposed discharge.[20] For the nine other discharges whose applications were approved, benthic alterations were observed near the existing discharge but proposed improvements by the discharges are also expected to decrease or eliminate the potential for adverse impacts on the benthos. For example, following implementation of improvements proposed by four major southern California applicants[21], the total area of altered benthos (<60 Infaunal Index) is expected to shrink from 52 mi^2 to 9 mi^2. Improvements proposed by applicants receiving tentative approvals which would result in reduced potential for benthic impacts include improved treatment, outfall relocation to receiving waters with increased transport and dispersion characteristics, improved control of toxic substances, and reduced mass emissions of suspended solids.

Shellfish

The 301(h) Task Force investigated a variety of information regarding potential impacts on shellfish due to marine sewage discharge. In the northeastern United States, soft-shell clams, hard-shell clams, scallops, blue crabs, and lobsters are of particular importance. In the Chesapeake Bay, major shellfish include blue crabs, oysters, and clams. Puget Sound shellfish of major importance include Dungeness crab, shrimp, oysters, and several species of clams. Major shellfishery resources along the southern California coast include clams, abalone, and spiny lobster.

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[19]Seattle (Duwamish), WA; New York (Newtown Creek), NY; and Honolulu (Honouliuli), HI (tentatively denied for suspended solids only).

[20]The seventh discharge is discussed in the previous paragraph.

[21]Los Angeles City (Hyperion), CA; Los Angeles County (JWPCP), CA; San Diego, CA; and Orange County, CA.

In most cases information provided by the applicants on shellfish was limited. Supplemental information was provided by EPA Regional technical staff and by the technical support contractor and was obtained through the literature and personal communication with scientific researchers and with experts in various State agencies.

Shellfish resources may be affected by oceanic and estuarine sewage discharges primarily by:

- o fecal coliform bacteria (and other associated pathogens),
- o settleable solids, and
- o toxic pollutants.

The first (pathogen effects), may result in disease or illness in people consuming contaminated shellfish. The second (impacts due to settleable solids), may affect shellfish populations through shellfish attraction due to increased food supply or through shellfish aversion and avoidance of the area. Settleable solids may cause a habitat change and a resultant alteration in community composition. The third (toxic pollutants' effects), may result in disease or mortality in shellfish and/or may cause illness in people consuming the shellfish if these toxic pollutants occur in adverse concentrations.

The 301(h) Task Force concluded that of the 25 major proposed discharges, six would potentially result in adverse impacts on shellfisheries. All of these proposed discharges are located in saline estuaries, critical habitats for many important shellfish species. Four are located on the East Coast[22] and two are located on the West Coast.[23]

Fishes

Observed impacts on fish related to certain sewage discharges include:

- o increased prevalence of fish diseases,
- o mass mortalities,
- o fish tissue contamination

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[22]Mamaroneck, NY; Hampton Roads (Lamberts Point), VA; Hampton Roads (Chesapeake-Elizabeth), VA; and New Bedford, MA.

[23]Seattle (Duwamish), WA; and Tacoma (Central), WA.

- o alterations in community composition, and
- o effects on commercial or recreational fisheries.

Various pathological conditions have been found among fishes collected in the vicinity of municipal sewage outfalls (TABLE 9). Of these only fin erosion, hepatic lesions, and certain other liver abnormalities seem to be directly related to chemical contamination of the environment. Fin erosion has been found in demersal fish species (bottom-living fish such as flounder and sole) inhabiting chemically contaminated environments, such as those in the vicinity of certain municipal sewage discharges. As fin erosion has been found in bottom-dwelling fish, the disease appears to be linked to sediment impacts. Chemically contaminated environments where there is a higher than normal incidence of fish disease include both environments subject to multiple pollutant inputs[24] and areas where the major sources of pollutants are the existing discharges.[25] Field data lead to the conclusion that eight of the existing discharges had contributed to the chemical contamination of the benthic environment believed to be responsible for the increased prevalence of fish diseases in the vicinity impacted by the discharges. The Task Force concluded that for five discharges, proposed improvements would not significantly reduce the prevalence of fish disease.[26] These applications received tentative denials. For the remaining three applicants where there was an increased prevalence of fish disease near the existing discharge, the Task Force concluded that proposed system improvements would bring about substantial reductions in the prevalence of fish disease.

Bioaccumulation of potentially toxic substances is occurring in the vicinity of a number of existing discharges, but only in the vicinity of one discharge[27] is the problem so severe that fin fisheries have actually been prohibited (due to PCB contamination).

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[24]Boston Harbor, New York's East River, western Long Island Sound, and Washington's Commencement Bay.

[25]The vicinity of the Los Angeles County (JWPCP), Los Angeles City (Hyperion), and Orange County discharges in California.

[26]Boston (Deer Island and Nut Island), MA; New York (Newtown Creek), NY; Westchester County (Mamaroneck), NY; Tacoma (Central), WA; and Tacoma (North End), WA.

[27]New Bedford, MA.

TABLE 9. TYPES AND PREVALENCE OF FISH DISEASES AND OTHER ABNORMALITIES FOUND AT 25 EXISTING DISCHARGES

	Fin Erosion	Liver Lesions and Other Liver Abnormalities	Skin Tumors	Lip Papillomas	Color Anomalies	Parasites	Morphological Asymmetry	Structural Deformities	Gill Lesions	Kidney Lesions	Gall Bladder Lesions	Lymphocystis	Exopthalmia	Sensory Lesions	Unspecified Fish Disease	Predicted Change
Boston (Deer and Nut Island), MA	H	--	--	--	--	--	--	--	--	--	--	--	--	--	--	I
Lynn, MA	—	—	--	--	--	--	--	--	--	--	--	--	--	--	ND	U
New Bedford, MA	ND	Q	ND	ND	ND	--	--	--	--	--	Q	--	--	Q	--	U
South Essex, MA	--	--	ND	--	--	L	--	--	--	--	--	--	--	--	--	D
Westchester County (Mamaroneck), NY	Q	--	Q	--	--	--	--	--	--	--	--	Q	--	--	--	I
New York (Newtown Creek), NY	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Q	U
Hampton Roads (Chesapeake-Elizabeth), VA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NP
Hampton Roads (Lamberts Point), VA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NP
Goleta, CA	--	--	--	--	L	L	--	--	--	--	--	--	--	--	--	NP
Los Angeles City (Hyperion), CA	M	--	L	L	L	L	--	Q	--	--	--	--	--	--	--	D
Los Angeles County (JWPCP), CA	H	--	L	L	L	L	Q	--	--	--	--	--	Q	--	--	D
Monterey, CA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	L	U
Orange County, CA	M	--	L	--	--	--	--	--	--	--	--	--	--	--	--	D
Oxnard (Ventura), CA	L	--	L	--	--	L	--	--	--	--	--	--	--	--	--	U
San Diego, CA	ND	--	L	--	--	L	--	--	--	--	--	--	--	--	--	D
Santa Cruz, CA	L	--	--	--	--	L	--	--	L	--	--	--	--	--	--	NP
Honolulu (Honouliuli), HI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NP
Honolulu (Sand Island), HI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NP
Anchorage, AK	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NP
Seattle (Duwamish), WA	ND	--	L	--	--	H	--	--	--	--	--	--	--	--	--	NP
Seattle (Richmond Beach), WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NP
Seattle (West Point), WA	ND	--	L	--	--	M	--	--	--	--	--	--	--	--	--	NP
Tacoma (Central), WA	--	H	--	--	--	H	--	--	M	M	--	--	--	--	--	I
Tacoma (North End), WA	--	M	Q	--	--	M	--	--	Q	Q	--	--	--	--	--	I
Tacoma (Western Slopes), WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	D

Key: H = High prevalence (15 percent)
M = Moderate prevalence (5 to 15 percent)
L = Low prevalence (5 percent)
Q = Qualitative only, prevalence not stated
ND = Not detected

I = Increased prevalence
U = Unchanged prevalence
D = Decreased prevalence
NP = No prediction made
-- = Not discussed or not examined

In two locations[28], municipal sewage discharges may have contributed to conditions responsible for fish kills in their vicinity (e.g., low concentrations of dissolved oxygen, high concentrations of toxic metals).

Alterations in fish community composition (such as changes in species distribution) have also been noted near some existing discharges, although they are not always considered adverse. The best evidence for such alterations comes from large West Coast applicants which have conducted extensive fish sampling programs. For these discharges, planned improvements which would reduce the degree of solids accumulation (and consequent alterations in benthic infaunal communities) are expected to also reduce the alteration of local fish communities.

Distinctive Habitats of Limited Distribution

Distinctive habitats of limited distribution include those segments of the marine environment whose protection is of special concern because of their ecological significance or their direct value to man. These habitats include, but are not limited to, coral reefs, kelp beds, seagrass meadows, spawning or nursery areas for commercial species, sites of aesthetic appeal to man, and rocky intertidal habitats (where they are uncommon). The scientific literature indicates that many of these distinctive habitats may be particularly sensitive to municipal discharges. Ten of the 25 major discharges are located near distinctive habitats of limited distribution.

Coral

Three major components of potential coral reef impacts from municipal sewage discharges are: 1) eutrophication associated with high nutrient concentrations in discharged wastewater, 2) sedimentation of suspended solids, and 3) toxic pollutant impacts (R. Pastorak and G. Bilyard, 1983). Coral reef locations include the coasts of southern Florida, the Hawaiian Islands, Puerto Rico, and the Virgin Islands (FIGURE 17). Of the 25 major discharges, coral reefs only occur inshore of the two proposed discharges at Honolulu, Hawaii. At Sand Island (Honolulu, HI), cessation of sludge discharge through the outfall will reduce shoreward transport of particulates and associated toxicants, resulting in expected improvements in the condition of inshore coral reefs. In the case of Honouliuli (Honolulu, HI), although adverse impacts are not expected to result from the proposed discharge of BOD, transport of effluent solids to inshore coral

[28]New Bedford, MA; and Hampton Roads (Lamberts Point), VA.

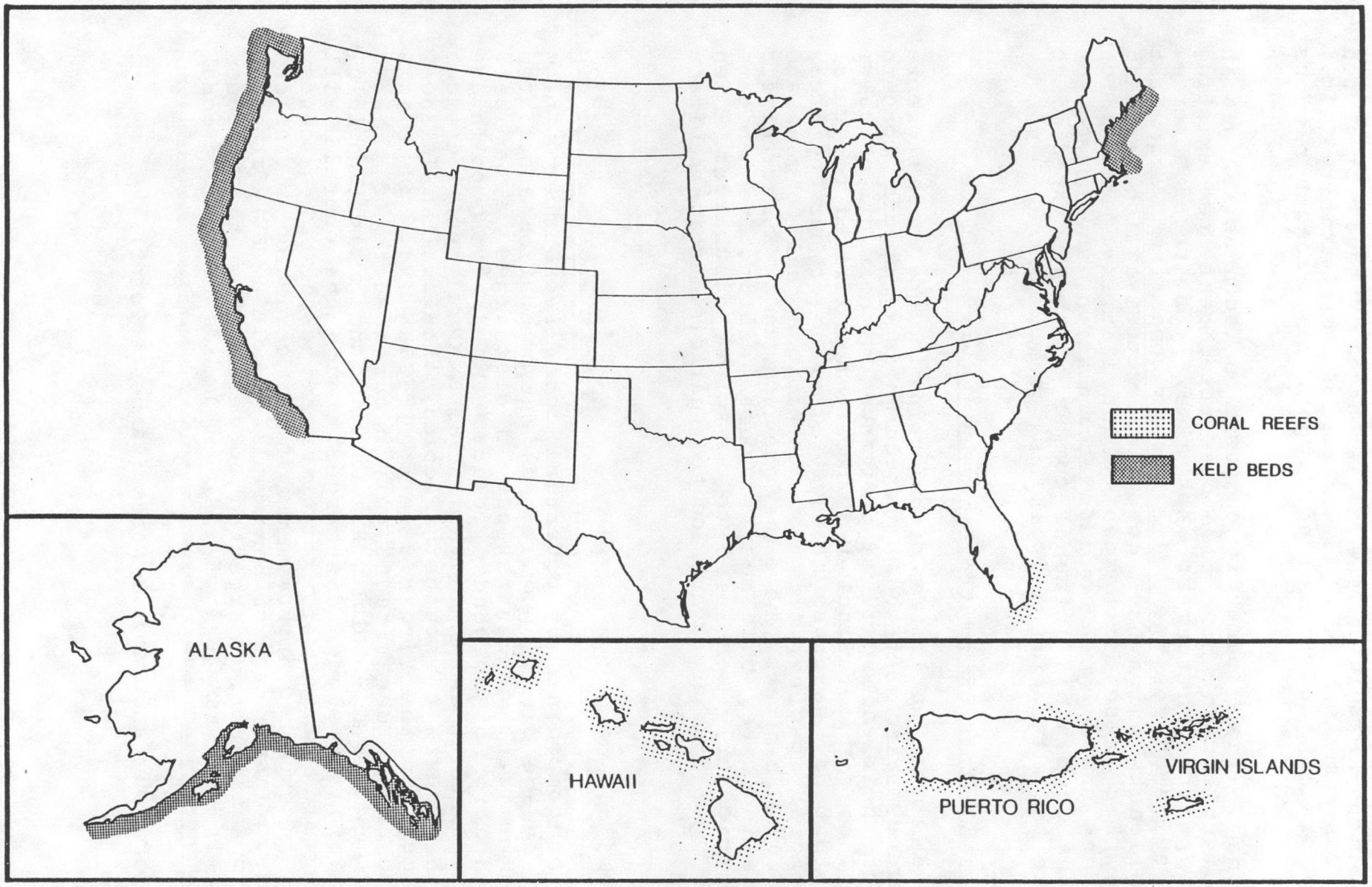

Figure 17. Geographical distribution of kelp beds and nearshore coral reefs.

reef habitats and subsequent increases in sedimentation rates may degrade coral communities inshore of this outfall. A tentative approval for BOD, but not for suspended solids was granted in this case.

Kelp Beds

Kelp occurs on the New England coast and along the West Coast, from Southern California to Alaska (FIGURE 17). Potential impacts of sewage discharge on kelp are varied and are still under scientific study. Of the 25 major discharges, kelp habitat occurs in the vicinity of eight discharges.

Ecological impacts of sewage effluents on distinctive kelp habitats have been documented at four of the existing discharge sites[29]. Observed impacts include: changes in the structure and function of kelp bed communities, degradation of the kelp beds (possibly caused by high levels of copper and zinc in the effluent), attenuation of light due to discharged suspended solids, and sediment accumulation due to both the effluent discharge and the outfall terminus structure. Proposed improvements in outfall design, location, and/or sewage treatment (including toxic control measures) are expected to alleviate any existing impacts on distinctive kelp habitats near the proposed discharges.

At the other four discharges located near kelp habitat[30], no effects on kelp due to the discharge of sewage effluent were reported, and none is expected for the proposed discharge.

Bioaccumulation

The potential for bioaccumulation of toxic pollutants from the discharge is an important consideration in the demonstration of the existence of a BIP of shellfish, fish, and wildlife. Toxic pollutants and pesticides can exert a number of adverse effects on marine organisms, including disease, reduced reproduction rates, avoidance of the impacted area, and death. Adverse impacts may result when marine organisms accumulate toxic pollutants to high levels from the water, sediment, and/or food, or are directly exposed to toxic pollutants.

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[29]Los Angeles (JWPCP), CA; San Diego (Point Loma), CA; Monterey, CA; and Seattle (West Point), WA.

[30]Santa Cruz, CA; Goleta, CA; Tacoma (Western Slopes), WA; and Lynn, MA.

Important factors in evaluating the bioaccumulation potential of a proposed discharge include:

- o Effluent concentrations of toxic pollutants
- o Characteristics of toxic substances
- o Initial dilution and dispersion in the receiving water
- o Solids accumulation and sediment concentration in the discharge area
- o Contamination from other sources
- o Type, sensitivity, importance, and location of potentially impacted organisms
- o Potential for human health effects

Adverse bioaccumulation of toxic pollutants in marine and estuarine organisms in the receiving waters is difficult to assess due to variations in receiving waters, currents, sediments, organisms (feeding habits, movement, habitat, susceptibility, etc.), multiple pollutant sources, and complicated chemical, physical, and biological interactions.

The range of quality and quantity of information submitted by the applicants on bioaccumulation was considerable. Task Force analysis of bioaccumulation potential involved review of field studies submitted by the applicant including, in various cases, effluent, water column, sediment, and biotic surveys. Additionally, EPA-recommended water quality criteria (WQC) provide a useful guide for evaluating whether toxic priority pollutants are present in sea water in concentrations that adversely affect biota and human health (45 Fed. Reg. 79318 November 28, 1980, and Fed. Reg. 4551, February 7, 1984). WQC are based on the available scientific data on the effects of pollutants on public health and welfare, aquatic life, and recreation. They establish numerical values which indicate the concentrations of pollutants in water which will generally ensure water quality adequate to support the pertinent water use.

The sixteen priority pollutants in concentrations in excess of EPA saltwater quality criteria after (proposed) initial dilution are shown in TABLE 10. The total number of toxic pollutants exceeding EPA criteria after initial dilution in any one discharge ranged from 0 to 12 compounds. These priority pollutants include metals (cadmium, copper, lead, mercury, nickel, silver, and zinc), pesticides (chlordane, DDT, endosulfan, endrin, heptachlor, and lindane) and other compounds (PCBs and cyanide). Metals are more likely to be concentrated in the tissues of certain invertebrates (e.g., clams, mussels, oysters), while PCBs and

TABLE 10. PRIORITY POLLUTANT CONCENTRATIONS IN EXCESS OF EPA SALTWATER QUALITY CRITERIA FOR 25 MAJOR DISCHARGES

	Number of Discharges Exceeding Criteria*
Cadmium	2
Chlordane	1
Chromium	2
Copper	8
Cyanide	6
DDT	3
Endosulfan	1
Endrin	1
Heptachlor	2
Lead	2
Lindane	1
Mercury	7
Nickel	3
PCBs	2
Silver	1
Zinc	3

* Following proposed initial dilution.

pesticides are generally accumulated in fishes and other animals high in the food chain.

Of the nine tentatively denied applications, eight exceeded EPA criteria for one or more priority pollutants; the ninth submitted insufficient information for compliance determination. Seven of these applicants requested increased effluent limits and/or mass emission rates for suspended solids[31]. In addition, seven of the nine tentative denials reported relatively low initial dilution for both the existing and proposed outfalls.

All nine proposed discharges which received tentative denials were found to have a significant potential for adverse bioaccumulation of toxic pollutants. Factors considered to be indicative of a high potential for adverse bioaccumulation include:

- o exceedence of the chronic saltwater quality criteria as determined through measurement of the concentrations of toxic pollutants in the effluent or receiving water,
- o elevated concentrations of toxic pollutants in samples of sediments and/or resident biota collected in the vicinity of existing discharge, and
- o the significant occurrence of toxic pollutants, as well as low critical initial dilution of the proposed discharge and poor flushing characteristics of the receiving water body.

Among the nine proposed discharges predicted to have a significant potential for adverse bioaccumulation, eight are to estuarine environments and have relatively low predicted critical initial dilutions (less than 60:1). Every one of these eight proposed estuarine discharges is expected to affect areas already impacted by toxic pollutants.

Certain fisheries have been prohibited due to high tissue concentrations of toxic chemical pollutants in the vicinity of two of the 25 major existing discharges. 301(h) applications for both of these discharges have been tentatively denied, in part because of the present and predicted contribution to the adverse bioaccumulation occurring in the area. In one case, the harvesting of fish, shellfish, and lobster had been prohibited in New Bedford Harbor due to tissue contamination by PCBs. In the other situation, oyster harvesting was prohibited in the Elizabeth River due to high coliform bacteria levels, trace metals, PCBs, and pesticides.

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[31]Seattle (Duwamish), WA, did not have an existing discharge to the ocean, and information provided is not sufficient for inclusion in these calculations.

Seven of the 16 discharges receiving tentative approvals[32] were predicted to have only a low potential for adverse bioaccumulation due to low concentrations of toxic pollutants in the effluent, high initial dilutions, and good receiving water flushing characteristics. The other nine existing discharges currently have the potential or occurrence of adverse bioaccumulation[33], but the Task Force concluded that proposed improvements would significantly mitigate this potential so as to protect the BIP. Reduced potential for adverse bioaccumulation is expected from improvements of increased solids removal associated with improved treatment processes, toxic substance control programs designed to reduce input of toxic pollutants to the sewage system, and increased initial dilution associated with outfall modifications (such as relocation or diffuser construction).

(8) OTHER RELEVANT STATUTES

A 301(h) modified discharge must be consistent with other applicable State and Federal laws including: 1) the Endangered Species Act, and 2) the Coastal Zone Management Act, and 3) Title III of the Marine Protection, Research and Sanctuaries Act. Applicants are to contact the appropriate Agencies to determine consistency with these statutes. EPA has coordinated efforts with the National Marine Fisheries Service, US Fish and Wildlife Service (USFWS), and the Office of Coastal Zone Management at the National Oceanic and Atmospheric Administration to determine consistency.

As an example of EPA coordination with Federal agencies, Region IX has recently completed formal consultation with the USFWS on consistency with the Endangered Species Act for three large southern California discharges[34]. At issue was the impact on thinning of the brown pelican egg shells due to the presence of DDT. This formal consultation resulted in a Biological Opinion on October 7, 1983, indicating that "permit actions are not likely to jeopardize the continued existence of the California brown pelican." In the Biological Opinion, USFWS delineated six recommendations for the conservation of the California brown

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[32]Honolulu (Sand Island), HI; Honolulu (Honouliuli), HI; Ventura/Oxnard, CA; Santa Cruz, CA; Seattle (Richmond Beach), WA; Tacoma (Western Slopes), WA; Anchorage, AK.

[33]Los Angeles County (JWPCP), CA; Los Angeles City (Hyperion), CA; Orange County, CA; San Diego (Point Loma), CA; Monterey, CA; Goleta, CA; Seattle (West Point), WA; South Essex, MA; Lynn, MA.

[34]Los Angeles City (Hyperion), CA; Los Angeles County, CA; and Orange County, CA.

pelican. Formal consultation with USFWS is anticipated by EPA Region IX on other large California applications as well.

(9) RECREATION

Section 301(h)(2) states in part that the proposed discharge must allow for "recreational activities in and on the water."

All of the approved proposed discharges are expected to allow for recreational activities.

The proposed discharges of all nine of the denied applications were expected to interfere with recreational activities, such as fishing, shellfishing, and/or body-contact activities such as surfing, swimming, wading, and SCUBA diving. Coliform bacteria levels, dissolved oxygen levels, toxic pollutant concentrations, and proximity to recreational areas were generally of primary concern in evaluation of recreational impacts in these predominantly estuarine environments.

(10) MONITORING PROGRAM

Section 301(h) of the Clean Water Act requires waiver recipients to monitor the impact of the discharge on a representative sample of aquatic biota, to the extent practicable.

Municipalities receiving a 301(h) variance must develop and implement appropriate effluent, receiving water, and biological monitoring programs. In addition to documenting the short and long-term effects of the modified discharge on receiving water quality, sediments, and marine biota, the programs are also to measure influences on beneficial uses of the receiving water, compliance with NPDES permit terms and conditions, and the effectiveness of toxic substance control programs.

Coastal dischargers are currently required by their NPDES permits to implement monitoring programs for meeting their technology based effluent limits. These programs are supplemented or modified to address the 301(h) water quality based requirements. Through the application evaluation process, proposed monitoring programs are evaluated, resulting in identification of additions or deletions necessary to ensure monitoring programs are adequate to assess discharge impacts without unnecessary complexity and cost. Even though cost is not a decision factor in waiver evaluations, the cost of environmental monitoring is significantly less than the cost to meet secondary treatment requirements. Special consideration is given to small applicants in recognition of the typically reduced environmental impacts associated with such discharges and the limited resources available for long-term monitoring programs. Monitoring requirements are discussed

in the tentative decision document for each approval. Often, additional meetings are arranged with the applicants and EPA scientists and managers to work out monitoring program specifics. Specific guidance is available in the 301(h) Monitoring Program Document and the Revised 301(h) Technical Support Document to assist applicants in designing and conducting the monitoring programs.

Effluent Monitoring

Routine monitoring of an applicant's effluent for various water quality parameters (e.g., pH, BOD, settleable solids, total suspended solids, total coliform bacteria, etc.) is generally required under the conditions of the NPDES permit. In addition, monitoring of priority pollutants has been included in the 301(h) effluent monitoring program to emphasize toxic pollutant detection and the need to determine the effectiveness of the toxics control programs.

Effluent monitoring objectives include the evaluation of:

- Treatment plant performance
- Toxic substance and pesticide presence and levels and toxic control program effectiveness
- Effluent limitation compliance
- Information for other assessments

  Water quality impacts
  Sedimentation
  Biological impacts

Water Quality Monitoring

Water quality monitoring is required to determine compliance with applicable State and Federal water quality standards and 301(h) criteria. Sediment sampling is to be conducted to support the water quality and biological surveys and to measure the accumulation of toxic pollutants. This is to be accomplished near the zone of initial dilution (ZID) and at areas beyond this zone where discharge impacts might reasonably be expected, especially during critical environmental periods. Monitoring is also to be conducted at control or reference stations for evaluation of discharge-related impacts.

Water quality and sediment monitoring include evaluations of:

- o Compliance with State standards
- o Continued attainment or maintenance of water quality which assures protection of the biological indigenous population
- o Allowance of recreational activities
- o Identification of, and monitoring during, critical environmental periods
- o Improvements or impacts on environmental quality
- o Estuarine discharge requirements (below)
- o Stressed water analyses by waiver recipients discharging to stressed water

Biological Monitoring

Biological monitoring is necessary to evaluate the overall impact of the permittee's modified discharge on the BIP. Data collected are to provide evidence of environmental conditions conducive to the maintenance of the balanced indigenous population of shellfish, fish, and wildlife beyond the zone of initial dilution (ZID) boundary, and to show that within-ZID conditions do not contribute to extreme biological impacts.

Biological monitoring objectives are:

- o Protection and propagation of the BIP near the ZID boundary and beyond
- o Within ZID conditions which do not contribute to extreme biological impacts
- o Protection of distinctive habitats of limited distribution
- o Assessments of commercial and recreational fisheries potentially impacted by the discharge
- o Estuarine discharge requirements (below)
- o Stressed water analyses by waiver recipients discharging to stressed water

For estuarine discharges, the monitoring program must also be designed to show that:

- o within-ZID benthic populations are not substantially different from those immediately beyond the ZID boundary,
- o the discharge does not interfere with migratory pathways within the ZID, and
- o toxic pollutant or pesticide accumulations do not accumulate at levels which exert adverse effects on the environment.

Utilization of Monitoring Results

301(h) modifications take the form of a modified NPDES permit and like all NPDES permits may not exceed a period of five years. 301(h) modifications may be renewed, and the monitoring results will be used in evaluating the application for permit renewal.

In the tentative decision document, monitoring program weaknesses are identified and specific program changes are recommended to ensure documentation of modified discharge impacts. Prior to permit issuance, these changes are typically discussed with an applicant, and a program is developed mutually, focusing on critical measurements while recognizing the extent of resources available for program implementation. As a result of the uniform review and development of monitoring programs, the information collected will not only identify the presence or absence of site-specific problems but will also allow a synthesis of findings applicable to larger regional and coastal areas. In turn, this will permit consistent revision of current monitoring requirements, and provide a comprehensive data base upon which to define up-to-date monitoring requirements. Appropriate new monitoring programs would be developed on the basis of a proposed effluent's characteristics and known long-term responses to such discharges in similar biogeographical regions.

To effectively utilize the data soon to be submitted as a result of 301(h) monitoring, the Agency is in the process of developing an ocean data evaluation system (ODES) to be managed by Office of Marine Discharge Evaluation in consultation with the Office of Information Resources Management. This system will enable effective storage, retrieval, and analysis of 301(h) monitoring program data, in conjunction with relevant data available in existing EPA and other Federal, State, or local governmental agencies and will permit synthesis of information rapidly to ensure early detection of unacceptable changes. This procedure will allow the Agency to modify permit requirements, thereby avoiding severe changes in the receiving environment and its biota. The investment now in an effective ocean data evaluation system to handle information from over 200 potential discharges

is critical to the evaluation of potential impacts and trends in the marine environment and to report to Congress on the impact on marine waters of the issuance of 301(h) modified permits.

(11) TOXIC SUBSTANCES CONTROL

Introduction

The toxics control program is designed to identify and assure control of toxic pollutants and pesticides discharged into the POTW. Large applicants are to submit with their applications an analysis of treatment plant effluent under wet-weather and dry-weather conditions. The analyses must include all 126 priority pollutants which include toxic organic compounds, metals, asbestos, and six additional pesticides.

Toxics control programs are required for both industrial and nonindustrial sources discharging to the POTW. The 301(h) industrial source control requirements are consistent with the 40 CFR Part 403 pretreatment program regulations.

Small applicants with no industrial discharges to the POTW are exempt from the requirements of effluent analysis and industrial pretreatment in the application. However, upon approval of the proposed modification they are required, to the extent practicable, to analyze for priority pollutants and pesticides. At a minimum, small applicants must implement a public information program designed to reduce nonindustrial contributions of priority pollutants to the POTW.

Effluent Characteristics

Analysis of the toxic pollutant concentrations for the existing 25 major discharges showed 34 toxic pollutants occurring in over 20 percent of all the sewage effluent samples.[35] A list of these toxic pollutants and their concentrations is given in TABLE 11, along with a list of the percentage of occurrence in the samples. The most frequently detected substances were metals, of which chromium, copper, zinc, cadmium, arsenic, and lead were detected in greater than 90 percent of the samples.

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[35]The data base represents 22 separate analyses of wet-weather and dry-weather conditions plus one analysis for dry weather only and two analyses for which antecedent rainfall conditions were not provided.

TABLE 11. PRIORITY POLLUTANTS DETECTED IN OVER 20 PERCENT OF SEWAGE EFFLUENT SAMPLES FOR 25 MAJOR DISCHARGES (EXISTING)

Pollutant	Percent of Total Samples	Concentration (ug/l)		
		Mean	Minimum	Maximum
Chromium	100	226	0.3	6,600
Copper	100	176	10	2,800
Zinc	98	239	3	1,290
Cadmium	98	15	0.1	150
Arsenic	96	23	2	250
Lead	94	44	0.4	250
Mercury	89	1.8	<0.1	12
Antimony	81	83	0.3	730
Nickel	81	92	4	420
Silver	81	12	<0.1	48
Beryllium	79	10	<0.1	85
Thallium	77	48	0.1	800
Selenium	77	13	0.5	100
Cyanide	70	41	<0.1	250
Toluene	68	124	0.4	1,300
Phenol	66	105	0.8	814
Chloroform	64	29	2	180
Tetrachloroethane	60	56	0.4	273
1,1,1-Trichloroethane	57	188	1	1,377
Trichloroethylene	53	40	3	170
Bis(2-ethylhexyl)phthalate	49	30	0.9	140
Benzene	47	44	0.4	540
Ethylbenzene	45	63	0.3	640
Di-N-Butyl Phthalate	40	51	1	806
Dichloromethane	38	134	0.6	1,600
Pentachlorophenol	36	117	1	1,700
Napthalene	34	17	<0.1	87
Diethyl Phthalate	32	16	1	62
1,2-Dichlorobenzene	28	17	3	67
1,2-Trans-dichloroethylene	23	28	1	120
Butyl Benzyl Phthalate	23	12	0.4	40
1,3-Dichlorobenzene	21	4	<0.1	10
Anthracene	21	6	0.3	10
Phenanthrene	21	6	1	10

The highest mean and maximum concentrations were observed for chromium, copper, and zinc. The range of the total number of toxic pollutants detected in any given discharge varies from 18 to 92 compounds overall.

To determine compliance of the proposed discharges with EPA receiving water criteria, priority pollutant concentrations in the receiving environment are calculated using concentration data obtained from laboratory analyses of existing effluent divided by the proposed initial dilution. These figures represent the concentration of the pollutant in the receiving water immediately following critical initial dilution. These figures are used for comparison to EPA water quality criteria. Priority pollutant concentrations in excess of EPA saltwater criteria following critical initial dilution for the major discharges are shown in TABLE 10. Metals were the most common priority pollutant group exceeding EPA criteria. The total number of toxic pollutants exceeding EPA criteria after initial dilution in any one discharge ranged from 0 to 12 compounds.

Of the nine tentatively denied applications, eight exceeded EPA criteria for one or more priority pollutants; the ninth submitted insufficient information for compliance determination. Seven of these applicants requested increased effluent limits and/or mass emission rates for suspended solids[36]. In addition, seven of the nine tentative denials reported relatively low initial dilution for both the existing and proposed outfalls. Analyses of the majority of the tentatively denied applications showed these proposed discharges to have significant potential for adverse toxic pollutant impacts, even after proposed improvements.

Industrial Pretreatment

Section 301(h)(5) states that "all applicable pretreatment requirements for sources introducing waste into such treatment works will be enforced." The 301(h) regulations provide in 40 CFR 125.64(c) that applicants with known or suspected industrial sources of toxic pollutants shall have or develop an approved pretreatment program in accordance with the Agency's general pretreatment regulations (40 CFR Part 403). The applicant's proposed program is subject to revision by the Agency prior to the issuance of a 301(h) modification and during the term of the 301(h) modification.

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[36]Seattle (Duwamish), WA, did not have an existing discharge to the ocean, and information provided is not sufficient for inclusion in these calculations.

As part of the 301(h) review process the Agency considers the status of the applicant's program and also identifies toxic pollutants at levels which raise concerns about potential impacts to the receiving water quality or ecosystem. Where appropriate, the approval of a 301(h) modification may be conditioned on additional steps above and beyond categorical pretreatment requirements to control these toxics in order to avoid the potential for adverse impacts.

Nonindustrial Source Control

Section 301(h)(6) states that "to the extent practicable, the applicant has established a schedule of activities designed to eliminate the entrance of toxic pollutants from nonindustrial sources into such treatment works". The 301(h) regulations provide in 40 CFR 125.64(d) that all applicants shall develop a public education program for nonindustrial source control. Large applicants (average dry-weather flow greater than 5 mgd) are to undertake additional steps for nonindustrial source control designed to minimize the introduction of toxic pollutants from these sources, to the extent practicable. The applicant's nonindustrial source control program is subject to revision as required by the Agency prior to the issuance of a 301(h) modification and during the term of the 301(h) modification.

As described in the preceding section on pretreatment, if the Agency's 301(h) analysis identifies toxic pollutants at levels which raise concerns about adverse impacts, the applicant may be required to control these toxics in order to avoid the potential for adverse impacts.

(12) DISCHARGE VOLUMES

Section 301(h)(7) states that "there will be no new or substantially increased discharges from the point source of the pollutant to which the modification applies above the volume of the discharge specified in the permit." Applicants are not allowed, under 40 CFR 125.61(e)(2) and 125.65, to increase effluent volume or mass loadings of BOD_5 and suspended solids beyond normal projected increases as a result of the modified permit.

Average flows for the major proposed discharges range from 2 million gallons per day (mgd) to 515 mgd (median flow is 100 mgd). The proposed percent removal efficiency for the 25 major applications is shown in FIGURE 8. Total mass emission rates for the tentatively denied major applications and tentatively approved major applications are shown in FIGURES 9 and 10, respectively (see section of Discharge Characteristics for discussion of these three figures).

(13) PUBLIC WATER SUPPLIES

Section 301(h)(2) states in part that "such modified requirements will not interfere with the attainment or maintenance of that water quality which assures protection of public water supplies." None of the 25 major proposed discharges would impact public water supplies.

CHAPTER III. RESULTS OF THE MUNICIPAL WASTEWATER TREATMENT CONSTRUCTION GRANT AMENDMENTS (1981) AND REVISED 301(h) REGULATIONS (1982)

(1) CHANGES TO THE ACT AND THE 301(h) REGULATIONS

The 301(h) regulations were revised by EPA in 1982 following five significant actions (FIGURE 18):

- o lawsuit results
- o Pacific Legal Foundation (PLF) Rulemaking petition[37]
- o GAO Report on 301(h)
- o statutory changes
- o program experience from review of existing applicants

The 1979 regulations were challenged by the Natural Resources Defense Council (NRDC) alleging that the 301(h) regulations were too lax. The regulations were also challenged by Pacific Legal Foundation (PLF), several municipalities, and Anchorage, Alaska, alleging that the regulations were too restrictive.

The District of Columbia Circuit Court of Appeals decision [NRDC v. EPA, 656 F.2d 768 (D.C. Cir., 1981)] upheld the 301(h) regulations of 1979, with three exceptions. The Court struck down regulatory prohibitions against:

- o waivers for less-than-primary treated sewage
- o sewage sludge
- o municipalities achieving secondary treatment

The Court assumed EPA would be flexible on data and monitoring requirements and enforce its toxics control requirements "with flexibility and discretion."

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[37]The PLF Rulemaking Petition (September 1981) questioned the need for regulations to implement section 301(h) and urged elimination of all major provisions in the regulations and implementation of program based solely on statutory criteria.

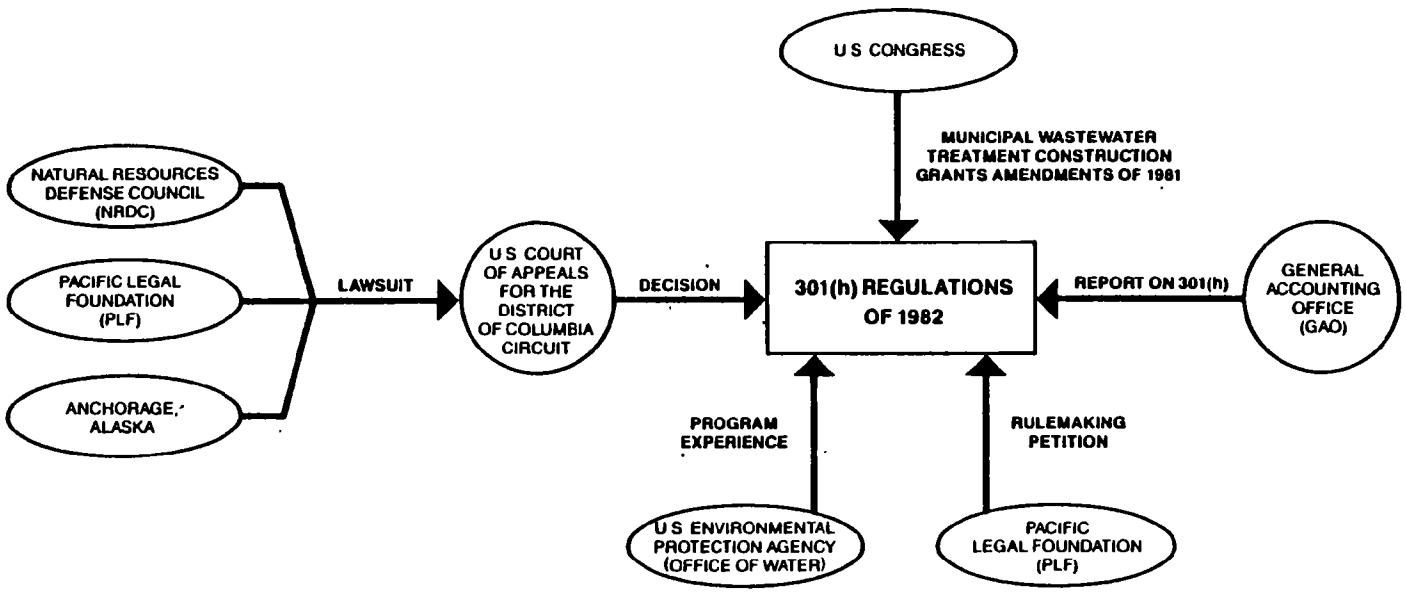

Figure 18. Inputs to the 1982 301(h) regulations.

Congress subsequently passed the Municipal Wastewater Treatment Construction Grant Amendments of 1981 to amend the Clean Water Act, changing section 301(h) among other items. Congressional amendment of section 301(h) was prompted in part by the above court ruling and by the General Accounting Office (GAO) report on section 301(h) which urged Congress to provide for an expanded 301(h) program.[38]

The statutory amendments expanded the opportunity to apply for 301(h) waivers:

- o the application deadline was extended to December 29, 1982,
- o the requirement for a pre-existing discharge to marine water was removed, and
- o communities already achieving secondary treatment were allowed to apply.

In addition, section 301(h) of the Clean Water Act as amended in 1981 (FIGURE 19) included:

- o a statutory provision which prohibited 301(h) waivers authorizing the discharge of sewage sludge was added, and
- o section 301(h)(8) (which dealt with use of Title II construction grant funds) was deleted, but
- o the other seven criteria enumerated in section 301(h) were not changed.

The 1982 regulatory amendments were issued in two parts--final amendments and proposed amendments:

- o The June 1982 final and immediately effective amendments responded to mandatory changes resulting from the lawsuit and statutory changes.

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[38]The General Accounting Office Report on the 301(h) Program (May 27, 1981) asserted that: (1) the regulations were too complex for small communities, and suggested that a stratified approach should be adopted which focused on applicants with greatest potential harm; and that (2) EPA unfairly limited eligible communties by allowing only 90 days to submit final applications, the cost of application was too high, and communities presently at secondary treatment were unfairly excluded. GAO estimated there were 800 potential applicants with potential cost savings of $10 billion capital costs.

(h) The Administrator, with the concurrence of the State, may issue a permit under section 402 which modifies the requirements of subsection (b)(1)(B) of this section with respect to the discharge of any pollutant ~~in an existing discharge~~ from a publicly owned treatment works into marine waters, if the applicant demonstrates to the satisfaction of the Administrator that--

(1) there is an applicable water quality standard specific to the pollutant for which the modification is requested, which has been identified under section 304(a)(6) of this Act;

(2) such modified requirements will not interfere with the attainment or maintenance of that 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;

(3) the applicant has established a system for monitoring the impact of such discharge on a representative sample of aquatic biota, to the extent practicable;

(4) such modified requirements will not result in any additional requirements on any other point or nonpoint source;

(5) all applicable pretreatment requirements for sources introducing waste into such treatment works will be enforced;

(6) to the extent practicable, the applicant has established a schedule of activities designed to eliminate the entrance of toxic pollutants from nonindustrial sources into such treatment works;

(7) there will be no new or substantially increased discharges from the point source of the pollutant to which the modification applies above that volume of discharge specified in the permit.

~~(8) any funds available to the owner of such treatment works under title II of this Act will be used to achieve the degree of effluent reduction required by section 201(b) and (g)(2)(A) or to carry out the requirements of this subsection.~~

For the purposes of this subsection the phrase "the discharge of any pollutant into marine waters" refers to a discharge into deep waters of the territorial sea or the waters of the contiguous zone, or into saline estuarine waters where there is strong tidal movement and other hydrological and geological characteristics which the Administrator determines necessary to allow compliance with paragraph (2) of this subsection, and section 101(a)(2) of this Act. **A municipality which applies secondary treatment shall be eligible to receive a permit pursuant to this subsection which modifies the requirements of subsection (b)(1)(B) of this section with respect to the discharge of any pollutant from any treatment works owned by such municipality into marine waters. No permit issued under this subsection shall authorize the discharge of sewage sludge into marine waters.**

Boldface indicates 1981 additions.
Strikeouts indicate 1981 deletions.

Figure 19. Section 301(h) of the Clean Water Act (showing changes made by the 1981 amendments).

- The June 1982 proposed amendments were based on program experience. Many groups which had previously opposed the 1979 regulations indicated general agreement with proposed amendments. The proposed amendments to the 301(h) regulations were issued in final form on November 26, 1982, and were not challenged in court.

The amendments to the 301(h) regulations were drafted to reflect the Agency's experience in implementing section 301(h) and are intended to simplify and provide added flexibility in the application and regulatory requirements, especially for small dischargers (flows less than 5 mgd). Changes made by the amended regulations are highlighted in FIGURE 20.

Important regulatory changes to the 301(h) process include:

- Early involvement by the States in areas related to water quality compliance and impacts on other sources.

- Applicants were provided with a one-time opportunity to revise their application after EPA's tentative decision.

The environmental impact criteria were largely unchanged since experience indicated that such regulatory criteria were sound.

Concurrent with the regulatory amendments, revisions were made to the 301(h) Technical Support Document, and a technical guidance document on designing 301(h) monitoring programs was prepared:

- The Revised 301(h) Technical Support Document explains the technical basis for the regulatory changes and provides detailed technical guidance on how to complete an application. Particular attention was given to assist the needs of small applicants and step-by-step instructions and simplified calculation methods were provided for their use.

- The Design of Monitoring Programs provides detailed documentation and guidance for assistance in developing the 301(h) monitoring programs for modified discharges.

(2) RESPONSE TO THE REVISED REGULATIONS

The 1982 regulations were generally received favorably by reviewing parties and were not challenged in court.

- Application deadline of December 29, 1982:
  - Eliminated requirement that applications "on their face" show compliance, substituting increased opportunity to collect and submit necessary data following application submission.
- Applications may be based on current discharge, improvements to current discharge, or reduced treatment from current discharge ("altered" discharge):
  - Removed the requirement for minimum of primary treatment;
  - Allowed communities already achieving secondary to apply;
  - Retained prohibition against discharge of sewage sludge.
- Provided opportunity for applicants to submit one-time revision to proposed treatment levels following EPA's tentative decision.
- Simplified data requirements, especially for small applicants (less than 5 MGD and less than 50,000 population), which were provided with simplified application format.
- Added flexibility in monitoring and toxics control requirement, especially for small applicants.
- Requirement added for favorable State determination on compliance with State law and impacts on other sources prior to commencement of EPA review.
- Regulatory provisions to implement each of statutory criteria regarding environmental impacts were left largely unchanged from 1979 regulations.
- Revised Technical Support Document and the Design of Monitoring Programs, containing advisory guidance on how to assess compliance with 301(h) criteria, with simplified methods for small applicants.

Figure 20. Highlights of the 1982 regulations implementing section 301(h).

As a result of the reopening of the application period, EPA received 138 new applications. The geographic locations of the 1982 applicants are shown in FIGURE 21. By Region:

- o 32 new applications were received for Region I - Boston
- o 31 new application were received for Region II - New York
- o 4 for Region III - Philadelphia
- o 8 for Region IV - Atlanta
- o 47 for Region IX - San Francisco
- o 16 for Region X - Seattle

EPA has received a total of 208 applications for 301(h) modified permits, including both 1979 and 1982 applications.

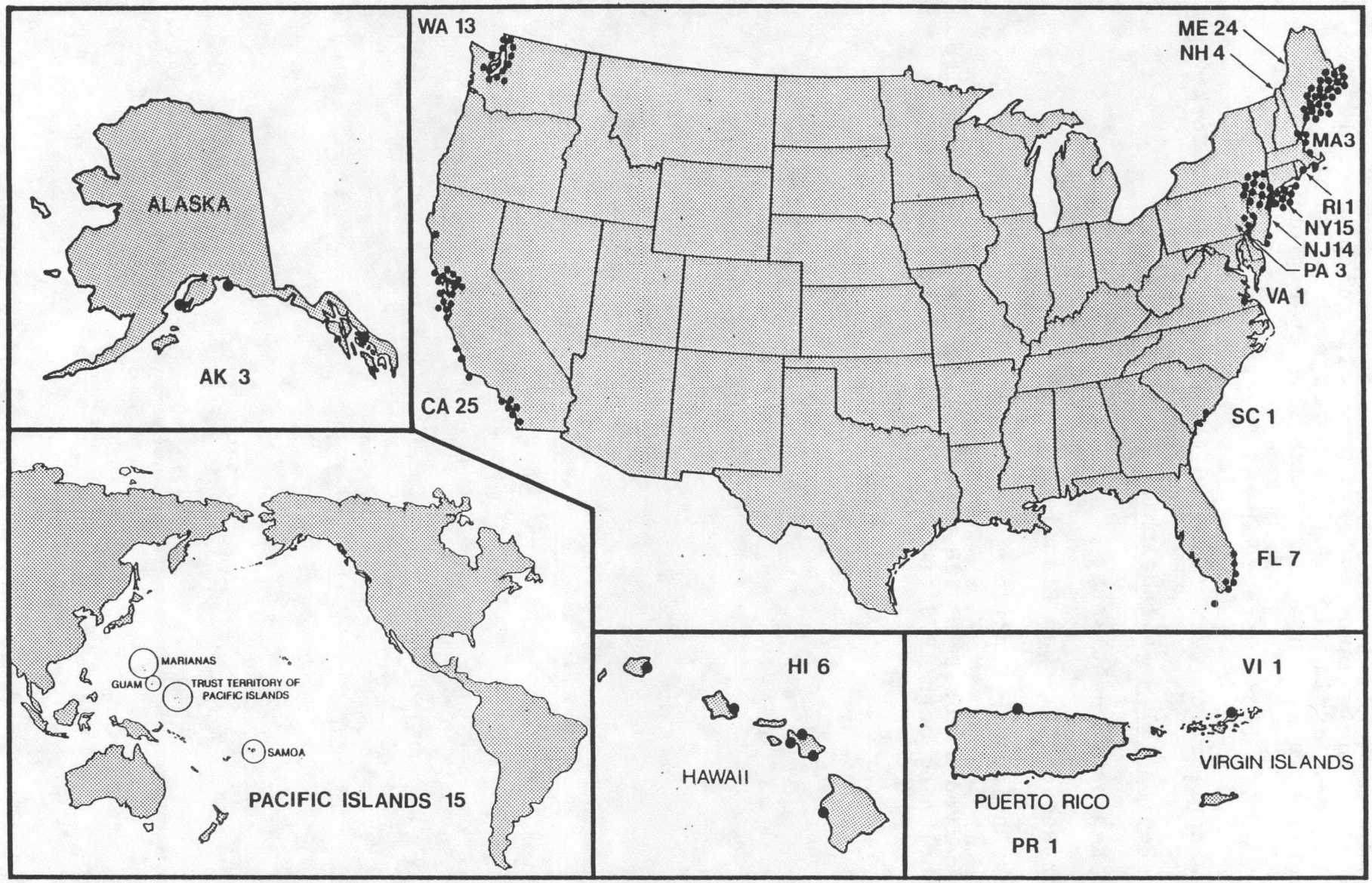

Figure 21. Locations of the 1982 301(h) applicants.

CHAPTER IV. ACCOMPLISHMENTS TO DATE

(1) DELEGATION

The decisionmaking authority of the Administrator was delegated to the Regional Administrators in order to distribute the Agency's workload on such a significantly expanded program. All six Regions accepted delegation by June, 1983. To provide for program consistency, Headquarters will provide concurrence on Regional decisions for the 30 major applications for which tentative decisions were made by the Administrator. The methodology and procedure developed by the Task Force in the tentative decisions for the major applications are to be used in the remaining decisions by the Regions.

The Delegation Handbook issued in March, 1984, provided guidance on decision document preparation, application review, and development of monitoring programs for small applicants, to the Regions implementing the 301(h) program. The Handbook also provided response to specific Regional questions on the technical and administrative aspects of delegated program.

Regional delegation training workshops were conducted in February and March, 1982. The workshops provided an overview of the 301(h) regulatory criteria and the review process, and provided response to technical questions from the Regions.

National coordination workshops for the Regions have been held at least twice a year, as of May 1983. At these meetings, technical information for application review and development of monitoring programs is disseminated. Resource allocation and review schedules are also developed involving the Office of Research and Development and the Regions, as well as the technical support contractor.

The 301(h) Process Flowchart (FIGURE 22) describes the current process for 301(h) decisions.

(2) ACCOMPLISHMENTS TO DATE IN THE 301(h) PROGRAM -- SUMMARY

301(h) regulations were originally promulgated in June 1979 along with the Technical Support Document, which provided technical guidance to 301(h) applicants on demonstration of compliance with the regulatory criteria. A technical support contract was awarded to provide technical assistance for the 301(h) program. The technical support contractor completed Technical Evaluation Reports (TERs) and summary document reports on the 70 final applications.

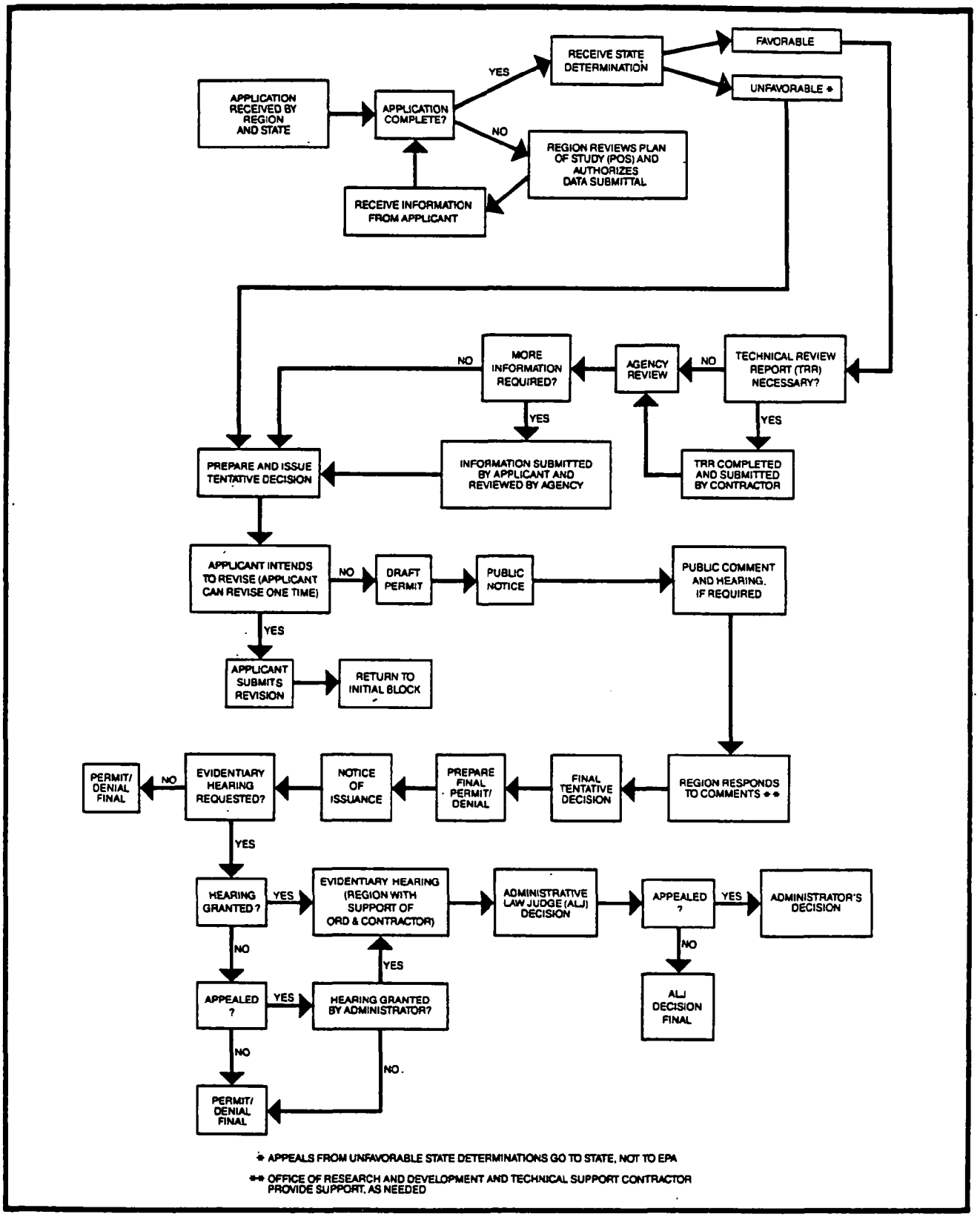

Figure 22. 301(h) process flowchart for new decisions and revisions.

Tentative decisions have been issued on 25 of the largest 1979 applications representing the major municipal wastewater dischargers. Review of these applications has resulted in a substantial increase in technical knowledge of potential effects of less-than-secondary treatment POTW discharges on the marine environment. Technical knowledge gained during these reviews will be used in documents and future reviews by the 301(h) program.

Revised 301(h) regulations were finalized in November 1982. The new 301(h) regulations were responsive to changes in the Clean Water Act and incorporated experience gained by the program. The regulations were favorably received by commenters and were not challenged in court. Accompanying the 1982 regulations were two major guidance documents, the Revised Section 301(h) Technical Support Document and the Design of 301(h) Monitoring Programs document.

EPA received 138 applications for 301(h) modified permits following the 1982 regulations; therefore, a total of 208 applications have been received.

As of June 1984, EPA has made 94 tentative decisions on 45 percent of the remaining 301(h) applications (FIGURES 23 and 24). These 94 tentative decisions represent approximately 72 percent of the total flow of all the 301(h) applications.

Approximately half of those applicants receiving tentative decisions have indicated their intent to use their one-time revision option. Eighty percent of these intents to revise are from applicants issued tentative denials. Twenty-three (23) applicants have received final denials and will be required to meet secondary treatment requirements. Five (5) final 301(h) modified permits have been issued by EPA as of June 1984[39].

Technical knowledge gained from review of the major applications will be used in the technical review and decisionmaking for the remaining 301(h) applications. Information derived from the monitoring programs and from Agency research will further enhance the Agency's ability to assess and predict environmental impacts of municipal wastewater discharges.

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[39]Rye, NH; Sitka, AK; Skagway, AK; Whittier, AK; and Wrangell, AK.

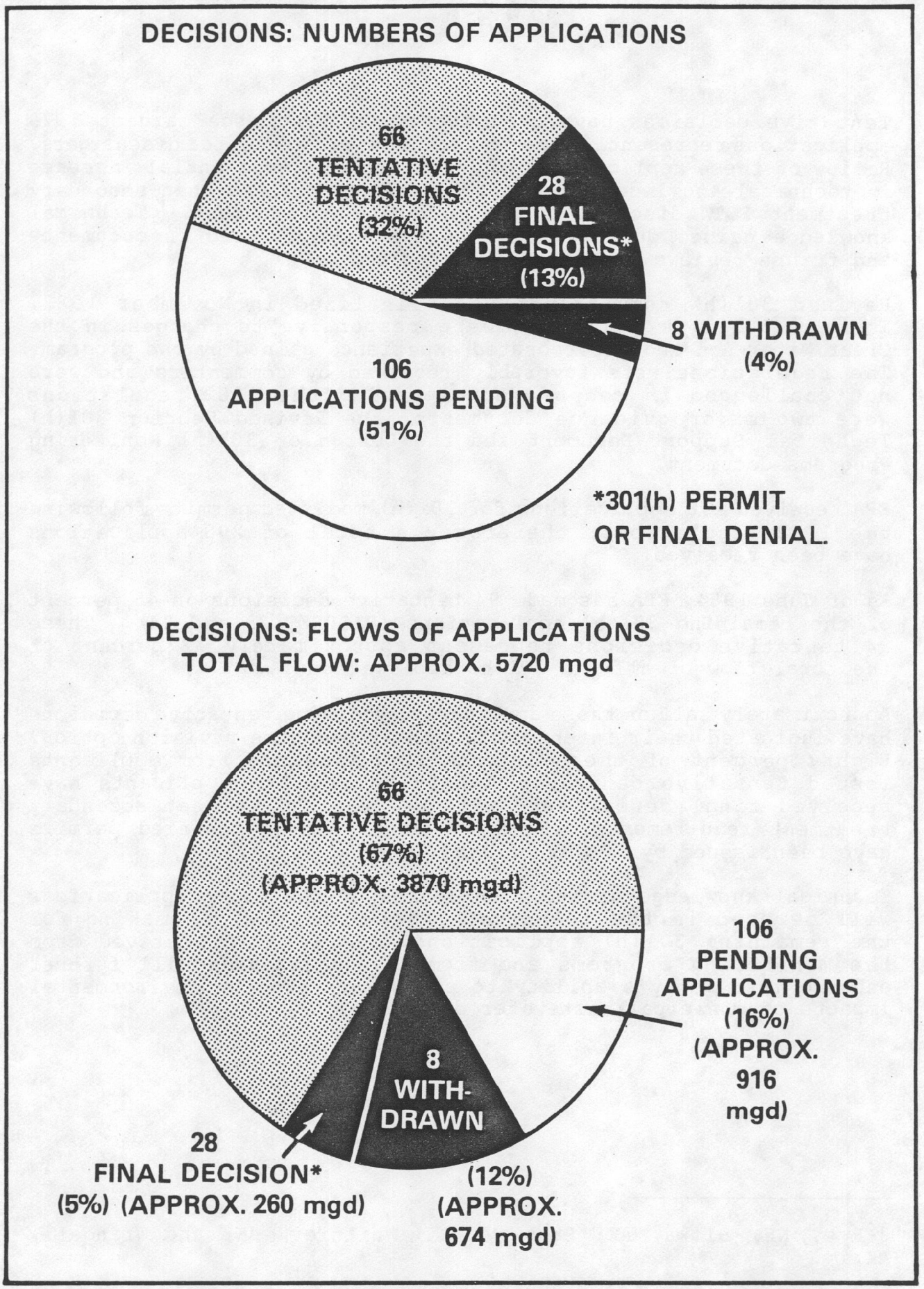

Figure 23. 301(h) Decision status (June 1984).

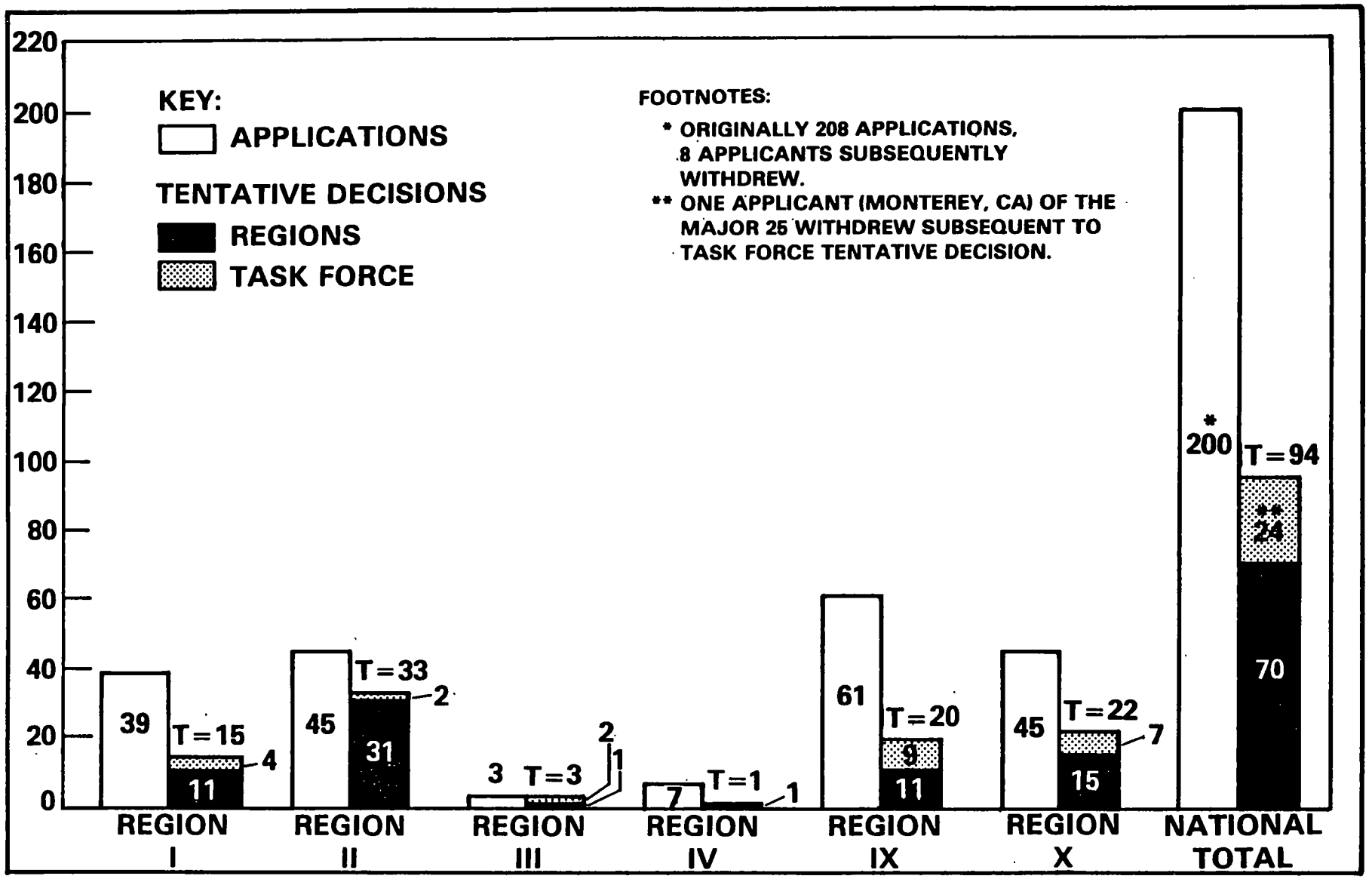

Figure 24. Tentative decisions on applications for 301(h) modified permits (June 1984).

CHAPTER V. PROGRAM RECOMMENDATIONS

The following approach is recommended for the future 301(h) program:

- o Regions are to continue application review and decisionmaking. Headquarters is to provide overview for consistency.

- o 301(h) program emphasis is to shift to monitoring data analysis and compliance determination as the number of 301(h) permits increase.

- o Program is to collaborate with local, state, and other Federal agencies to better define environmental baseline conditions in marine waters.

- o Research is to be supported to bridge information gaps while dealing with state-of-the-art issues.

  - Development of quantitative cause-effect relationships of causative agents associated with sewage discharges, environmental factors, and biological responses.

  - Methodology for prediction of particulate distributions near outfalls to determine the extent of sewage dispersion and solids deposition.

  - Evaluation of processes (physical/chemical) affecting particle settling characteristics for prediction of the initial distribution of particulates near the outfalls.

- o The 301(h) regulations are more stringent with regard to proposed discharges into saline estuarine waters than for proposed discharges to open ocean waters.

  - EPA review of applications which propose discharge into saline estuaries is to continue to take into account the major ecological significance of estuaries and the fragile nature of the estuarine environment.

  - Rigorous review of potential adverse impacts due to discharges with less-than-secondary treatment on these valuable resources will be conducted in accordance with the stringent 301(h) regulatory criteria for saline estuaries.

  - Review of these applications will also emphasize protection of these valuable resources through assessment of the potential of combined effects from other pollutant sources on the estuarine environment.

REFERENCES

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