MANAGEMENT OF PATHOGENIC CONTAMINATION

PROBLEMS
Beach closures
Shellfish bed closures

SOURCES
Municipal discharges
Combined sewer overflows
Storm water
Vessel discharges
Other non-point sources

VISION *To establish and maintain a healthy and productive Harbor/Bight ecosystem with full beneficial uses.*

GOALS
Preserve, restore, and maintain human uses of Harbor and coastal waters for bathing and shellfishing.
Ensure protection of human health from ingestion of pathogens.
Protect marine and coastal resources from adverse pathogenic effects.

OBJECTIVES

Reduce Loadings

P-1 Reduce loadings of pathogens from CSOs, storm water discharges, and non-point sources to levels protective of public health.
P-2 Reduce or eliminate the discharge of raw or inadequately treated sewage due to sewage treatment plant malfunctions and illegal connections.
P-3 Establish marina pumpout facilities and no discharge zones to reduce impacts of vessel discharges.

Understand and Manage Risk

P-4 Develop additional indicators of pathogenic contamination.
P-5 Continue interstate dialogue on beach closure policies to ensure reasonably consistent approach.
P-6 Optimize disinfection practices.
P-7 Continue appropriate research, environmental monitoring, and modeling to identify remediation activities and support recovery of uses.

THE PROBLEMS

Pathogens are disease causing micro-organisms, such as bacteria, protozoans, and viruses, that are present in untreated or inadequately treated human sewage and domestic and wild animal wastes.

Human sewage and related discharges have for a long time impaired the water quality of the Harbor/Bight. This contamination affects the public when recreational beaches are closed, waters for recreational boaters are degraded, and shellfish beds are closed or restricted. Unhealthy water quality conditions may also pose risks to living marine resources.

Currently, no portion of the Harbor core area is approved for the direct harvesting of shellfish; on the other hand, all public bathing areas, which are primarily in the outer reaches of the Harbor core area, are currently approved for recreational bathing. In the Bight, waters are generally approved for shellfishing, except for a Federal Shellfish Closure Area around the former municipal sewage sludge disposal site; all ocean beaches are approved for bathing.

In the back bays adjacent to the Bight, closed and restricted shellfish areas are common in the more heavily developed areas and in tidal tributaries. Storm water and non-point source runoff periodically cause closures of back bay area

bathing beaches which are particularly sensitive to such contamination sources.

Assessment Based on Existing Water Quality Standards

Fecal and total coliform bacteria are water quality indicators that have been used since the early 1920s to protect the public from such waterborne bacterial diseases as typhoid fever. Water quality suitable for bathing and shellfishing is determined by measuring the concentration of these fecal and total coliform indicators, which are associated with sewage contamination (see highlighted text box). Samples are not routinely taken for pathogenic organisms because they typically exist only sporadically and in low concentrations, making their detection difficult and costly. New York and New Jersey are two of only four states in the Nation that monitor the entire length of their marine coastlines for bacterial indicators.

Shellfish

Water quality impairments in New York-New Jersey Harbor have adversely affected shellfish resources since the mid-1920s. Currently no area of the Harbor is approved for direct shellfish harvesting, but restricted harvesting is permissible for portions of the Lower, Raritan, and Sandy Hook Bays and the Shrewsbury and Navesink Rivers. Restricted harvesting means that shellfish must be cleansed before being marketed for human consumption. Pathogenic organisms (as measured by bacterial indicators) are purged, either at a depuration plant or in clean marine waters. Water quality standards for waters used for harvesting for depuration are less stringent than water quality standards for waters used for direct harvesting. There are no specific water quality standards for waters used for relay harvesting. Jamaica Bay, New York also has a significant shellfish resource, but its waters are closed because of water quality concerns and wildlife protection mandates of the U.S. National Park Service. Hard and soft-shell clams are currently the most commercially valuable molluscan shellfish in the Harbor.

Beyond the mouth of the Harbor, in the Bight Apex, there is a Federal Shellfish Closure Area at the former 12-mile ocean dump site for municipal sewage sludge. The closure area is generally a circle, six nautical miles in radius, and includes portions of the adjacent shore areas of Long Island and New Jersey. Sewage sludge dumping ceased at this site in 1987, and a three-year monitoring study conducted by the National Marine Fisheries Service has demonstrated progressive environmental recovery of the site. Currently, bacterial indicator levels in the Bight Apex waters meet the standards for direct shellfish harvesting, but the U.S. Food and Drug Administration has not yet taken administrative action to reopen the

Water quality, including the choice of water quality indicators, is only one of several factors that must be considered in a discussion of bathing and shellfishing use impairments. To evaluate the potential for restoration of historic uses within the Harbor/Bight, the states must also consider:

- ***proximity to effluent discharges;***
- ***extent and nature of shoreline modification;***
- ***navigation lanes and berthing areas; and***
- ***current and circulation patterns.***

Thus, despite the improvements that are possible in Harbor/Bight water quality, full recovery of historic uses is not an attainable goal. For example, shellfish areas are closed around each sewage treatment plant outfall, regardless of effluent quality, as a precautionary measure. The regulating authority must avoid potential human health risks associated with even a temporary violation of water quality standards. These types of factors are used by both states in setting policies for permanent and temporary closures of shellfish and bathing beach areas.

Federal Closure area. Both states administer other precautionary closure areas around ocean outfalls and some inlets. New Jersey also designates shellfish closure areas to protect spawning stock. The most commercially valuable molluscan shellfish in ocean waters are surf clams, ocean quahogs, and sea scallops.

In the back bay regions, closed and restricted shellfish areas are common in the more heavily developed areas and in tidal tributaries. In recent years, New Jersey has restored some back bay waters to less-restrictive shellfish classifications. A continuing trend in Long Island back bays is more restrictive classifications and larger closure areas. Commercially significant shellfish in back bay waters include hard and soft-shell clams, oysters, blue mussels, and bay scallops.

Beaches

New York City manages 24 miles of public beaches along its Harbor and ocean shores, and all are approved for bathing. Recent declines in total coliform loadings have led to the reopening of Seagate Beach on Coney Island and South Beach and Midland Beach on Staten Island. Furthermore, NYCDOH has dropped rainfall advisories completely from seven of the ten New York City public beaches and reduced the advisories for the remaining three. Water quality is a concern and continues to affect a number of private or historical beach sites in New York City and other municipalities along the Upper East River, western Long Island Sound, Jamaica Bay, and Raritan Bay.

Ocean beaches in New York and New Jersey are generally approved for swimming. Temporary beach closures, in 1987 and 1988, stimulated action to address washups of floatable debris and sewage treatment plant malfunctions. These actions have resulted in reduced incidences of ocean beach closures since 1988.

Some Bight back bay area bathing beaches have been periodically closed. Storm water and non-point sources, such as boat discharges and waterfowl, have a greater effect on the quality of these back bay beaches than on ocean beaches or Harbor beaches.

Assessment Based on Additional Pathogenic Indicators

Fecal and total coliform indicators are useful surrogates for bacterial disease-causing organisms. Currently, however, it is believed that the most common marine pollution-related disease agents are viruses. Coliforms are not as persistent in the water environment as viral pathogens and may not reflect the actual presence of pathogenic viruses and, thus, health risk. Studies are underway at both the federal (National Indicator Study) and state (New Jersey Alternative Pathogenic Indicator Study) levels to evaluate indicators that may better assess public health risk or track and identify sources of contamination.

A first study conducted by NJDEP with HEP funds assessed the utility of a specific viral indicator, F+RNA coliphage. This type of indicator may better trace the fate of pathogenic viruses in coastal waters than conventional bacterial indicators. The following conclusions resulted from this study:

- The F+RNA coliphage is a promising indicator, and it demonstrates a relationship to the expected degree of fecal contamination for significant population sources.
- The F+RNA coliphage can potentially differentiate human from animal fecal contamination.
- The F+RNA coliphage does not correlate well with other, conventional, bacterial indicators of water quality.
- The monitoring of waters for F+RNA coliphage is possible through routine quantitative testing procedures.

New Jersey is currently undertaking a follow-up study to further assess the potential of the F+RNA coliphage as a practicable microbial water quality indicator and to detect the presence of human enteric (pathogenic) viruses in Harbor/Bight waters.

SOURCES CONTRIBUTING TO THE PROBLEMS

Based on Bacterial Indicators

Pathogens of human origin enter the aquatic environment by a number of pathways. The public health significance of each will vary depending on the kinds and concentrations of micro-organisms present, the volume of the effluent discharged relative to the volume of the receiving waters (the dilution factor), and the uses to be made of the affected waters. It is important to distinguish between contamination as measured by fecal coliforms (FCOLI) and actual pathogenic contamination. The term pathogenic contamination refers to the full suite of disease causing micro-organisms (viruses, bacteria, protozoans, etc.) in the wastestream, but these are not routinely measured. Characterization of pathogenic water quality conditions in the Harbor/Bight is determined primarily by the coliform bacterial indicators, which are routinely measured, associated with pollution sources, and applied conservatively to protect public health.

Sources of pathogens to the Harbor/Bight, based on conventional pathogenic indicators, include: 1) sewage treatment plant effluents, 2) combined sewer overflows, 3) storm water discharges, 4) non-point source runoff, 5) tributary sources, 6) vessel discharges, and 7) ocean dump sites. The relative importance of these sources varies among the several geographically distinct components of the regional ecosystem: the Harbor core area including the Lower Bay Complex and other waters; the Bight; and the back bays. Table 17(p) presents a comparison of the major pathogenic sources, and their relative significance to resource impairment in the Harbor/Bight, for shellfish beds and bathing beaches. Resource impairment is rated by relative FCOLI contributions from the sources, in combination with the extent to which additional precautionary actions are considered necessary to protect public health.

The tributary flow into the Estuary is greater than any other source contribution, representing 80 percent of the entire flow, but this source contributes only 1.8 percent of FCOLI. Municipal flow is secondary in volume at 14 percent but contributes very small quantities of FCOLI (0.04%). On the other hand, CSO flows are low(1.3%) but contribute 89 percent of the FCOLI levels; storm water flows are also low (3.5%) and contribute 8.9 percent of the FCOLI levels.

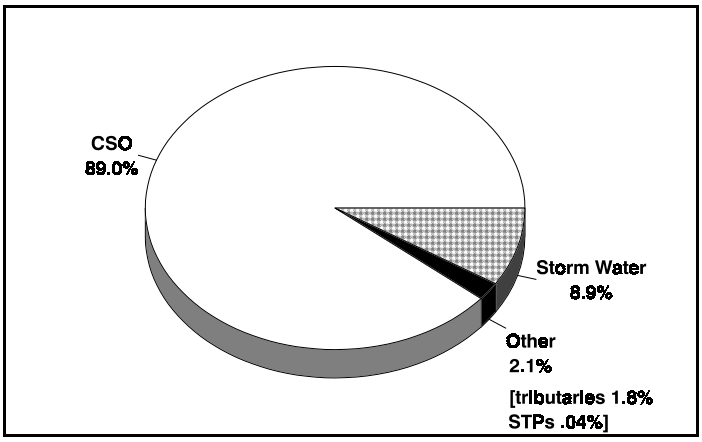

Figure 8. Loadings of Fecal Coliform to the Estuary

Sources in Table 17(p) are rated high (H), medium (M), or low (L) for their significance to use impairments. A source rated high (H1) significantly degrades waters for bathing or shellfishing uses; a source rated H2 requires precautionary closures affecting a wide area. A medium-rated source (M) contributes measurable contamination to a water body, which may restrict uses, but leads to closures for only short durations. A source rated low (L) contributes little or nothing to the pathogenic contamination problem of a water body. In general, a given source is more significant in terms of shellfish impairment than bathing beach impairment because water quality standards for shellfishing waters are much stricter. This analysis does not directly consider current water quality classifications for the Harbor/Bight. Information on each of the major pollution sources follows Table 17(p).

Table 17(p). Use Impairments by Bacterial Pathogenic Indicator Sources in the Harbor/Bight (for use in understanding relative contributions to use impairments)

SHELLFISH

SOURCE	HARBOR		BIGHT	BACK BAYS
	LOWER BAY COMPLEX*	OTHER WATERS**		
STPs	M	H2	M	M(LI) n/a(NJ)
CSOs	H1	H1	M	n/a
Storm water	H1	H1	M	H1
Non-point	M	H1	M	H1
Tributaries	L	M	L	M
Vessels	L	M	L	M
Dump Sites	n/a	n/a	?	n/a

BATHING BEACHES

SOURCE	HARBOR		BIGHT	BACK BAYS
	LOWER BAY COMPLEX*	OTHER WATERS**		
STPs	L	M	L	L
CSOs	M	H1	L	n/a
Storm water	M	H1	M	H1
Non-point	L	M	L	M
Tributaries	L	M	L	M
Vessels	L	L	L	L
Dump Sites	n/a	n/a	n/a	n/a

A source rated high (H1) significantly degrades waters for bathing or shellfishing uses; a source rated H2 requires precautionary closures affecting a wide area. A medium-rated source (M) contributes measurable contamination to a water body, which may restrict uses, but leads to closures for only short durations. A source rated low (L) contributes little or nothing to the pathogenic contamination problem of a water body.

* Lower Bay Complex -- Lower Bay, Raritan Bay and Sandy Hook Bay
** Other Harbor Waters -- Generally, Jamaica Bay, Shrewsbury and Navesink Rivers, and west Long Island Sound. There is little potential for shellfishing and bathing uses elsewhere in Harbor and New York City waters.
n/a = not applicable
LI = Long Island
NJ = New Jersey

1) Sewage Treatment Plants (STPs) - STPs, as currently operated in the region, are not normally a substantial threat to human health based on contributions of FCOLI; however, failures at treatment plant operations can have serious and widespread short-term water quality impacts. As a result, STPs remain a significant source of pathogenic use impairment.

2) CSOs - Under current year-round disinfection practices at area STPs, CSOs represent the greatest discharge of FCOLI to the Harbor. Large volumes of water generated during rain events, when combined with the regular sanitary wastestream, overwhelm the capacity of the STPs and collection systems, and overflow directly into the Harbor. During dry weather, the Harbor generally attains water quality standards, but during wet weather when CSOs are discharging, water quality is seriously degraded. There are no CSOs in the Bight; however, CSOs in the Harbor do contribute to impacts in the Bight Apex.

3) Storm water - Separate storm water lines also contribute FCOLI, although the public health risk varies. Human pathogens may enter storm lines from leaking sanitary lines or through illegal sewer connections, but the level of human pathogens is generally low compared to other sources. Storm water may also carry domesticated animal droppings and other street refuse. Storm water discharge occurs frequently throughout the region, and although its contamination level may be lower than some other sources, it is often sufficient to cause water quality degradation. Even in coastal portions of the Bight, storm water may adversely affect bathing beaches and shellfish beds. For storm water, and for non-point and tributary sources, indicators that can differentiate between human and animal pathogens may better enable

health officials to determine actual public health risk.

4) Non-point Sources - Non-point sources (NPS) of FCOLI include agricultural runoff, which transports animal fecal wastes, and discharges from improperly functioning septic systems. Another NPS may be the resuspension of sediments. NPS, in combination with storm water, is a major source of beach and shellfish contamination in portions of the Harbor and coastal back bays.

5) Tributary Sources - Rivers and freshwater tributary flows contain upstream point and non-point sources. While their volume is the largest of all of the sources, their contribution of FCOLI is relatively low, and effects on water quality tend to be local. While these contributions contain a mix of human and animal pathogens, the public health risk of this source is uncertain at present.

6) Marine Vessel Discharges - These can be locally significant sources of pathogens in coastal waters, particularly in the back bays and protected embayments of the Harbor core area. This source of contamination does not generally have serious effects on bathing beach conditions, but can cause intermittent violations of shellfishing standards or pose the potential for such violations. For example, several thousand acres of potential shellfish waters in the State of New York are restricted based on their proximity to marinas and vessel discharges.

7) Ocean Dump Sites - Ocean dump sites have been sources of FCOLI to the Bight. The most significant of these is the former 12-mile site for municipal sewage sludge, which was active from 1924 to 1987. Ocean sludge dumping led to the federal shellfish closure designation in the Bight Apex. Recent surveys show a substantial recovery of the waters at this site, but any remaining health risk from bottom sediments has not yet been determined.

THE PLAN TO SOLVE THE PROBLEMS

Overview

HEP has identified three major pathogen-related goals:

- Preserve, restore, and maintain human uses of Harbor and coastal waters for bathing and shellfishing.
- Ensure protection of human health from water-borne pathogens.
- Protect marine and coastal resources from adverse pathogenic effects.

The goals for recovery of beneficial uses are targeted to specific geographic areas of the Harbor/Bight region where a potentially recoverable resource is present and other considerations do not preclude those uses. HEP has identified the Bight Apex, the Lower Bay Complex (including Sandy Hook and Raritan Bays) within the Harbor core area, and the western end of Long Island Sound as priority areas for recovery and enhancement of bathing and shellfishing uses. The Shrewsbury and Navesink Rivers and Jamaica Bay also contain viable recoverable resources and are priorities for recovery by the two states. It is noted that shellfishing in Jamaica Bay is restricted due to the wildlife management mandates of the U.S. National Park Service, which has jurisdiction over most of the Bay. Other waterways within the Harbor core area, which are highly developed and urbanized, have only limited, if any, potential for recovery of bathing or shellfishing uses.

Consistent with the goal of preserving, restoring, and maintaining human uses, New York State has identified a subgoal to restore water quality, in those portions of the Harbor core area with viable shellfish resources, to levels that would permit depuration harvesting. Depuration harvesting standards are also protective of bathing beach uses. HEP supports this goal and will seek to achieve it wherever recoverable uses are found in the region.

Based on recent readings of improved estuarine water quality, New Jersey is in the process of evaluating the possibility of upgrading over 1,000 acres of shellfish waters in the Navesink River to the "seasonally approved" classification, which would permit direct harvest and marketing of shellfish during the winter. This development came about through a major interagency initiative in New Jersey, over a period of years, to reduce non-point source bacterial pollution in the Navesink Estuary.

The links between human pathogenic contamination and disease and mortality in marine species are not clear, but it is presumed that measures to improve water quality to promote bathing and shellfishing uses will also benefit the marine environment.

In order to achieve the three pathogen-related goals, HEP has developed a program with seven objectives:

- Reduce loadings of pathogens from CSOs, storm water discharges, and non-point sources.
- Reduce or eliminate the discharge of raw or inadequately treated sewage due to sewage treatment plant malfunctions and illegal connections.
- Establish marina pumpout facilities and no discharge zones to reduce impacts of vessel discharges.
- Develop additional indicators of pathogenic contamination.
- Continue interstate dialogue on beach closure policies to ensure reasonably consistent approach.
- Optimize disinfection practices.
- Continue appropriate research, environmental monitoring, and modeling to identify remediation activities and support recovery of uses.

COMMITMENTS AND RECOMMENDATIONS

OBJECTIVE P-1 Reduce loadings of pathogens from CSOs, storm water discharges, and non-point sources to levels protective of public health

Rainfall-Induced Sources

Three sources of pollution to the Harbor/Bight -- CSOs, storm water discharges, and non-point source runoff -- are associated with runoff induced by rainfall. Effective abatement of these sources is important in reducing pathogenic use impairments in the Harbor/Bight. Details of HEP's plan to address these sources is found in the section on Rainfall-Induced Discharges.

Combined Sewer Overflows

CSOs are the dominant source of bacterial indicators in the Harbor. HEP's plan to abate CSO discharges includes the following actions addressing pathogen contamination:

-- Fully implement the nine minimum control measures of the National CSO Control Policy (see Objective CSO-1 below).

-- Implement additional CSO controls to meet water quality standards and restore beneficial uses (see Objective CSO-2 below).

  - New York City is constructing CSO retention facilities and conducting long-term CSO abatement planning (see Action CSO-2.1 below).
  - USEPA and NJDEP will obtain commitments from New Jersey CSO owners and operators to develop long-term CSO abatement plans (see Action CSO-2.2 below). HEP encourages the owners/ operators to do this work as a cooperative regional effort.

- HEP is using the New York City water quality model to refine target areas for actions to recover and enhance bathing and/or shellfishing uses (see Action CSO-2.3 below).

Storm Water Discharges

Storm water discharges are important sources of bacterial indicators in back bays of the Bight and in portions of the Harbor. HEP's plan to abate storm water discharges includes the following actions addressing pathogen contamination:

-- Implement measures to control municipal and industrial storm water discharges (see Objective SW-1 below).
  - Issue NYC storm water permit (see Action SW-1.1 below).
  - Process storm water permit applications from New Jersey local authorities in areas of the Harbor where water quality parameters violate established standards or classifications (see Action SW-1.2 below).
  - Incorporate requirements of the general permits that control construction discharges into local codes (see Action SW-1.3 below).
  - Expand geographic coverage of the New Jersey Sewage Infrastructure Improvement Act (see Action SW-1.4 below).

Non-Point Source Runoff

Non-point source runoff is an important source of bacterial indicators in back bays of the Bight and in portions of the Harbor. HEP's plan to abate non-point source runoff includes the following actions addressing pathogen contamination:

-- Conduct non-point source management programs for Barnegat Bay, Whippany River, and Navesink River (see Actions NPS-1.1 and NPS-1.2 below).

-- Develop and implement coastal non-point source management programs under the Coastal Zone Act Reauthorization Amendments (see Objective NPS-2 below).

-- Focus the Urban Resources Partnership Initiative on Harbor/Bight watersheds (see Objective NPS-3 below).

OBJECTIVE P-2 Reduce or eliminate the discharge of raw or inadequately treated sewage due to sewage treatment plant malfunctions and illegal connections

Consistent with the requirements of the Clean Water Act and regional disinfection policy, all municipal sewage treatment plants in the region must meet secondary treatment requirements and year-round disinfection requirements. In 1993, sewage flows from the Tottenville area of Staten Island were connected to the Oakwood Beach sewage treatment plant for treatment. This captured 0.7 mgd of sewage previously discharged without treatment, eliminating the last significant known area of raw sewage discharge to the Harbor. Since all of the region's STPs are meeting year-round disinfection requirements, they are no longer major sources of bacterial indicators.

There are, however, continuing problems associated with:

-- Occasional bypasses of raw sewage caused by sewage treatment plant and collection system malfunctions; and

-- Scattered, illegal connections of sanitary sewage to storm sewers and to combined sewers at points where the flow is not intercepted for treatment.

ACTION P-2.1
Beach/Shellfish Closure Action Plan
In response to intermittent closures of bathing beaches associated with occasional bypasses of raw sewage caused by sewage treatment plant and collection system malfunction, USEPA, NYSDEC, and NJDEP are currently implementing a short-term strategy for prevention and mitigation of these closures. This strategy, referred to as the Beach/Shellfish Bed Closure Action Plan, was first implemented in 1989, and has been a continuing

program since then. It includes the following provisions:

-- All short-term beach and shellfish closures are assessed for cause and traceability.

-- Causes that are traceable to discrete sources trigger prompt enforcement corrective action and penalties.

-- These enforcement responses are coordinated between USEPA and the affected states.

-- The lead agencies make public announcements of the enforcement responses as a further deterrent.

ACTION P-2.2
Reduction in Unregulated Sewage Discharges
HEP recommends that all dischargers in the region implement continuing programs to track down and eliminate unregulated discharges of raw sewage, both during dry weather and wet weather (see Rainfall-Induced Discharges section below).

-- Under the 1988 SPDES permit, New York City has increased surveillance and maintenance of its sewerage system, including a shoreline survey program, reducing the discharge of raw sewage from 4.84 mgd in 1989 to 0.4 mgd in 1993.

OBJECTIVE P-3 Establish marina pumpout facilities and no discharge zones to reduce vessel discharges

Marine vessel discharges can have local adverse effects on pathogenic water quality, particularly in tributary areas and small embayments where tidal flushing action is reduced. Since tributary areas and embayments are among the most severely impacted in the Harbor/Bight region, HEP recommends prudent measures to reduce pathogenic inputs from this source.

ACTION P-3.1
Marina Pumpout Stations
The states, using funds available under the Clean Vessel Act, will issue grants to install pumpout stations at marinas statewide to serve the boating community. New York and New Jersey have received $1 million and $700,000, respectively, portions of which will be applied to waterways in the Harbor/Bight region. Both states will apply for additional funds in fiscal years 1995-1997 to meet the need for pumpout facilities in harbors and embayments identified as potential "No Discharge" zones.

ACTION P-3.2
Clean Water Act Amendment
HEP recommends that the Clean Water Act be amended to allow the states to establish "no-discharge" zones and thus eliminate the need for the states to seek USEPA approval prior to the designation of no-discharge zones.

ACTION P-3.3
"No Discharge" Zones
The states, with USEPA concurrence, will designate, under Section 312(f)(3) of the Clean Water Act, "No Discharge" zones, where vessel discharge of sanitary wastes to protected waters is prohibited. The states will make designations on a targeted basis, with USEPA assistance, in the back bay areas tributary to the Bight in order to restore beneficial uses. The steps to designate "No Discharge" zones include:

-- States identify waters that require greater environmental protection than that afforded by existing standards for marine sanitation devices.

-- States request a determination from USEPA that adequate facilities for the pumpout and treatment of vessel sewage are available.

-- USEPA makes determinations on the adequacy of existing pumpout and treatment facilities.

-- States designate "No Discharge" zones to prohibit the discharge of vessel waste in the designated waters, if it is demonstrated that adequate pumpout facilities exist.

-- USEPA approves the "No Discharge" zone designation.

OBJECTIVE P-4 Develop additional indicators of pathogenic contamination

HEP recognizes the need to develop additional indicators of pathogenic contamination and recommends the following:

ACTION P-4.1
NJ Pathogenic Indicator Study
NJDEP will complete the current NJ Pathogenic Indicator Study, ascertain the utility of F+RNA coliphage as an additional pathogenic indicator, and the states will assess it as a diagnostic tool to identify pathogenic pollution source categories.

ACTION P-4.2
Research to Develop Human-specific Indicator
Based on an evaluation of the existing NJ Pathogenic Indicator Study (Action P-4.1), HEP will continue and seek funds, as appropriate, to develop a human-specific indicator that more closely approximates survival of viruses in the marine environment.

ACTION P-4.3
National Shellfish Indicator Study
USEPA, the states, and other HEP Management Conference participants will continue to support the National Shellfish Indicator Study and assess its findings in light of the ongoing HEP study. The states will determine any necessary changes to current shellfish sanitary policies based on these results.

ACTION P-4.4
Research on Relay/Depuration Process
As warranted by ongoing regional and national indicator studies, HEP recommends that research be conducted to determine the effectiveness of the relay and depuration process on the purging of human enteric viruses from shellfish.

ACTION P-4.5
Epidemiological Study of Beaches
In order to assess the efficacy of existing bathing beach sanitary policies, HEP recommends a national epidemiological study of beaches. The study should include data sets from the Harbor/Bight region.

OBJECTIVE P-5 Continue interstate dialogue on beach closure policies to ensure reasonably consistent approach

ACTION P-5.0
Beach Closure Policies
Recognizing that they have differing policies with regard to beach closures, the states will continue their dialogue in order to ensure the protection of public health and to ensure effective risk communication.

OBJECTIVE P-6 Optimize disinfection practices

Disinfection of treated effluent is one way to control the input of pathogenic agents to the Harbor/Bight system. As stated earlier, chlorination as a disinfection method is more effective against indicator bacteria than it is against pathogenic viruses. New York State is considering reducing the permitted discharge concentration of chlorine from STPs, prompting managers to explore alternative disinfection methods.

ACTION P-6.0
Disinfection Methods
HEP supports the use of optimal methods of disinfection and recommends that the states evaluate the results of New York City's investigation, under HEP, of alternative disinfection methods. As appropriate, the states will issue disinfection guidance.

-- NYCDEP will complete a report assessing alternative wastewater disinfection methods.

OBJECTIVE P-7 Continue appropriate research, environmental monitoring, and modeling to identify remediation activities and support recovery of uses

Billions of dollars have been expended over the past 25 years on the improvement of sanitary water quality in the Harbor/Bight region, and recent monitoring results attest to the effectiveness of those measures. In addition, New York City has developed a water quality model of the Harbor to help set priorities for future remedial actions and to predict the outcome of alternative pollution control measures. Since problem areas remain, and other problems become higher priorities as the most significant pollution sources are addressed, HEP recommends a comprehensive program of research and monitoring in the region.

ACTION P-7.1
Research Agenda
Appropriate agencies should conduct the following research activities:

-- Investigate the feasibility, desirability, and cost to attain shellfish depuration standards in specific waters where shellfish resources exist: Raritan Bay, Jamaica Bay, Shrewsbury and Navesink Rivers, and Western Long Island Sound.

-- Assess the residual toxic contamination within the sediments and shellfish of the Bight Apex, and in closed shellfish areas of the Harbor, to determine the suitability of the resource for human consumption (see Toxics section).

-- Review recent studies of marine-specific pathogenic outbreaks to determine potential human-induced causes and develop remediation measures as appropriate.

-- HEP recommends appropriate continuing research, as funds are available, based on an evaluation of New York City's study of alternative wastewater disinfection methods.

ACTION P-7.2
Environmental Monitoring Agenda
NYSDEC, NYCDEP, and NJDEP should continue and enhance pathogen-related monitoring efforts. ISC will continue to assist the states with collection of data for their monitoring programs.

-- The states will continue regular programs of bathing beach and shellfish monitoring as appropriate.

-- New York City will continue its Harbor Survey program.

-- New Jersey should consider supplementing New York City's Harbor Survey program by supplying data from existing supplemental survey stations in New Jersey tributaries to the Harbor core area.

ACTION P-7.3
Modeling Activities
HEP recommends that NJDEP, in cooperation with the responsible dischargers, calibrate and verify a water quality model for pathogen indicators for those waters not adequately addressed in New York City's Harbor Water Quality Model. The model would be used to forecast needed sanitary improvements to recover beneficial uses, design remedial measures, and assess the effectiveness of actions taken. (Note: This action would build upon efforts under Action CSO-2.3 below).

COSTS OF IMPLEMENTING THIS PLAN

A number of the actions in the pathogens component of the CCMP can be accomplished through the effective use of base program resources. The CCMP itemizes 5 new HEP-driven commitments to control pathogenic contamination using base program resources.

The CCMP also includes 9 commitments and recommendations for pathogens control programs that entail enhanced program funding. As shown in Table 18(pc) below:

- The Plan includes 2 commitments for efforts started through the HEP planning process, which total $281,800.
- The Plan includes 3 recommendations for actions which total $325,000 plus $15,000 per year.
- The Plan also includes 3 additional actions for which cost estimates will be developed as part of the continuing planning process.

This component of the CCMP includes another 2 commitments involving implementation costs for special projects. As shown in Table 19(pc) below, both New York and New Jersey will implement marine pumpout station installation programs for a total combined expenditure of $1.7 million. These funds will be distributed statewide in both states, including the Harbor/Bight region.

Table 18(pc). Enhanced Program Costs for Management of Pathogenic Contamination

ACTION	COMMITMENTS		RECOMMENDATIONS	
	Cost	Cost/Year	Cost	Cost/Year
ACTION P-4.1: Complete NJ pathogenic indicator study.	$256,800			
ACTION P-4.2: Continue research on human-specific pathogenic indicator.			$145,000	
ACTION P-4.4: Conduct research on relay/depuration process.			$180,000	
ACTION P-4.5: Conduct comprehensive epidemiological study of beaches.			*	
ACTION P-6.0: Complete assessment of optimal methods of disinfection.	$25,000			
ACTION P-7.1: Study recovery of NY Bight Apex (sludge dump site).			*	
ACTION P-7.1: Continue research, as appropriate, on best alternative wastewater disinfection methods.			*	
ACTION P-7.2: Supplement NYC Harbor Survey Program.				$15,000
ACTION P-7.3: Develop water quality model for pathogen indicators.			Cost included in estimate for Action CSO-2.2	
TOTAL	$281,800		$325,000+*[1]	$15,000

* Enhanced program costs to be developed as part of the continuing planning process.
[1] Notation (+*) indicates cost plus additional costs to be determined.

Table 19(pc). Project Implementation Costs for Management of Pathogenic Contamination

ACTION	COMMITMENTS		RECOMMENDATIONS	
	Cost	Cost/Year	Cost	Cost/Year
ACTION P-3.1: Implement pumpout station installation program in NY.	$1 million (statewide)			
ACTION P-3.1: Implement pumpout station installation program in NJ.	$700,000 (statewide)			
TOTAL	$1,700,000 (statewide)			

BENEFITS OF IMPLEMENTING THIS PLAN

Implementation of the commitments and recommendations for the management of pathogenic contamination would move the Program toward the fulfillment of goals to:

- Protect the human uses of the Harbor and coastal waters for bathing and shellfishing.
- Ensure the protection of human health from ingestion of pathogens.
- Protect the marine environment from adverse pathogenic effects.

Through implementation of the Clean Water Act, the state and federal governments have helped to:

1) Secure the quality of ocean beaches.
2) Improve the quality of beaches in the Harbor core area, allowing bathing in some areas for the first time in 20 years.
3) Slow the degradation of shellfishing areas, even to the point of restoring shellfish water quality in certain areas.

With the implementation of a number of short-term actions, such as the beach/shellfish closure action plan, participants of HEP have made additional incremental progress toward the attainment of these goals. Aesthetics, recreational opportunities, and the health of the human population and the regional ecosystem will all benefit from the implementation of this Plan component.

Table 20(ps). Summary—Management of Pathogenic Contamination

ACTION	RESPONSIBLE ENTITY[1]	TARGET DATE	ESTIMATED COST	STATUS[2]
OBJECTIVE P-1: Reduce loadings of pathogens from CSOs, storm water discharges, and non-point sources to levels protective of public health (see Rainfall-Induced Discharges section).				
OBJECTIVE P-2: Reduce or eliminate the discharge of raw or inadequately treated sewage due to STP malfunctions and illegal connections.				
ACTION P-2.1: Continue Beach/Shellfish Closure Action Plan.	NYSDEC, NJDEP, USEPA	Ongoing	Base program	C/N
ACTION P-2.2: Reduce unregulated sewage discharges.	NYSDEC & NYCDEP	Ongoing	Base program	C/O
	NJDEP	Ongoing	Base program	C/O
OBJECTIVE P-3: Establish marina pumpout facilities and no discharge zones to reduce impacts of vessel discharges.				
ACTION P-3.1: Ensure the installation of pumpout stations at marinas serving the boating community.	NYSDEC	By Dec 31, 1996	Project implementation cost - $1 million federal funding statewide	C/O
	NJDEP	Ongoing through 1998	Project implementation cost - $700,000 federal funding statewide	C/O

-- In some cases CCMP actions are recommendations, not commitments, because responsible entities require resources to implement the action. HEP will advocate making these resources available.

-- In other cases, CCMP actions are recommendations because HEP has not obtained the commitment of regulated entities and other responsible entities to implement the action. By issuance of this CCMP, HEP seeks the commitment of the responsible entities and requests that they step forward to voluntarily agree to implement the actions.

[1] Responsible entities may accomplish the actions directly or via contract or grant.

[2] C/O - An ongoing commitment, not driven by the HEP CCMP
C/N - A new commitment, driven by the HEP CCMP
R - Recommendation

(Continued)

Table 20(ps). Summary—Management of Pathogenic Contamination

ACTION	RESPONSIBLE ENTITY[1]	TARGET DATE	ESTIMATED COST	STATUS[2]
ACTION P-3.2: Amend CWA to allow "No Discharge" zone designations by the states.	US Congress	By Dec 31, 1996	Base program	R
ACTION P-3.3: Designate "No Discharge" zones, where vessel discharge of sanitary wastes to protected waters is prohibited.	NYSDEC & NJDEP, with USEPA concurrence	Ongoing	Base program	C/N
OBJECTIVE P-4: Develop additional indicators of pathogenic contamination.				
ACTION P-4.1: Complete the current NJ Pathogenic Indicator Study.	NJDEP	Mar 1996	Enhanced program cost - $256,800	C/N
ACTION P-4.2: Continue research to develop a human-specific indicator.	HEP	Post-CCMP	Enhanced program cost - $145,000	R
ACTION P-4.3: Support the National Shellfish Indicator Study.	NYSDEC, NJDEP, USEPA	Ongoing	Base program	C/N
ACTION P-4.4: Conduct research on relay/ depuration process.	Federal and state agencies	Beginning by Dec 31, 1996	Enhanced program cost - $180,000	R
ACTION P-4.5: Conduct comprehensive epidemiological study of beaches across the Harbor/Bight region.	NYSDOH & NJDEP	Post-CCMP	Enhanced program cost to be developed prior to conducting study	R
OBJECTIVE P-5: Continue interstate dialogue on beach closure policies to ensure a reasonably consistent approach.				
ACTION P-5.0: Continue dialogue on beach closure policies.	Interstate Sanitation Commission, NYSDOH, NJDEP, local health agencies	Ongoing	Base program	C/N

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[2] C/O - An ongoing commitment, not driven by the HEP CCMP
C/N - A new commitment, driven by the HEP CCMP
R - Recommendation

(Continued)

Table 20(ps). Summary—Management of Pathogenic Contamination

ACTION	RESPONSIBLE ENTITY[1]	TARGET DATE	ESTIMATED COST	STATUS[2]
OBJECTIVE P-6: Optimize disinfection practices.				
ACTION P-6.0: Issue guidance on optimal methods of disinfection.				
-- NYC Report.	NYCDEP	Completed	Enhanced program cost - $25,000	C/N
-- Guidance.	NYSDEC & NJDEP	Mar 1996	Base program	C/N
OBJECTIVE P-7: Continue appropriate research, environmental monitoring, and modeling to identify remediation activities and support recovery of uses.				
ACTION P-7.1: Research Agenda.				
-- Assess residual toxic contamination in Bight Apex and Harbor shellfish beds.	Federal agencies (NOAA lead), NYSDEC & NJDEP	Begin by Dec 31, 1996	Enhanced program cost to be developed prior to conducting studies	R
-- Review studies of marine-specific pathogenic outbreaks.	Federal agencies	Sep 1996	Base program	R
-- Continue research, as appropriate, on best alternative wastewater disinfection methods.	NJDEP & NYCDEP	Sep 1996	Enhanced program cost to be developed based on results on NYC report (Action P-6.0) and other information	R

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[2] C/O - An ongoing commitment, not driven by the HEP CCMP
C/N - A new commitment, driven by the HEP CCMP
R - Recommendation

(Continued)

Table 20(ps). Summary—Management of Pathogenic Contamination

ACTION	RESPONSIBLE ENTITY[1]	TARGET DATE	ESTIMATED COST	STATUS[2]
ACTION P-7.2: Continue and enhance pathogen-related monitoring efforts.	NJDEP, NYSDEC, NYCDEP, local authorities	Ongoing	Base program	C/O
-- Continue bathing beach and shellfish monitoring as appropriate.	NYSDEC, NJDEP, ISC, some local health authorities	Ongoing	Base program	C/O
-- Continue Harbor Survey Program.	NYCDEP	Ongoing	Base program	C/O
-- Consider supplementing Harbor Survey Program by supplying data from existing supplemental survey stations in New Jersey tributaries to the Harbor core area.	NJDEP	By Dec 31, 1995	Enhanced program cost - $15,000/yr	R
ACTION P-7.3: Calibrate and verify a water quality model for pathogen indicators. (Note: This effort would build upon Action CSO-2.3).	NJ dischargers	By Dec 31, 1996	Enhanced program cost included in project implementation cost estimate for Action CSO-2.2; project-specific cost to be developed prior to conducting study.	R

[1] Responsible entities may accomplish the actions directly or via contract or grant.

[2] C/O - An ongoing commitment, not driven by the HEP CCMP
C/N - A new commitment, driven by the HEP CCMP
R - Recommendation