STATE GUIDE PLAN ELEMENT 715 REPORT NUMBER 71

COMPREHENSIVE CONSERVATION AND MANAGEMENT PLAN

FOR

NARRAGANSETT BAY

Final Report

December 1992

U. S. Environmental Protection Agency
Region I
Boston, Mass.

Narragansett Bay Project
State of Rhode Island
Dept. of Environmental Management
Providence, R.I.

Division of Planning
State of Rhode Island
Dept. of Administration
Providence, R.I.

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ABSTRACT

TITLE:	Comprehensive Conservation and Management Plan for Narragansett Bay
SUBJECT:	Narragansett Bay element of National Estuary Program
DATE:	December, 1992
AGENCY and SOURCE OF COPIES:	Division of Planning Rhode Island Department of Administration One Capitol Hill Providence, Rhode Island 02908-5872
SERIES NO.:	Report Number 71; State Guide Plan Element 715
NUMBER OF PAGES:	497, plus 108 in Bibliography and published Appendices

ABSTRACT: This document sets forth goals and implementation strategies to improve and sustain the health of Narragansett Bay. It is the culmination of six years of research and review of the issues by scientists, planners, interest groups, and legal experts, an endeavor funded by the U.S. Environmental Protection Agency and overseen by an Executive Committee of directors of Environmental Management, the Coastal Resources Management Council, the R.I. Division of Planning, and the Water Quality Branch of USEPA Region I.

The Plan has six distinct but interrelated parts: an Introduction, establishing the need for the Plan, the history of the Narragansett Bay Project, and the process of Plan development; Background, describing "the state of the Bay"; Goals; Issues, Objectives, and Strategies; information on Plan Implementation, including unfinished agenda; and Summary Matrices. These are followed by an extensive Bibliography and Appendices.

DEDICATION

"If we have seen further, it is by
standing upon the shoulders of giants."

Paraphrased fr. Sir Isaac Newton

The first edition of the Narragansett Bay *Comprehensive Conservation and Management Plan* (1992) is dedicated to Senator John Chafee, Mr. Robert L. Bendick, Jr., Ms. Gertrude "Trudy" Coxe and Mr. Michael Deland who were instrumental in founding the Narragansett Bay Project. These individuals should be credited for recognizing that the nation's inheritance in its coastal waters ultimately depends upon the nation's ability to comprehend the relationship between estuaries and the land, and the durability of the public - private partnership to steward the use of coastal resources for the next generation.

The staff of the Narragansett Bay Project also extends its deepest appreciation and thanks to Mr. Daniel W. Varin, Ms. Louise Durfee, Mr. Malcolm J. Grant and Mr. James W. Fester for their counsel and perseverance; the staffs of the Rhode Island Department of Environmental Management, the Rhode Island Coastal Resources Management Council, and the Rhode Island Division of Planning, who labored on the Narragansett Bay Plan knowing they were to be its custodians; the Project's Committees for keeping their eyes on the prize; friends and supporters of the planning process; and the generations of citizens that must now take the lead in protecting Narragansett Bay.

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AND
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STATE PLANNING COUNCIL
Policy Statement on Implementation of the Comprehensive Conservation and Management Plan for Narragansett Bay

The state recognizes the need for all levels of government and the private sector to cooperate in implementing the recommendations of this plan. The benefits of a clean Bay are important to federal, state, and local governments alike. Each level has a role in striving toward the goals of the plan. It is important to recognize that many recommendations are already required by state or federal law, such as the Clean Water Act. In such cases, the state is limited in its ability to reassign responsibility for recommended actions.

Local role

Local governments are properly assigned to carry out many recommendations of the plan. However, in plan implementation decisions, the state shall not assign responsibilities disproportionately to local governments, who are least able in terms of financial and other resources to support new efforts. The state shall provide cities and towns with financial and technical assistance, where possible, to implement recommendations of the plan and shall attempt to secure assistance from federal agencies also, where appropriate. No city or town shall be held solely responsible for accomplishing recommendations, in the absence of equitably proportioned federal or state assistance, if these actions are not otherwise required by federal or state law and would impose a severe and unreasonable burden as determined by state officials. In determining consistency of a local comprehensive plan with the State Guide Plan, the state shall recognize that goals represent ideals rather than immediately achievable objectives, and shall take into account the reasonableness of expecting local governments to implement State Guide Plan recommendations. The state shall recognize the different scale and responsibilities of local government; limitations on their authority, capacity, and ability to pay; and competing demands for resources. Local plans shall be found inconsistent with the State Guide Plan only where they:

- directly conflict with goals, policies, or recommendations;
- use erroneous data or incompatible forecasts to justify different goals, policies, or recommendations; or
- fail to include or recognize state goals, policies, or recommendations when it is appropriate and feasible to do so.

Federal role

The federal government should also be committed to help implement the plan. The state shall notify the Rhode Island Congressional delegation of the financial enormity of some of the actions called for in the plan, and shall request funding to assist with plan implementation.

Role of Massachusetts

Rhode Island shall work with Massachusetts to assure that many of the actions proposed in the plan are pursued. Sixty percent of the Narragansett Bay watershed lies in Massachusetts. Efforts of the two states must be coordinated so that resources are used most efficiently.

Role of industry

In future implementation activities, the state shall emphasize communication with industries. Industrial users of the Bay must be given an idea of what is reasonably expected of them, in terms of taxes, fees, and regulations. Industries are already concerned about the business climate and competitive disadvantages; they need to be reassured about the plan's long-run economic benefits and recognition of economic development needs. Continued participation and support from industry are essential to the success of the plan. The state shall advocate that the federal government implement a low-interest loan program tailored to assist industries in upgrading to best-available wastewater treatment technology.

Role of the public

People whose activities affect the Bay can often prevent pollution problems, so that costly cleanup or regulatory programs are unnecessary. Public education programs are crucial; for example, in how to maintain septic systems, care for lawns and gardens, and dispose of boat wastes.

The CCMP is intended to be a working guide to future actions that will preserve and restore Narragansett Bay. It calls for agencies, industry, interest groups, and the public to continue the planning process: completing unfinished studies, developing new recommendations, monitoring progress, and revising old recommendations and priorities as conditions change. This should be a living, useful plan that builds on past collective efforts and maintains the momentum of achieving the goals for Narragansett Bay.

PREFACE

Narragansett Bay is arguably the best-studied estuary in the United States, but until now has lacked a single, Bay-wide blueprint for improving its health and sustaining it for generations to come. The purpose of this *Comprehensive Conservation and Management Plan* (CCMP) is to provide that blueprint, after examining and assessing problem areas and possible solutions.

Toward that end, the authors of the CCMP evaluated potential and existing mechanisms for implementing the Plan's recommendations, making suggestions for expanding regulatory responsibilities as well as planning horizons. Authors of the reports and briefing papers that contributed to the Plan are listed in Appendix C; Bay Project staff are shown in Appendix B.

It was left to the Bay Project Management Committee to resolve any conflicts through exhaustive consensus building and principled compromise, a process that was truly remarkable considering the scope of the Project, the volumes of scientific material to be considered, and the many competing and at times contentious uses of the Bay as natural resource, recreational site, fishing ground, and receiving water. The names of the individuals who served on the Management Committee and performed that unenviable task are also listed in Appendix B. Chaired by Malcolm J. Grant, Associate Director of the R.I. Department of Environmental Management, they deserve special recognition for bringing the Plan into being, and will continue to merit recognition as they help bring the Plan into full implementation.

Likewise is credit due members of the Bay Project staff who conducted an extensive program of public outreach and education. Many issues were brought to the Management Committee and addressed as a result of that outreach. This endeavor was spearheaded by Caroline A. Karp, Esq., Project Manager, and Judith E. Korch, Communications Coordinator. Ms. Karp spoke before many different audiences, answering questions and soliciting advice and support for the Project, while Ms. Korch edited an excellent newsletter explaining Bay management issues and how the Project intended to address them. Assistance from the staff of Planners Collaborative, Inc., must also be mentioned.

Because the CCMP was written as an element of the State Guide Plan, certain background information and recommendations in the "Briefing Papers" prepared for the Management Committee had to be digested and re-presented in language appropriate for the Guide Plan. Bruce F. Vild, Principal Planner, of the R.I. Division of Planning, was responsible for that task, working under the direction of Susan P. Morrison, Chief of Systems Planning, and John P. O'Brien,

Supervising Planner. Mr. Vild wrote, edited, and reworked several drafts of Parts 03, 04, and 05, along with the Bibliography and this modest Preface, under Task 209 of the Division's Work Program.

The final revisions to the Plan, representing the consensus of the Bay Project Management Committee, Bay Project Executive Committee, and the State Planning Council, were done by Richard C. Ribb, Environmental Policy Analyst, of the Bay Project staff. The CCMP as the reader sees it now is the product of his editorial work.

The process of developing the Plan is further described in Part 715-01, Introduction.

The Plan is organized in a straightforward way, continuing with Parts 715-02, background; 03, goals; 04, analysis of issues and strategies; 05, implementation; and 06, summary of recommendations and costs. A 24-page Executive Summary appears at the beginning of the Plan.

Funding and guidance for the Narragansett Bay Project were provided by the U.S. Environmental Protection Agency.

The State Planning Council adopted the CCMP as an element of the State Guide Plan on October 8, 1992, and made a few revisions on December 10, 1992.

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EXECUTIVE SUMMARY

INTRODUCTION

The Narragansett Bay *Comprehensive Conservation and Management Plan* (*CCMP*) represents the culmination of a unique experiment in environmental policy-making. Over a period of seven years (1985 to 1992), more than 100 people representing 45 federal, state, and local government agencies, universities, marine trade organizations, environmental advocacy groups, industry, and land development interests met under the aegis of the Narragansett Bay Project (NBP), a member of the U.S. Environmental Protection Agency's (EPA) National Estuary Program, to consider the future of Narragansett Bay and the Narragansett Bay basin.

The NBP's specific mandate under Section 320 of the federal Clean Water Act was to "...recommend priority corrective actions and compliance schedules addressing point and nonpoint sources of pollution to restore and maintain the chemical, physical and biological integrity of the estuary, including restoration and maintenance of water quality, a balanced indigenous population of shellfish, fish and wildlife, and recreational activities in the estuary, and assure that the designated uses of the estuary are protected." In order to satisfy this broad charge, the Bay Project's governing committees directed the completion of over 100 peer-reviewed scientific and policy studies that focused on the following identified issues of concern:

- Impacts of toxic pollutants,
- Impacts of nutrients and eutrophication,
- Land-based impacts on water and habitat quality,
- Health and abundance of living resources,
- Fisheries management,
- Health risk to consumers of seafood, and
- Environmental impacts on commercial and recreational uses of Narragansett Bay.

These studies provided the NBP's governing committees with an objective basis to determine the relative significance of problems confronting the Bay basin in terms of environmental impacts and impairment of water quality-dependent uses of the Bay, *e.g.*, shellfish harvesting. These studies, in combination with NBP briefing papers also provided a starting point for recommending specific actions to protect and restore Narragansett Bay. [See Appendix C for a complete list of NBP publications.]

BACKGROUND: DESCRIPTION OF THE PROBLEM

In many respects, Narragansett Bay is the "Everyman" of American estuaries. Major urban and industrial centers developed along the major rivers tributary to the Bay to take advantage of water supply and easy access to foreign markets from protected deep water ports. As the cities flourished and the region's economic base and transportation options diversified, the population sprawled along the adjacent coastline—accompanied by commercial development and public infrastructure such as roads, public water supplies, and sewers. The Bay's resulting economic importance to the region is clear—in 1989 dollars, the Bay generated almost $2.5 billion in revenues for the State of Rhode Island based on direct exploitation of Bay fisheries, tourism, marine-related industry, marine research and education, and U.S. Navy-related activities. Narragansett Bay's water and habitat quality reflects its urban history and recent suburban pattern of development, as well as the multiple demands placed on it by its citizens.

This history of environmental degradation in the Bay basin can largely be explained by four "universal" attributes of the Narragansett Bay system which continue to affect the pollutants generated in the Bay basin, and the environmental fate of those pollutants in Narragansett Bay. The first attribute is the geography of the Narragansett Bay watershed. The second attribute is population density within the Bay basin; the third is population distribution within the basin;

and the fourth is the trend in population growth and distribution.

The Bay watershed—or the land area that ultimately drains water (and entrained pollutants) to Narragansett Bay—is over ten times larger than the surface area of the Bay itself, and extends well into the Commonwealth of Massachusetts. In fact, 60 percent of the Bay basin lies within the Commonwealth up to the headwaters of the Blackstone and Taunton Rivers, and 67 of the 100 cities and towns in the Bay basin are in Massachusetts. This geographic and political reality is significant because land use and environmental policies throughout the basin ultimately affect Narragansett Bay. For example, a governmental decision to divert water from a Bay tributary for ultimate discharge to another drainage basin reduces the flow in the Bay tributary, thereby affecting the quality of riverine habitat, and reducing the net flow to Narragansett Bay.

Population density within the Bay basin affects both the volumes of water use and ultimate wastewater discharge. Based on the 1980 census, the Narragansett Bay watershed is one of the most densely populated estuarine systems in the country with a population of 1.8 million people—887,863 in Rhode Island and 949,465 in Massachusetts—and an overall density of 1,109 people per square mile compared to a national average of 64 people per square mile. Most of the wastewater flow generated in the basin is treated by one of the 33 wastewater treatment facilities in the basin, although 12 Rhode Island communities are completely unsewered as are several in Massachusetts. Since the population continues to be concentrated in the metropolitan areas of Providence, Rhode Island, and Worcester and Fall River, Massachusetts, the largest volumes of wastewater enter Narragansett Bay at the mouths of the Blackstone, Pawtuxet, Providence-Seekonk, and Taunton Rivers.

Population distribution and land use within the basin also strongly affect the environmental quality of Narragansett Bay. The region's industrial and manufacturing core coincides with the major urban areas in the Blackstone-Providence and Taunton River basins. As a result, the largest volumes of industrial wastewater, and industrial-derived toxic pollutants, also enter Narragansett Bay at the mouths of the Blackstone, Pawtuxet, Providence and Taunton Rivers, and decrease along a down-Bay gradient toward Rhode Island Sound. However, domestic wastewater and point and nonpoint source pollutants generated by commercial, industrial, agricultural, construction and municipal activities in other communities in the basin also enter the Bay in proportion to local population density and land use patterns.

Although the Bay pollution gradient follows the Providence River-Rhode Island Sound axis and matches the history of the basin, projected changes in population growth and population density suggest that a different type and pattern of pollution problem may emerge in the future. The Rhode Island Division of Planning (RIDOP) has projected an average 20 percent growth rate for Rhode Island's suburban and rural communities between 1985 and 2010, compared to a 2.6 percent growth rate in the state's cities, and a statewide growth rate of 9.5 percent. Although 69 percent of the state's population already lives in a coastal city or town, coastal communities are expected to grow more rapidly than the state averages. In addition, based on the projected rate and distribution of growth, the RIDOP estimates that 88 percent of the developable lands in Rhode Island could be fully developed by 2010. (Note: Local zoning ordinances in effect in 1979 would authorize development of 95.5 percent of Rhode Island lands under local jurisdiction.) If this trend toward suburbanization and development of rural areas continues or accelerates, there will be profound consequences for the region's wastewater and waste disposal infrastructure related to increased population. There will also be detrimental consequences for the region's natural resources and remnant critical areas related to habitat loss and degradation.

(The major human impacts on Narragansett Bay are described below and summarized in Table I by geographic region.)

SEWAGE

Human sewage represents the most ubiquitous and overriding pollution problem in the Narragansett Bay basin. Based on 1990 census figures for Rhode Island and Massachusetts and per capita estimates of water use, over 125 million gallons of wastewater carrying a mixture of sanitary and household wastes are discharged each day to municipal wastewater treatment facilities (WWTF) and on-site sewage disposal systems (OSDS) in the basin. The majority of this wastestream receives some level of treatment and disinfection prior to discharge to the Bay and its tributaries. However, 37 percent of Rhode Island's population depends upon OSDSs to treat residential and commercial wastes. In addition, over 100 combined sewer overflows (CSO) in the Providence River region and the City of Fall River discharge a mixture of untreated sewage and stormwater to the Bay after rain events. As a result, multiple sources of untreated and partially treated sewage continue to discharge to the Bay—almost 100 years after the risks associated with human exposure to water-borne bacteria and viruses were first described.

All 33 WWTFs in the basin use chlorine disinfection which is relatively effective at killing bacteria but ineffective at killing viruses, including potential human pathogens responsible for causing illnesses such as polio, hepatitis, and gastroenteritis. On the one hand, cholera, typhoid, polio and infectious hepatitis appear to be water-borne diseases of the past in the northeast because of improvements in sanitary conditions, medical advances, improvements in wastewater treatment, and the development of bacteriological standards governing the certification of Bay waters for commercial and recreational use. However, sewage discharges to Narragansett Bay and its tributaries continue to pose a threat to public health and water quality-dependent uses of Bay waters such as swimming and shellfish harvesting.

At the present time, 40 percent of Narragansett Bay is permanently or conditionally closed to shellfish harvesting because of actual or suspected contamination from sewage-derived bacteria and viruses. The Providence River and Mount Hope Bay have been permanently closed to shellfish harvesting since the 1940s, and upper Narragansett Bay is routinely closed following rain storms because of CSO discharges of untreated sewage. Perhaps more disturbingly, however, all the closures of recent years have occurred in suburban areas such as the Narrow and Kickemuit Rivers, Point Judith Pond, and the coves surrounding Greenwich Bay—all as a result of actual or suspected evidence of sewage contamination from septic systems, storm drains and boats. Several bathing beaches in upper Narragansett Bay are also closed because of sewage contamination, and a number of coves and embayments—including the Pawtuxet, Providence, Seekonk, Kickemuit, Cole and Lees Rivers; Greenwich, Apponaug and Warwick Coves; and portions of Mount Hope Bay—suffer from seasonal dissolved oxygen depletion, algal blooms and occasional fish kills related to organic loadings from sanitary wastewater inputs.

In urban areas, point sources, including WWTFs, WWTF bypasses and CSOs represent the major sources of human fecal waste. The CSOs are also a major source of floatable human wastes, which foul the coastline and aesthetically limit use of the shore. In suburban and developing coastal areas, the major sources of human fecal wastes include failed and failing OSDSs, illegal sewer cross-connections to storm drains, and improper sewage discharges from vessels.

Although the population in the basin has grown and will continue to grow, sewage contamination represents a largely unnecessary public health and environmental risk given the treatment, disposal and disinfection technologies that are currently available. The region's failure to more carefully manage and abate the discharge of untreated human sanitary wastes will inevitably result in additional closures of shellfish harvesting areas, overall environmental degradation, and economic losses related to further limitations on water quality-dependent uses of the Bay. Therefore, public investment in more effec-

tive WWTF disinfection technologies and CSO abatement should be the highest priorities in urban areas of the Bay basin. The highest priority in suburbanizing areas and rural areas of the basin should be the implementation of more effective controls on the location, density and use of OSDSs in order to manage the incremental, cumulative impacts of population growth and land development on receiving water quality.

TOXIC POLLUTANTS

The Providence-Worcester corridor along the Blackstone River is acknowledged as the birthplace of the Industrial Revolution in the United States, and upper Narragansett Bay continues to reflect this heritage. Significant areas of the Providence River and its major tributaries, including the Blackstone, Pawtuxet, Woonasquatucket, Moshassuck and Ten Mile Rivers, continue to exceed federal and state water quality standards designed to protect aquatic life from exposure to toxic pollutants. Other less urban areas of the Bay, including parts of Portsmouth and Newport Harbor, Greenwich Bay and Mount Hope Bay, also show evidence of significant metals contamination although not in violation of federal and state standards.

Industry has historically been the largest source of toxic pollutant discharges to Narragansett Bay. However, federal, state, local and industry initiatives undertaken pursuant to the federal Clean Water Act have resulted in significant reductions in industrial pollutant loadings since the 1970s. As a result, non-industrial sources such as commercial and household toxic and hazardous wastes, motor vehicle emissions and leaks, and urban and highway runoff are increasingly significant sources of contamination throughout the Bay basin. In addition, suburbanization and diffusion of commercial growth away from existing industrial centers, combined with the emergence of new industries with "exotic" waste characteristics, have resulted in new sources and types of surface and groundwater contamination in developing areas of the Bay basin.

The levels of measured toxic pollutants in Bay waters do not pose an immediate public health risk, in part because the most severely contaminated areas are already closed to fish and shellfish harvesting due to sewage contamination. However, the presence and persistence of toxic pollutants in the environment contribute to habitat degradation, reduced fitness of aquatic organisms, and an unnecessary additive public health risk for some consumers of seafood harvested from the Providence River region. Elevated toxic pollutant levels in municipal sewage sludge and septage also limit the region's ability to consider alternative disposal methods such as agricultural or residential use of composted solid wastes. In addition, the presence of contaminated sediments in the Providence River basin and other commercially important ports and harbors complicates decision making about dredging to support navigation and boating activity. Unless a concerted effort is made to reduce domestic, commercial, industrial, urban and agricultural use and disposal of toxic pollutants, citizens of Rhode Island and Massachusetts should expect to see limited water quality improvements related to continuing source reduction efforts by industry.

LIVING RESOURCES

Many federal and state agencies with jurisdiction in Rhode Island and Massachusetts have programs to protect discrete elements of the Bay ecosystem. For example, the Rhode Island Department of Environmental Management (RIDEM) and the Coastal Resources Management Council (CRMC) have programs to protect drinking water supplies, tidal and non-tidal wetlands, barrier beaches, commercially harvested species, and state and federally-listed threatened and endangered species. However, these programs are not adequately coordinated to effectively protect water supply recharge areas, upland riparian corridors, intertidal and subtidal habitats, or key breeding, nursery and foraging habitats. Nor are they effectively coordinated to preserve unique, ecologically important, or remnant natural resources or populations.

Both Rhode Island and Massachusetts have experienced declines and collapses of important fisheries in recent years. Rhode Island, for example, recently imposed a moratorium on commercial and recreational harvesting of winter flounder in Narragansett Bay, Little Narragansett Bay, and the coastal salt ponds in order to allow the native winter flounder population to recover from overfishing. Other historically important fisheries such as the oyster, bay scallop, soft shell clam, Atlantic salmon, shad, menhaden, tautog, and windowpane flounder have experienced similar declines due to overfishing, physical obstruction of river flow and drainage, destruction of key subtidal habitats, and pollution. In addition, apart from the states' efforts to protect state and federally-listed threatened and endangered species, little governmental attention has been paid to protecting non-commercially important species or their associated habitats.

A concerted regional effort will be necessary to effectively manage (and sustain) commercial and recreational harvests of indigenous fisheries. In addition, land use controls and land acquisition efforts within Rhode Island and Massachusetts should be coordinated to focus on critical areas threatened by suburbanization and rural development in order to protect or restore remnant critical habitats for native plants and animals, as well as to protect human use and enjoyment of these resources. The region's failure to regulate the use of its natural resources will continue the present cycle of collapsed fisheries and economic hardship for the fishing community. The region's failure to regulate the development of its critical areas will ultimately result in the loss of biological diversity, sustainable ecosystem function, and human use and enjoyment of these resources.

PROGRESS TO DATE AND THE UNFINISHED AGENDA

A great deal of progress has been made in spite of this picture. Data compiled by the NBP suggest that programs initiated under the federal Clean Water Act, such as mandatory secondary sewage treatment, the industrial pretreatment program, and the phase-out of leaded gasoline, have measurably improved dissolved oxygen concentrations and reduced toxic pollutant loadings to Narragansett Bay. The most significant evidence of the environmental benefit of this investment can be seen in the Providence River. Recent state initiatives such as mandatory recycling and toxics' source reduction programs are expected to further reduce pollutant inputs. Rhode Island's open space acquisition program and its recent moratorium on winter flounder fishing also represent important initiatives with respect to protection of critical resources, and establishing modern principles of resource management.

However, a virtual revolution in land management philosophy and practice will be required to deal with the incremental degradation of water quality related to population growth in the Bay basin. Coastal towns in the Narragansett Bay basin have experienced dramatic population growth and development since the 1970s. The Town of Narragansett, for example, tripled its population between 1960 and 1990 and the Town of East Greenwich essentially doubled over the same period. As a result, many of the developing communities fronting Narragansett Bay lack the necessary infrastructure, *e.g.*, public water and sewers, to cope with the consequences of this rate of growth. Since demographic projections indicate that future growth will continue to concentrate in rural and suburban areas, many of which are unsewered, the population's dependency upon OSDSs will also increase. The environmental consequences of failing to effectively manage population growth are readily observable in terms of increasing restrictions on shellfish harvesting in the vicinity of intensively developing residential areas and crowded harbors, increased fouling of the shore by floatable human wastes, and the increased incidence and geographic extent of seasonal low oxygen problems, algal blooms and fish kills.

Without effective land use controls, the trend toward suburbanization and dispersion of the population to currently undeveloped areas of the Bay basin will also result in the physical

loss of remaining unprotected natural habitats. In addition, the unregulated development of open space within the watershed—including deforestation and encroachment on wetlands—can also disrupt the natural hydrological cycle, increase stormwater runoff, promote erosion, and result in new point and nonpoint sources of pollution. Evidence of these effects already exists. For example, the RIDOP reported a 15 percent decrease in the acreage of forested lands between 1982 and 1988 associated with the recent development boom, and the U.S. Department of Agriculture Soil Conservation Service (USDA SCS) estimates that over 100,000 tons of sediment are washed into the Bay and its tributaries each year as the result of unregulated runoff from construction sites, road surfaces, and agricultural lands. In addition, the RIDEM estimates that, as of 1991, 45 percent of its 674 river miles are threatened by nonpoint and point sources of pollution, while an additional 25 percent of the state's rivers are only partially supporting or are not supporting their designated uses. The consequences of failing to effectively manage land use include the physical loss and/or degradation of natural resources, loss of biological diversity, increasing limitations on water quality-dependent uses, and ultimately, a decrease in the Bay ecosystem's sustainable revenue generating potential.

SOLUTIONS: THE NARRAGANSETT BAY *CCMP*

The Narragansett Bay *CCMP* reflects the complexity of the Bay's environmental problems, the diversity of pollutant sources, the variety of demands that continue to be placed on the Bay's resources, and the difficulty in identifying simple solutions. The complexity of the *CCMP* also reflects the complexity of the planning process itself. However, the Project's governing committees ultimately agreed on the environmental, social, and economic necessity of protecting and restoring Narragansett Bay. As a result, the *CCMP* represents a community vision of the measures that must be taken by the State of Rhode Island and the Commonwealth of Massachusetts in conjunction with the municipalities and the federal government, to achieve the following goals for Narragansett Bay:

1. prevent further degradation of water quality;

2. protect diminishing high quality critical resource areas;

3. improve management of Bay-dependent living resources;

4. rehabilitate degraded waters throughout the Bay basin; and

5. coordinate and oversee implementation of the *CCMP*.

The organization of the *CCMP*, summary cost and financing information, and highest priority implementation actions are briefly described below.

ORGANIZATION AND USE OF THE *CCMP*

The *CCMP* is intended first and foremost to be a "blueprint" for immediate coordinated action by federal, state, and local implementing authorities. (The ten highest priority implementation actions are briefly described below, by goal, and summarized in Table II with information on projected costs and implementation status.) However, the *CCMP* acknowledges that many of the recommended actions will have to be staged over many years in order to achieve measurable progress and respond to changing demographic, environmental and economic conditions in the Bay basin. Therefore, the "Issues, Objectives, and Strategies" section of the *CCMP* (Part 715-04) is intended for use by implementing authorities and other users with a specialized interest in particular issues over a five to ten year planning horizon. Related high priority recommendations in each chapter are identified with bolded text and a checkmark. (Table 715-06(1) Summary of *CCMP* Recommendations summarizes all *CCMP* actions according to whether the primary focus of the recommended initiative is on additional policy development, planning, regulation, public education, research or capital improvement.)

Readers should also note that space has been reserved for *CCMP* chapters on Greenwich Bay, Management of Living Marine Resources, Management of Marine and Riverine Sediments, Bay Governance, and Role of Public Participation in *CCMP* Implementation. The Management of Living Marine Resources, and Management of Marine and Riverine Sediments chapters should be completed as soon as possible in order to address the continuing trend toward collapse of important fisheries and loss of critical habitats; and the need to resolve the region's dredging and sediment management concerns. The Role of Public Participation chapter should also be completed as a high priority because of the need for broad public understanding of its role in environmental protection and the environmental and economic consequences of failing to act. Sufficient information currently exists to address these subject areas. Completion of the Greenwich Bay chapter should be deferred until the RIDEM and CRMC complete the preliminary basin plan and recommend comprehensive pollution abatement and growth management initiatives to restore and protect Greenwich Bay.

Since the *CCMP* has been developed based on information collected between 1985 and 1991, the Plan should be revised as new information becomes available, new solutions emerge, and new priorities are established. In particular, the *CCMP* should not be used to stifle independent, creative solutions to the described problems, and should not be interpreted to dictate implementation schedules independent of the federal, state and local governments' competing social obligations and ability to pay. The "Implementation" section (715-05) provides an overview of the existing system of Bay governance, proposes an institutional structure for implementing the *CCMP*, and includes summary cost and financial information as the basis for future financial planning.

IMPLEMENTING THE *CCMP*

The *CCMP* explicitly recognizes that a sustained and coordinated interstate and interagency effort will be required over many years to achieve measurable progress in protecting and restoring Narragansett Bay. The Plan also recognizes that progress toward implementation will depend upon the availability of adequate and sustained funding, particularly for the state and local implementing authorities. The institutional and financial initiatives recommended in the *CCMP* are expected to provide the platform to support on-going implementation efforts. In addition, a variety of actions taken between 1985 and 1992 will also contribute to *CCMP* implementation. These institutional and financial efforts to assure implementation are briefly described below, and discussed in much greater detail in Part 715-05 of the Plan.

The *CCMP* recommends that the NBP committee structure be maintained in order to coordinate interstate and interagency efforts, and provide a permanent forum for the public to participate in future *CCMP* implementation and planning. The EPA Region I, RIDEM, RIDOP, and CRMC have agreed to continue their historic leadership role in the future by participating on the new Narragansett Bay Implementation Committee. Since many *CCMP* recommendations will depend upon municipal governments in Rhode Island and Massachusetts, it is essential that municipal representatives also serve on the Implementation Committee. Continued representation from academia, environmental advocacy groups, the business community, and marine trade organizations should be assured via establishment of a Narragansett Bay Policy Committee that assumes the responsibilities of the existing NBP Management Committee. In addition, *CCMP* implementation efforts should be coordinated with regional planning efforts such as the Bay State-Ocean State Compact, the Rhode Island Rivers Council, and RIDOP's *Greenspace 2000* initiative.

Although there is broad institutional support for the actions recommended in the *CCMP*, all the participants in the planning process acknowledge that progress toward effective implementation will be negligible without coordinated and predictable funding, partic-

ularly since the total estimated cost of implementing the *CCMP* over the next five years (1992 to 1997) is $392 million—$283 million for Rhode Island, and $109 million for Massachusetts. It is important, however, to consider several aspects of these cost projections, and the available revenue options.

1. The total estimated cost of *CCMP* implementation over the next five years is $20.2 million for Rhode Island and $10.3 million for Massachusetts—excluding projected capital costs associated with federally-mandated CSO abatement, proposed remediation of contaminated sediments on the Blackstone River, a state match for a $13 million FHWA grant, and proposed reauthorization of Rhode Island's Sewer and Water Supply Failure Fund. Over 90 percent of Rhode Island's and Massachusetts' total *CCMP* costs between 1992 and 1997 are associated with mandatory CSO abatement and proposed remediation of Blackstone River sediments.

2. If Rhode Island's total estimated non-capital costs ($20.2 million) were distributed evenly over the next five years, Rhode Island's first year expenditures would be $4.04 million, or 0.30 percent of Rhode Island's 1992 state budget. This estimated annual cost would amount to an annual, per capita cost of $4.03 to each of Rhode Island's 1,003,464 citizens for five years. Complete state financing, and a per capita distribution of *CCMP* costs are not realistic or desirable. However, the *CCMP* is clearly affordable over the long term if not the short term.

3. The procedure used to estimate the cost of *CCMP* implementation assumes that every action recommended in the Plan requires *new* funding (i.e., existing funds and staff time that could potentially be directed toward CCMP implementation are not included in the cost estimates). This overestimates the cost of implementation in two respects. First, many recommended actions have been initiated since the planning process began in June 1990—several as a direct result of the *CCMP* planning process. Second, *CCMP* planning estimates do not account for existing revenue sources such as the Aqua Fund bond fund and the State Revolving Funds, that may, in fact, be partially available to help finance *CCMP* implementation, recognizing that *CCMP* priorities will compete with other environmental priorities for existing revenues.

4. Although the *CCMP* cost estimates do not include expected federal costs of implementation, the *CCMP* explicitly states that federal financial assistance will be necessary to assist with implementation, particularly with respect to planned capital improvement projects. In fact, the *CCMP* has already acted as a "magnet" for external implementation funding, and may continue to do so in the future. (For example, Rhode Island received a $13 million demonstration grant under the federal Surface Transportation Act of 1991 to abate highway runoff from Interstate 95 and other coastal roadways that discharge runoff to Narragansett Bay.)

5. *CCMP* cost estimates do not include private sector costs associated with implementation. However, the NBP worked closely with affected business groups to identify economic incentives and financing options to facilitate private sector compliance with new regulatory requirements. These recommendations are incorporated into the *CCMP*. In addition, unit costs for implementing specific *CCMP* actions are reported where information is available. For example, the average cost of installing a marina pump-out facility, and the average cost per pump-out are reported, as are the average expected costs of establishing a wastewater management district (WWMD), and the annual homeowner cost of belonging to a WWMD.

6. Municipal costs are reported in the plan where available and where an accurate estimation is possible. However, the ultimate implementation costs for municipalities will vary depending on differing environmental and institutional conditions. In addition, the estimated municipal implementation costs do not include ultimate program and capital costs that may result from completion of underlying planning activities, or costs that are expected to be completely recoverable from user fees. For detailed cost estimation information, refer to the NBP technical

report, *CCMP Cost Estimation and Funding Strategy* (Apogee Research Inc./NBP, 1992)

7. A public opinion survey completed for the NBP in 1991 indicated that 47 percent of the 430 Rhode Island and 102 Massachusetts respondents believe that reducing pollution in the Bay should be an immediate priority, while an additional 46 percent believe that some work should begin immediately, but that more action should wait until the economy becomes stronger. In addition, the majority of the respondents were personally willing to pay more to protect the future of the Bay and its watershed. Although attitudes differ as to the best way to pay for cleaning up the Bay, strong support exists for several funding options:

- 91 percent believe that polluters should pay for environmental remediation through fines, taxes, or other charges;

- 79 percent would support personal tax increases to fund remedial efforts, providing that increases are not excessive and funds are used for environmental purposes;

- 78 percent would support a bond issue to fund Bay improvements; and

- 63 percent would accept increased user fees, such as increased fees for fishing licenses and beach access, as long as the increases are reasonable and the funds are dedicated for Bay-related purposes.

[Note: the margin of error for the Rhode Island portion of the survey was +/- 4.7%.]

8. Finally, the projected cost of *CCMP* implementation should be viewed within a broader economic context in two respects. First, a healthy Bay is a revenue generator—over $2 billion in revenues were generated by Bay-related activities in 1989, mostly attributable to tourism. However, the region's failure to invest in pollution abatement, source reduction, and sustainable use of the Bay's natural resources will ultimately have negative economic consequences for the entire region in terms of reduced fisheries landings, declining tourism-related revenues, and diminishing quality of life for citizens of the Bay basin. Second, *CCMP* implementation can contribute directly to economic growth in the region in terms of creating jobs and stimulating the development of new industries and technologies. For example, based on recommendations presented in the *CCMP*, area businesses could successfully exploit emerging national and international markets for innovative pollution abatement, source reduction, and waste treatment technologies. The *CCMP* also challenges public and private entrepreneurs to establish new, sustainable marine-related businesses related to aquaculture, marine research and monitoring, and marine education.

In summary, the cost of implementing the *CCMP* may superficially seem high. However, significant progress toward implementation is financially achievable if the political and institutional will exists to examine existing revenue sources, and to tailor new revenue sources to agreed-upon *CCMP* priorities.

Implementation efforts undertaken during the *CCMP* planning process will also contribute to the success of future actions to protect and restore Narragansett Bay. The NBP's efforts to develop practical planning "tools", establish permanent technical assistance programs, and obtain additional funding to support recommended planning and pollution abatement initiatives are described in Section 715-01-04 (Process of Plan Development). In addition, many agencies and organizations have also begun to implement portions of the *CCMP*. These efforts are recorded in the summary matrices following each *CCMP* chapter.

However, the "Letters of Support" (Appendix G), and the "Preliminary Agreements to Implement the Approved *CCMP*" (Section 715-05-06) possibly represent the most significant evidence of a basin-wide commitment to implement the *CCMP*. The "Letters" and "Preliminary Agreements" speak for themselves with respect to institutional willingness to participate in *CCMP* imple-

mentation. The authors of these documents clearly recognize that the *CCMP* is not perfect, that it is, however, a *plan* and, therefore, can be revised as new information becomes available and new solutions emerge. The agency agreements also explicitly state that real funding constraints exist and that successful implementation will depend upon coordinated action by federal, state and local implementing authorities, and the private sector. Most importantly, however, the "Letters of Support", and the "Preliminary Agreements" implicitly recognize that moving forward with implementation of the *CCMP* is the most responsible course of action to protect the region's long-term investment in and enjoyment of Narragansett Bay.

HIGHEST PRIORITY ACTIONS FOR IMPLEMENTATION

GOAL: ***The State of Rhode Island and the Commonwealth of Massachusetts, in conjunction with the Federal government and the municipalities, should act to prevent further degradation and incrementally improve water quality in developing coastal areas with deteriorating water quality.***

The following actions should be undertaken as soon as possible in order to prevent further degradation of water quality in rural and suburbanizing areas of the Narragansett Bay basin:

ACTION: The State of Rhode Island and the Commonwealth of Massachusetts should adopt legislation requiring municipalities to establish wastewater management districts (WWMD) in order to assure the proper inspection and maintenance of on-site sewage disposal systems (OSDS). In addition, the State and the Commonwealth should amend existing regulations governing siting, design, construction, and maintenance of on-site sewage disposal systems.

Rhode Island passed legislation in 1987 enabling municipalities to establish WWMDs to oversee the maintenance of OSDSs, and manage septage disposal within their jurisdictions. Although several municipalities are presently considering adopting WWMD ordinances, no districts have been established to date in the Narragansett Bay basin. Since the statewide OSDS failure rate is estimated to be three percent, and reportedly may be as high as 15 percent in some communities, WWMDs must be established to provide routine inspection, maintenance, and enforcement of residential and commercial OSDSs.

Both states also need to modernize the rules and regulations governing new, repaired, and replaced OSDSs. The revised regulations should address siting criteria, density limits in critical resource areas, buffer and set-back requirements, prohibitions on the use of chemical additives and garbage disposals, and enforcement. In addition, design and performance standards should be established for a range of on-site wastewater treatment technologies that can be approved for use in areas where conventional systems do not adequately protect receiving waters and/or habitat.

ACTION: The State of Rhode Island and the Commonwealth of Massachusetts should prepare a marina pump-out facility siting plan for Narragansett Bay that includes a consistent written policy for (1) regulating the construction of marinas, docks, and mooring fields; and (2) enforcing prohibitions against boater discharges in Narragansett Bay.

As of 1989, over 160 marinas, boat yards, and boat ramps were providing services to an estimated 58,000 registered and unregistered boaters in Rhode Island and Massachusetts portions of Narragansett Bay. However, only five marine pump-out stations were in operation in 1991—although three additional stations in Narragansett Bay and four stations on Block Island are expected to be in operation by Summer 1992. Although federal and state law prohibits the discharge of improperly treated vessel wastes within the three-mile territorial limit, the lack of available services, as well as observed violations of bacteriological standards in the vicinity of marine facilities, suggest that illegal discharges occur. A potentially serious public health risk exists to the extent that discharges of untreated or partially treated sewage occur near bathing beaches or shellfish harvesting areas.

Efforts to implement this recommendation are partially complete. However, RIDEM, CRMC, and Massachusetts authorities will need to reconcile inconsistent water quality and water use standards governing the use of

tidal waters in order to regulate the future construction or expansion of marine facilities. These agencies should also continue to work with harbormasters, marine trade organizations and boaters through the RIDEM Boating Safety courses and CRMC's Harbor Management Planning process to establish marine pump-out facilities, and investigate the use of boat inspection stations. Low interest loans for construction of publicly maintained pump-out facilities may be available from the Rhode Island Aqua Fund, the State Revolving Fund, or the states' Wallop-Breaux funds. Operating costs of the facilities should be recoverable from user fees. Ultimately, RIDEM and CRMC should work with coastal communities to petition the EPA to designate all or part of Narragansett Bay as a "no discharge area" in order to help protect water quality-dependent uses of Narragansett Bay.

The intent of CCMP recommendations concerning the reconciliation of CRMC and RIDEM water quality and water use standards is to:

1. Identify geographical and programmatic areas where CRMC water use and RIDEM water quality standards result in inconsistent regulation of permitted activities;

2. Reconcile, to the greatest extent possible, identified differences in water use and water quality classifications on a programmatic basis;

3. Establish appropriate memoranda of agreement between RIDEM and CRMC to ensure permitting activities by both agencies support the maintenance of water-dependent uses provided for in established water quality standards.

ACTION: The Federal government, the State of Rhode Island, and the Commonwealth of Massachusetts should develop useful guidance for municipal officials regarding (1) "best management practices" (BMPs) to control nonpoint source pollution, (2) innovative, environmentally protective land management and growth management practices, and (3) development of local and regional stormwater management plans to reduce or treat storm runoff.

Rhode Island municipalities exercise control over land use via zoning ordinances, special use ordinances, and direct state grants of authority. Municipal control over land use has recently been clarified and strengthened as the result of the Comprehensive Planning and Land Use Regulation Act of 1988 and the Zoning Enabling Act of 1991 which require communities to develop local comprehensive land use plans following state guidelines, and to adopt zoning ordinances and maps in conformance with the plans. These statutes also broaden the authority of Rhode Island municipalities to adopt and enforce environmentally protective policies. However, many communities still rely on volunteer planning and zoning boards—some without paid professional planning staffs, and few with environmentally trained professionals—to make complicated land use decisions.

In order to help assure predictable and environmentally appropriate land use decisions, local officials need standardized, practical guidance that describes pollution sources, pollution abatement options, and innovative land use and growth management controls. For example, the states should develop detailed guidance regarding regional stormwater management options, management of stormwater utilities, and design and performance standards for recommended "best management practices". Just as importantly, the municipalities need guidance on how to apply and defend the use of innovative growth and land use management techniques such as overlay protection districts, cluster zoning, development scheduling, and pollutant loading ordinances. Local officials also need straightforward descriptions of state regulatory requirements, and increased access to training and technical assistance in implementing new programs.

A great deal of useful information regarding structural and non-structural "best management practices" has already been compiled. For example, EPA has sponsored

the states' Nonpoint Source Management Programs pursuant to Section 319 of the Clean Water Act, and has prepared draft guidance for implementation of the states' Coastal Nonpoint Pollution Control Programs, as required by Section 6217 of the 1990 Amendments to the Coastal Zone Management Act. The guidance produced by the RIDOP and the Rhode Island Land Management Project to assist communities with the development of their local comprehensive plans provides the basis for future educational efforts. State efforts to prepare this information and provide technical assistance should continue. However, these efforts must be coordinated through a statewide nonpoint source advisory committee that is jointly chaired by the state environmental protection and coastal zone management agencies in order to assure consistency and avoid unnecessary duplication of effort.

GOAL: The State of Rhode Island and the Commonwealth of Massachusetts, in conjunction with the Federal government and the municipalities, should act to protect diminishing high quality critical resource areas throughout the Bay basin.

The following actions should be taken in order to effectively protect diminishing high quality critical resources in the Narragansett Bay basin:

ACTION: The State of Rhode Island and the Commonwealth of Massachusetts should develop statewide *Critical Resource Protection Policies* that include: (1) objective criteria for designating critical resources and critical resource protection areas, (2) a Geo-graphic Information System-based mapped inventory of identified resources, and (3) regulatory and non-regulatory controls for protecting identified critical resources.

Sustained use of coastal aquatic and living resources may require some areas to be retained in their natural states. For example, protection of drinking water supplies will require some limitations on development within water supply recharge areas. Similarly, critical nursery, breeding and foraging habitat for Bay fisheries, waterfowl and threatened and endangered species will have to be managed in order to protect the long-term viability of these populations. Effective protection of these coastal resources, however, will depend upon coordinated efforts to manage adjacent and upstream land areas.

The RIDOP's *Greenspace 2000* planning effort will assist Rhode Island in identifying resources that should be protected for aesthetic, recreational, and environmental reasons. The habitat inventory prepared by the NBP will also help with respect to identification of critical coastal and subtidal habitats and resources. In addition, Massachusetts' recent amendments to its Threatened and Endangered Species Act, which authorize public and private entities to nominate areas for designation as *Areas of Environmental Concern*, the Scituate Reservoir Watershed Plan, and CRMC's more recent Special Area Management (SAM) Plans provide models for managing future growth in designated critical areas.

New funds will be required to support this effort, although some funding may be available through federal grants to RIDEM for *CCMP* implementation. These funds will not be sufficient, however, to support the mapping effort or the necessary participation of state and local agencies.

ACTION: The Rhode Island Coastal Resources Management Council (CRMC), the Rhode Island Department of Environmental Management (RIDEM), and other state and local planning and implementing authorities should undertake the preparation of a *Special Area Management (SAM) Plan* for Greenwich Bay.

The strengths of the CRMC's *SAM Plan* process are that it recognizes the role of local government in governing land use, and that it can be used as a vehicle to focus the efforts

of state regulatory agencies. The Greenwich Bay *SAM Plan* should explicitly address point and nonpoint pollution sources, the need for additional sewering in the Greenwich Bay basin based on existing and projected population growth, long-term management of the Greenwich Bay Shellfish Management Area, and protection of remaining critical marine resources. Data collected by the NBP and others, including an engineering review of wastewater treatment infrastructure in the basin, should be used to develop the SAM Plan in combination with local land use and facilities plans.

Partial funding for development of a preliminary Greenwich Bay basin plan may be available via a Rhode Island Aqua Fund grant to the NBP, and an interagency agreement to prepare the plan has been in existence since November 1990. Additional funds may be necessary to develop a more detailed *SAM Plan*, and will be necessary to fund eventual implementation of point and nonpoint source controls.

GOAL: ***The State of Rhode Island and the Commonwealth of Massachusetts, in conjunction with the federal government, should act to more effectively manage commercially, recreationally, and ecologically important estuarine-dependent living resources.***

The following actions should be taken in order to assure that a balanced and biologically diverse indigenous population of estuarine-dependent flora and fauna is maintained in Narragansett Bay:

ACTION: The State of Rhode Island and the Commonwealth of Massachusetts should develop species-specific management plans for managing: (1) commercially, recreationally, and ecologically important fish and shellfish, (2) all threatened and endangered estuarine-dependent plants and animals, and (3) the re-introduction of native anadromous and catadromous fisheries to Bay tributaries, wherever possible.

Rhode Island's wildlife management efforts primarily focus on commercially harvestable living resources because of limited state appropriations, staffing shortages, and the requirements of federal granting agencies. Apart from the RIDEM Natural Heritage program's efforts to monitor the distribution and abundance of threatened and endangered species, there is no systematic effort to manage ecologically important estuarine-dependent plants and animals, or their habitats. In addition, the RIDEM Division of Fish and Wildlife's efforts to manage commercially important fisheries and re-establish native anadromous fisheries rarely include efforts to protect critical breeding or nursery habitats or related elements of the ecosystem.

Therefore, the proposed management plans should identify the causes of observed declines in Narragansett Bay fish, invertebrate, and plant species, and propose specific management strategies for their protection, restoration, and management. The plans should also address protection and management of key breeding, spawning, and foraging habitats of estuarine-dependent plants and animals. A Narragansett Bay *Quahog Management Plan* should be considered the highest priority because of the economic and historic importance of the quahog fishery in Rhode Island, and the effect of sewage contamination of coastal waters on the future of the industry. This plan should be completed prior to any decision to re-open Mount Hope Bay or upper Narragansett Bay to shellfish harvesting as a result of CSO abatement in these areas. Native anadromous fisheries also deserve special attention because of their reliance on unimpaired riverine water quality and unrestricted river flow. Restoration of native fisheries such as shad and Atlantic salmon should be viewed as indicators of

riverine health as the Bay's tributaries are restored.

The RIDEM Division of Fish and Wildlife has recently completed a winter flounder management plan, as well as species' profiles for several commercially and recreationally important fishes. The profiles represent an important source of information to support the development of subsequent management plans. Additional state funding will be required to support this effort. However, the U.S. Fish and Wildlife Service and the National Marine Fisheries Service should be strongly encouraged to expand or revise their grant eligibility criteria to support the states' efforts to develop these management plans, particularly for ecologically important species and their associated habitats.

GOAL: ***The State of Rhode Island and the Commonwealth of Massachusetts, in conjunction with the Federal government and the municipalities, should act to rehabilitate degraded waters in the Bay basin and restore water quality-dependent uses of Narragansett Bay.***

The following actions should be initiated as soon as possible in order to reduce the discharge of toxic pollutants, untreated fecal wastes, and sewage-derived floatables to Narragansett Bay and its tributary waters:

ACTION: The U.S. Environmental Protection Agency (EPA), the State of Rhode Island, and the Commonwealth of Massachusetts should: (1) revise existing municipal and industrial discharge permits to include enforceable, numeric, and chemical-specific limits for all toxic chemicals listed on the Narragansett Bay "List of Toxics of Concern," (2) enforce compliance with these revised discharge limits, and (3) include other significant non-industrial sources of toxic chemicals within these regulatory programs in order to meet state water quality goals for state waters.

There is persuasive scientific evidence that the regulatory programs initiated pursuant to the Federal Clean Water Act, in combination with voluntary source reduction efforts by industry, improvements in wastewater treatment technology, and outright product bans, have been moderately successful in reducing toxic pollutant discharges to Narragansett Bay. However, the existing federal and state regulatory programs control only some of the pollutant sources and pollutants that are potentially of public health or environmental concern. In addition, due to competing program requirements, existing chemical limits intended to protect human health and aquatic life are rarely enforced by EPA, the states, or the municipalities. Although EPA and the states should focus on regulating discharges of toxic pollutants, they should also support efforts to reduce the use of these pollutants. Innovative efforts by organizations such as Rhode Island's Hazardous Waste Reduction Program, Massachusetts' Blackstone Project and the Rhode Island Pollution Prevention Council to promote source reduction (*e.g.*, conservation, raw material substitution, recycling, use of recycled and reclaimed materials) should, therefore, continue to be supported.
Additional funds will be required to support expansion of existing regulatory programs at both the state and municipal level. Potential funding sources include discharge fees assessed on the basis of the volume of water used and/or pollutant characteristics of the waste, penalties for violations of discharge limits, set-asides from the *Hard to Dispose of Materials* tax, and general appropriations. The states' source reduction efforts should also be funded from these revenue sources.

ACTION: The U.S. Environmental Protection Agency (EPA), the State of Rhode Island, the Commonwealth of Massachusetts, and the relevant municipalities and publicly owned wastewater treatment facilities (WWTFs) should proceed with current efforts to abate the combined sewer overflows (CSOs) in Mount Hope Bay and the

Providence and Blackstone Rivers in accordance with a statewide CSO abatement priority ranking system.

CSO abatement is required by EPA, RIDEM, and the Massachusetts Department of Environmental Protection completely independently of the *CCMP*. CSOs in the City of Fall River are directly and overwhelmingly responsible for the closure of Mount Hope Bay to shellfishing. The City of Fall River is presently under an EPA compliance order to abate these CSOs, and has reportedly eliminated illegal dry weather discharges to the Quequechan River. Rhode Island and Massachusetts should synchronize negotiation of interstate agreements about Mount Hope Bay water quality standards, and future plans for regulating shellfish harvesting with Massachusetts' plans for abatement of the Fall River CSOs.

CSOs and WWTF bypasses in the Providence-Blackstone-Seekonk Rivers were responsible for closing the conditional shellfishing areas in upper Narragansett Bay for 281 days in 1990. Until recently, jurisdiction over the 89 CSOs in the Providence-Seekonk River basins was divided between the Narragansett Bay Water Quality District Commission (NBC) and the Blackstone Valley District Commission (BVDC). The merger of the BVDC and the NBC in early 1992 should, therefore, facilitate the development of a comprehensive, basinwide plan for abating these CSOs in a cost-effective and environmentally beneficial manner.

Estimated costs for abatement of the Fall River CSOs are approximately $122 million. Abatement of the Providence-Blackstone-Seekonk River CSOs is projected to exceed $325 million. A significant portion of the costs for construction of CSO abatement facilities is expected to be recovered from sewer use fees although some funding may be available through the State Revolving Funds, subject to other state priorities for wastewater treatment projects.

GOAL: ***The State of Rhode Island and the Commonwealth of Massachusetts, in conjunction with the federal government and the municipalities, should establish necessary interstate and interagency agreements to coordinate and oversee implementation of the Narragansett Bay Comprehensive Conservation and Management Plan.***

The following actions should be undertaken in order to assure coordinated implementation of the *CCMP* and to achieve measurable progress toward restoring and protecting Narragansett Bay:

ACTION: The U.S. Environmental Protection Agency (EPA), the State of Rhode Island, and the Commonwealth of Massachusetts should cooperate to establish a Narragansett Bay Implementation Committee, a Narragansett Bay Policy Committee, and a Narragansett Bay planning section to: (1) coordinate and oversee *CCMP* implementation, including negotiation of interagency agreements where necessary, (2) participate in *CCMP* implementation by drafting necessary legislation, regulations, and policies, and by participating as commenters in federal consistency reviews, (3) supervise and review the results of the long-term monitoring program, and (4) revise the *CCMP*, as necessary, based on new scientific, policy, and/or economic information.

Completion of the *CCMP* signals the beginning of the implementation process. The ability of the federal, state, and local authorities in the Narragansett Bay basin to implement the *CCMP* obviously depends upon available funding. However, implementation of the *CCMP* also depends upon coordinated interstate and interagency action, public support, and the ability to continuously upgrade and refine *CCMP* recommendations, priorities, and implementation schedules. Therefore, the imple-

menting authorities should continue to work together to coordinate their actions, solicit public comment, evaluate progress, and revise the *CCMP* based upon new scientific, policy, and economic information.

The Narragansett Bay Implementation Committee, modeled after the Narragansett Bay Project Executive Committee, should be responsible for coordinating agency action. The Narragansett Bay Policy Committee, modeled after the Narragansett Bay Project Management Committee, should provide a permanent forum for the public to comment on policy matters related to the health and governance of Narragansett Bay. A Narragansett Bay planning section should be established within RIDEM to provide staff support to *CCMP* implementing authorities; oversee the long-term monitoring program; and assist with *CCMP* implementation.

The recommended oversight committees are expected to be volunteer boards that meet routinely to review progress to date. Some external funding may be available from the EPA to oversee *CCMP* implementation. These funds, in conjunction with appropriate state funds, should be sufficient to support basic staff activities on behalf of the Narragansett Bay *CCMP*.

ACTION: The U.S. Environmental Protection Agency (EPA), the State of Rhode Island, the Commonwealth of Massachusetts, and other federal, state, and local authorities should cooperate in the execution of a long-term monitoring program for Narragansett Bay in order to measure the effectiveness of actions taken pursuant to the *CCMP* and to evaluate trends in the status and health of Narragansett Bay .

Section 320 of the federal Clean Water Act requires participants in the National Estuary Program to evaluate the effectiveness of actions taken pursuant to the *CCMP* and to report biennially to Congress on the status and health of the estuary. The long-term monitoring plan for Narragansett Bay builds on baseline physical, chemical, biological, and physiographic information collected by the NBP and others since 1985. The monitoring plan will enable regulators, planners, and scientists to evaluate the success of pollution control and source reduction measures, CSO abatement, and living resource management efforts, as well as to evaluate changes in the health of Narragansett Bay and its living resources.

Since over 40 separate monitoring programs administered by different federal, state, and local agencies are presently collecting information relevant to the management of Narragansett Bay, the State of Rhode Island should also make a concerted effort to establish and maintain a centralized natural resources database to archive this information. A centralized repository of natural resources data, linked to the existing Narragansett Bay Data System (NBDS) and the Rhode Island Geographic Information System (RIGIS), will enable resource managers to more effectively identify natural resource problems and trends.

The success of the long-term monitoring program in future years will depend upon coordinating the activities of all agencies that support monitoring programs, and also upon additional federal and state funding. The nucleus of a statewide natural resources database presently exists in the form of the NBDS and the RIGIS. However, an additional and continuing source of funds will be required to maintain the databases for the use of all state and local resource management agencies. Discussions are presently under way with regard to affiliating the NBDS with the University of Rhode Island's Coastal Institute.

SUMMARY

The high priority implementation actions, which are described more completely in the body of the *CCMP*, represent only a subset of all the pollution abatement and resource protection initiatives recommended in the Plan. (See Table II and Table 715-06(1) .) Although the Narragansett Bay *CCMP* borrows and descends from a long line of basin planning efforts in the State of Rhode Island, this Plan proposes many sweeping changes in the way government and the public address environmental protection. Most of the recommended actions anticipate and promote changes in the way citizens of Rhode Island and Massachusetts use raw materials and dispose of waste—the *CCMP* consistently stresses reduction in the use of polluting substances as the most cost-effective means to protect the integrity of the Bay ecosystem. Most of the recommended actions acknowledge that Narragansett Bay and the Bay basin will experience surges in growth over the next few decades—the *CCMP* consistently stresses the need to manage the impacts of the rate and distribution of growth as the only hope for protecting Narragansett Bay and avoiding costly remedial efforts in the future. Most importantly, all of the recommended actions consider Narragansett Bay within the context of its watershed and within the context of its changing demographics and use—the *CCMP* stresses that protection of Narragansett Bay cannot be separated from protection of its watershed. Finally, the *CCMP* also attempts to nurture the sense of stewardship that many Rhode Islanders already feel for the Bay. Therefore, the *Comprehensive Conservation and Management Plan* represents a view shared by many citizens of the Narragansett Bay basin: The protection and restoration of Narragansett Bay are realistically within the grasp of the Bay's managers, its trustees, *and most importantly*, its beneficiaries.

The Narragansett Bay Project Management Committee met on July 27, 1992, and recommended that the *CCMP* be transmitted to the Narragansett Bay Project Executive Committee for final approval. The Executive Committee met on August 4, 1992, and voted (three in favor and one abstention) to send the *CCMP* to the Governor of Rhode Island and the Administrator of the U.S. EPA for their signatures.

Providence, Rhode Island

15 August 1992

Mr. Ronald Manfredonia, Chair
NBP Executive Committee

The Narragansett Bay Project Executive Committee:

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TABLE I. SUMMARY OF BAY PROBLEMS, RANKED, BY REGION

BAY-WIDE			
PROBLEM(S)	**CAUSE(S)**	**SOURCE(S)**	**RISKS**
1. Loss of major fisheries	1. Overfishing	1. Efficiency of harvesting techniques, and level of effort 2. Lack of adequate information, and resource management structure	Failure to intervene will perpetuate the cycle of collapsing commercial fisheries, and resulting economic hardship.
	2. Habitat loss	1. Lack of adequate land use controls to protect critical habitats from effects of population growth and development 2. Habitat degradation due to point and nonpoint pollutant inputs	Failure to intervene will result in incremental loss of critical habitats, habitat degradation, eventual loss of biological diversity, and increased limitations on human use and enjoyment of natural resources.
2. Limitations on water quality-dependent uses	1. Fecal contamination	1. Human sewage from WWTFs 2. Human sewage from CSOs 3. Human sewage from OSDSs, storm drains, boater discharges	Failure to more effectively disinfect WWTF discharges and abate CSO discharges will permanently limit shellfish harvesting in urban areas. Failure to abate nonpoint pollution sources will result in increased closures of harvesting areas in suburbanizing regions.
	2. Toxics contamination	1. Industrial discharges and emissions 2. Residential, commercial discharges, motor vehicle emissions and runoff 3. Accidental chemical spills	Failure to reduce use and disposal of toxic pollutants will result in long-term public health risk to seafood consumers, incremental environmental degradation, and damage to aquatic organisms.

TABLE I. SUMMARY OF BAY PROBLEMS, RANKED, BY REGION

SUBURBANIZING AND UNDEVELOPED AREAS *e.g.*, **PARTS OF THE SAKONNET RIVER**			
PROBLEM(S)	**CAUSE(S)**	**SOURCE(S)**	**RISKS**
1. Trend toward habitat degradation and loss	Lack of adequate land use and development density controls to protect critical habitats and water quality	Rate and pattern of population growth and development	Failure to more effectively regulate land use and the density of development will result in incremental loss of critical habitats for aquatic plants and animals, and incremental degradation of water quality.

SUBURBAN AND URBANIZING AREAS *e.g.*, **GREENWICH BAY, NEWPORT HARBOR**			
PROBLEM(S)	**CAUSE(S)**	**SOURCE(S)**	**RISKS**
1. Trend toward limitation on water quality-dependent uses	Fecal contamination	Human sewage from WWTFs, OSDSs, storm drains, boater discharges	Failure to abate or more effectively treat existing sources of fecal contamination, and failure to limit density of future development dependent on septic systems will result in increased closures of shellfish harvesting areas, and other limitations on water quality-dependent uses.

TABLE I. SUMMARY OF BAY PROBLEMS, RANKED, BY REGION

2. Pockets of contaminated sediments	Toxics contamination and excess organic loadings	Historic and current discharges of toxic pollutants and domestic wastes from local industrial, commercial and residential sources	Failure to reduce use and disposal of toxic pollutants will result in further environmental degradation, may increase the long-term health risk to seafood consumers, and will limit future dredging and dredged material disposal options.
3. Habitat degradation and loss	Lack of adequate land use and development density controls to protect critical habitats	Rate and pattern of population growth and development	Failure to protect remnant critical habitats will result in incremental loss of critical habitats for aquatic plants and animals, incremental degradation of water quality, and eventual loss of biological diversity.

MOUNT HOPE BAY			
PROBLEM(S)	**CAUSE(S)**	**SOURCE(S)**	**RISKS**
1. Limitations on water quality-dependent uses	1. Fecal contamination	1. Combined sewer overflows - Fall River	Failure to abate Fall River CSOs will result in permanent closure of 6,820 acres in Mount Hope Bay and parts of the Kickemuit River to commercial quahog, oyster, mussel fisheries.

TABLE I. SUMMARY OF BAY PROBLEMS, RANKED, BY REGION

PROVIDENCE-SEEKONK RIVER

PROBLEM(S)	CAUSE(S)	SOURCE(S)	RISKS
1. Limitations on water quality-dependent uses. (Also applies to segments of the Blackstone, Pawtuxet, Woonasquatucket, Moshassuck and Ten Mile Rivers.)	1. Fecal contamination	1. Human sewage from WWTFs 2. Human sewage from CSOs	Failure to more effectively disinfect WWTF discharges will result in continued closure of 5,430 acres to shellfish harvesting and swimming. Failure to abate CSOs will result in continued (intermittent) closure of 9,853 acres to shellfish harvesting.
2. Exceedance of Federal and state water quality standards intended to protect aquatic life and public health. (Also applies to segments of the Blackstone, Pawtuxet, Woonasquatucket, Moshassuck and Ten Mile Rivers.)	1. Toxics contamination, and excess nutrient inputs	1. Industrial, residential, commercial discharges through WWTFs and runoff (toxics) 2. Human sewage from WWTFs (nutrients)	Failure to reduce use and disposal of toxic pollutants will result in long-term health risk to seafood consumers, and further environmental degradation. Failure to reduce excess nutrient inputs could result in algal blooms, prolonged episodes of low oxygen, and/or fish kills.
3. Contaminated sediments. (Also applies to segments of the Blackstone, Pawtuxet, Woonasquatucket, Moshassuck and Ten Mile Rivers.)	1. Toxics contamination	1. Historic and current discharges of toxic pollutants and domestic wastes from sources in the Providence River basin, including the Blackstone and Pawtuxet Rivers	Failure to reduce use and disposal of toxic pollutants will result in further environmental degradation and long-term public health risk to seafood consumers, and will limit future dredging and dredged material disposal options.

TABLE II. HIGHEST PRIORITY ACTIONS FOR IMMEDIATE IMPLEMENTATION

Recommended Action	Implementing Authorities	Goal no.					Cost by Year		Implementation Status
		1	2	3	4	5	92-93	93-94	
Adopt legislation requiring municipalities to establish wastewater management districts and amend existing regulations governing siting, design, construction, and maintenance of on-site sewage disposal systems.	RIDEM, MADEP, CRMC, RIDOP, municipalities or utilities, *e.g.*, WWTFs	X					95,000	0	Estimated cost is for dev'pt of OSDS regulations. Estimated first year cost to establish WWMD is $150,000, recoverable from user fees. [See RIDEM's "Preliminary Agreement".]
Implement a marina pump-out facility siting plan for Narragansett Bay that includes a consistent written policy for (1) regulating the construction of marinas, docks, and mooring fields; and (2) enforcing prohibitions against boater discharges in Narragansett Bay.	RIDEM, CRMC, municipal and private boating facilities	X					45,000	0	Cost estimate includes RIDEM-CRMC coordination efforts. Estimated cost of installing pump-outs ($11,500) is not included. [See EPA and RIDEM "Preliminary Agreements".]
Develop guidance for municipal officials regarding (1) "best management practices" to control nonpoint source pollution, (2) innovative, environmentally protective land management and growth management practices, and (3) development of local and regional stormwater management plans to reduce or treat storm runoff.	RIDEM, MADEP, CRMC, MACZM, RIDOP, EPA, USDA, NOAA, RI and MA Cooperative Extensions	X					111,000	111,000	Some funding may be available from EPA, NOAA, and USDA through CWA Section 319, CZMA Section 6217, and USDA SCS nonpoint source control initiatives. [See EPA, USDA SCS, RIDEM and RIDOP "Preliminary Agreements."]
Develop statewide *Critical Resource Protection Policies* that include (1) objective criteria for designating critical resources and critical resource protection areas, (2) a Geographic Information System-based mapped inventory of identified resources, and (3) regulatory and non-regulatory controls for protecting identified critical resources.	RIDEM, MADEP, CRMC, MACZM, RIDOP, municipalities		X				180,000	105,000	Some external federal funding may be available in 92-93 to initiate policy development. [See RIDEM and RIDOP "Preliminary Agreements".]

See 715-05-06 "Preliminary Agreements to Implement the Approved Narragansett Bay *CCMP*.

TABLE II. HIGHEST PRIORITY ACTIONS FOR IMMEDIATE IMPLEMENTATION

Recommended Action	Implementing Authorities	Goal no.					Cost by Year		Implementation Status
		1	2	3	4	5	92-93	93-94	
Prepare a Special Area Management (SAM) Plan for Greenwich Bay.	CRMC, RIDEM, RIDOP, munic.		X				150,000	100,000	$150,000 may be available for preliminary Greenwich Bay Plan. [See RIDEM-CRMC-NBP Interagency MOA (1991).]
Develop species-specific management plans for managing (1) commercially, recreationally, and ecologically important fish and shellfish; (2) all threatened and endangered estuarine-dependent plants and animals; and (3) the re-introduction of native anadromous and catadromous fisheries to Bay tributaries, wherever possible.	NOAA, USFWS, RIDEM, MADFW			X			N/A	N/A	No cost estimate prepared. Quahog Management Plan is highest priority. [See RIDEM "Preliminary Agreement", pending availability of funding.]
(1) Revise existing municipal and industrial discharge permits to include enforceable, numeric, and chemical-specific limits for all toxic chemicals listed on the Narragansett Bay "List of Toxics of Concern," (2) enforce compliance with these revised discharge limits, and (3) include other significant non-industrial sources of toxic chemicals in these regulatory programs in order to meet state water quality goals for state waters.	EPA, RIDEM, MADEP, WWTFs				X		50,000	62,500	Costs estimated only for state permitting and enforcement efforts. WWTF costs are recoverable from user fees, and are not presented. [See EPA and RIDEM "Preliminary Agreements".]
Continue efforts to abate the combined sewer overflows (CSOs) in Mount Hope Bay and the Providence and Blackstone Rivers in accordance with a statewide CSO abatement priority ranking system.	EPA, RIDEM, MADEP, NBC, City of Fall River				X		15,192,500	19,732,000	Primarily planning and design costs. Major capital construction costs begin in 94-95. [See EPA and RIDEM "Preliminary Agreements".]

See 715-05-06 "Preliminary Agreements to Implement the Approved Narragansett Bay *CCMP*.

TABLE II. HIGHEST PRIORITY ACTIONS FOR IMMEDIATE IMPLEMENTATION

Recommended Action	Implementing Authorities	Goal no.					Cost by Year		Implementation Status
		1	2	3	4	5	92-93	93-94	
Establish a Narragansett Bay Implementation Committee, a Narragansett Bay Policy Committee, and a Narragansett Bay planning section to oversee *CCMP* implementation.	NBP Executive Committee, NBP Management Committee					X	270,000	270,000	Some external federal funding available in 92-93 and 93-94 to begin implementation. [See EPA, RIDEM, RIDOP "Preliminary Agreements".]
Implement a long-term monitoring program for Narragansett Bay	RIDEM, MADEP, EPA, NOAA, RIDOH, MADPH					X	250,000	250,000	Coordination of on-going programs will offset projected cost. [See EPA ERLN's "Preliminary Agreement".]
Total cost							**16,343,500**	**20,630,500**	

See 715-05-06 "Preliminary Agreements to Implement the Approved Narragansett Bay *CCMP*.

TABLE III. SUMMARY OF ESTIMATED CCMP COSTS

COST ESTIMATES BY SUBJECT	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
Source Reduction: Toxics	1,532,500	755,000	720,000	755,000	918,500	1,801,000	853,500	1,116,000	853,500	1,116,000	4,878,000	5,543,000
Source Reduction: Nutrients	2,500	150,000	29,375	0	30,625	400,000	54,375	0	29,375	0	146,250	550,000
Source Control: Water Management and Wastewater Treatment	20,000	0	20,000	0	46,250	0	45,000	0	20,000	0	151,250	0
Source Control: Combined Sewer Overflows	102,500	15,090,000	60,000	19,672,000	82,500	103,481,000	65,000	116,462,000	70,000	86,222,250	380,000	340,927,250
Source Control: On-Site Sewage Disposal Systems	138,750	5,000,000	5,000	0	130,000	0	85,000	0	92,500	0	451,250	5,000,000
Source Control: Boater Discharges	210,000	107,250	10,000	6,000	57,500	6,180	20,000	6,000	20,000	6,000	317,500	131,430
Source Reduction: Nonpoint Sources	828,750	12,000	400,000	12,000	880,750	97,000	3,172,000	97,000	3,072,000	97,000	8,353,500	315,000
Land Use	257,500	12,000	167,500	12,000	437,500	12,000	330,000	12,000	305,000	12,000	1,497,500	60,000
Protection of Critical Areas	315,000	334,000	165,000	417,000	211,250	250,000	145,000	167,000	145,000	167,000	981,250	1,335,000
Public Health	384,000	354,550	281,500	340,000	521,500	355,000	456,500	340,000	471,500	340,000	2,115,000	1,729,550
Mount Hope Bay	182,500	50,000	15,000	50,000	37,500	250,000	15,000	0	15,000	0	265,000	350,000
Blackstone River	360,625	134,750	110,625	20,750	355,000	12,140,000	125,000	12,000	125,000	12,000	1,076,250	12,319,500
CCMP Implementation and Governance	448,750	265,000	390,000	265,000	400,000	265,000	400,000	265,000	400,000	265,000	2,038,750	1,325,000
TOTALS	4,783,375	22,264,550	2,374,000	21,549,750	4,108,875	119,057,180	5,766,375	118,477,000	5,618,875	88,237,250	22,651,500	369,585,730
TOTAL BY YEAR		**27,047,925**		**23,923,750**		**123,166,055**		**124,243,375**		**93,856,125**		**392,237,230**

715-01 INTRODUCTION

In establishing the National Estuary Program, the United States Congress recognized the special need to protect an important but endangered resource: our nation's estuaries. Four regional estuary projects were created in 1985, modeled on the Chesapeake Bay Program's multi-state effort to manage watershed-based impacts on the Bay. The 1987 amendments to the Clean Water Act formally established the National Estuary Program (NEP), and identified six "estuaries of national significance," including Narragansett Bay, that appeared to be threatened by pollution, overdevelopment or overuse. The goal of the NEP, which is administered by the United States Environmental Protection Agency (EPA), is to protect and improve estuarine water quality and habitat in order to support balanced and diverse marine resources, and to restore water quality-dependent uses of the estuary. Specifically, Section 320 of the federal Clean Water Act of 1987 directs participants in the NEP to convene Management Conferences to develop "Comprehensive Conservation and Management Plans" in order to "...recommend priority corrective actions and compliance schedules addressing point and nonpoint sources of pollution to restore and maintain the chemical, physical and biological integrity of the estuary, including restoration and maintenance of water quality, a balanced indigenous population of shellfish, fish and wildlife, and recreational activities in the estuary, and assure that the designated uses of the estuary are protected."

The Narragansett Bay Project (NBP) was established in 1985 under the joint sponsorship of the EPA and the Rhode Island Department of Environmental Management (RIDEM). A Narragansett Bay Management Conference was formally convened for the purpose of preparing a Narragansett Bay *Comprehensive Conservation and Management Plan* (*CCMP*) when Narragansett Bay was officially designated an "estuary of national significance" on March 11, 1988. The NBP's mandate is to develop a comprehensive management plan for restoring, protecting and managing Narragansett Bay's natural resources based on a thorough evaluation of the Bay's water quality, natural resource and use-related problems. The NBP has received over $10 million since 1985 from federal appropriations provided under the federal Clean Water Act and matching funds provided by the State of Rhode Island.

01-01 The Need for a Comprehensive Conservation and Management Plan

In 1985, citing its concern for the "health and ecological integrity" of the nation's estuaries and estuarine resources, the United States Congress identified Narragansett Bay as one of four urban estuaries, nationwide, that required prompt, coordinated government action to reverse a trend toward deteriorating water quality, gradual loss of natural resources and increasing impairment of water quality-dependent uses of the estuary, such as shellfish harvesting. The NBP was subsequently established to administer a five year study of the Bay and its resources.

Public opinion surveys and goal-setting workshops conducted by the NBP in 1986 and early 1987 confirmed that many Rhode Islanders shared Congress' perception that Narragansett Bay was in poor health and needed coordinated public action to restore and protect it for future generations. As a result, the NBP's mandate was explicitly broadened to require the development of a *CCMP* to restore and protect Narragansett Bay under the 1987 amendments to the federal Clean Water Act. The need for a comprehensive management plan that addresses the entire Narragansett Bay watershed is more completely documented in Section 715-02 ('State of the Bay') and Section 715-04 ('Issues and Strategies'). [A list of commonly used abbreviations and acronyms is given in Appendix A.]

01-02 History of the Project

The NBP program office was established in 1985 under the joint sponsorship of the EPA and the RIDEM to develop a comprehensive strategy to address water quality and living

resource problems throughout the watershed, based on a directed study of the Bay and its resources. Through the process described in Section 01-04, the NBP identified seven issues that required additional study and possible corrective action:

1. Impacts of toxic pollutants;

2. Impacts of nutrients and eutrophication;

3. Land-based impacts on water quality;

4. Health and abundance of living resources and habitat;

5. Fisheries management;

6. Health risk to consumers of seafood; and

7. Recreational uses of Narragansett Bay. (Korch *et al.*, 1989:1)

Based on these seven issues of concern, the NBP, with the advice and approval of the NBP's governing committees (See Section 01-03), then began a comprehensive and integrated course of scientific study to describe the geographic distribution, magnitude and source(s) of environmental, public health and use-related problems facing Narragansett Bay. Over 110 scientific and policy-related studies were funded by the NBP between 1985 and 1991, several of them in cooperation with other federal and state agencies with jurisdiction in the Narragansett Bay watershed. These studies provided the basis for further policy development and specific recommendations for corrective action.

Under the 1987 amendments to the Clean Water Act, the NBP was nominated for inclusion in EPA's National Estuary Program. On March 11, 1988, Mr. Lee Thomas, Administrator of the EPA, and Rhode Island Governor Edward D. DiPrete signed a 'designation agreement' that officially recognized Narragansett Bay as "an estuary of national significance," included the NBP as a member of the National Estuary Program, and committed the EPA and the State of Rhode Island to developing an implementable *Comprehensive Conservation and Management Plan* (*CCMP*) for Narragansett Bay.

The NBP continued to conduct scientific and policy-related surveys of the Bay and Bay basin following the 'designation agreement'. However, the Project also began to emphasize implementation of corrective actions. For example, the NBP:

1) established demonstration projects in the areas of nonpoint source pollution control ('Land Management Project'), toxic pollutant use reduction ('Hazardous Waste Reduction Project') and coordination of citizens' monitoring programs ('Citizens' Monitoring Project');

2) developed a Narragansett Bay Data System for the archival and analysis of long-term monitoring data;

3) developed planning tools for state and local resource managers such as a watershed-based pollutant loading model, technical guidance for delineation of buffer strips, and a mapped inventory of key coastal and subtidal habitats and species;

4) successfully competed for additional funds to develop a preliminary basin plan for Greenwich Bay, collect information to support basin planning efforts in Mount Hope Bay and the Blackstone River, and design and construct storm runoff controls on Interstate Highway 95;

5) participated on various state commissions involved with drafting legislation and/or developing statewide policy in the areas of water conservation, septage management, regionalization of municipal wastewater treatment facilities, protection of critical areas, and distribution of Aqua Fund bond funds for remediation of identified problems in Narragansett Bay; and

6) focused its public outreach program on implementation strategies for correcting identified environmental problems.

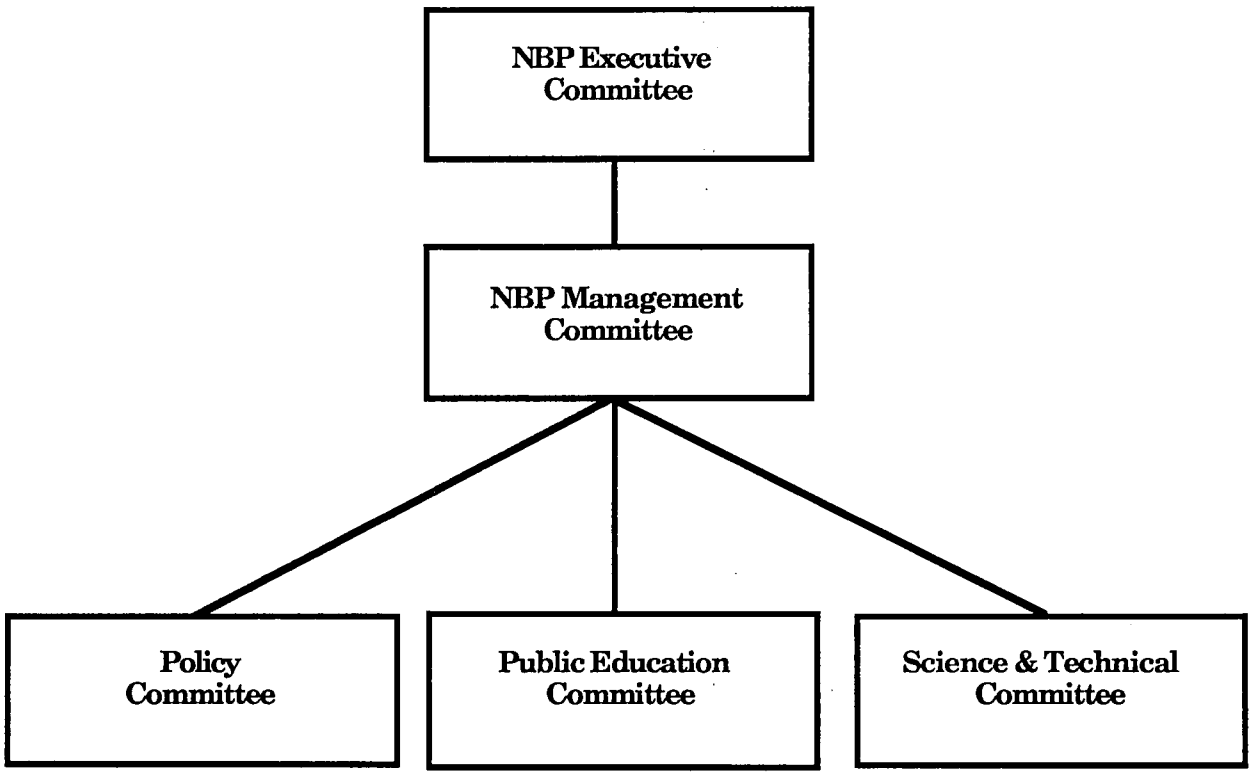
01-03 Project Governance

All activities of the NBP were governed by a hierarchy of advisory committees [Figure 715-01(1)]. The NBP Executive Committee, comprised of the Regional Administrator of the EPA Region I and the Director of the RIDEM, exercised ultimate decision-making authority regarding NBP policy direction between 1985 and 1990. In early 1990, the Executive Committee was expanded to include the Associate Director of the Rhode Island Division of Planning (RIDOP) and the Chair of the Rhode Island Coastal Resources Management Council (CRMC) as the NBP began to develop interagency agreements about implementation of the *CCMP*.

The NBP Management Committee was established in 1985 as the Project's primary decision-making body. The Committee provided broad representation to a diverse group of managers and users of Narragansett Bay in the interest of achieving the broadest possible consensus about the Narragansett Bay *CCMP*. Federal, state, and local officials from Rhode Island and Massachusetts as well as representatives from marine, land development and metals industry trade organizations; environmental and commercial fishing organizations; and academia were represented at the invitation of the Executive Committee. Since 60% of the Bay watershed lies in Massachusetts, Massachusetts representation on the Management Committee was crucial to the development of CCMP recommendations and the orchestration of subsequent implementation activities. [A complete list of NBP Management Committee members is given in Appendix B.] The more than 100 professionals who served on the Management Committee between 1985 an 1992 donated their time, energy, and ideas to help oversee all phases of the development of the *CCMP* from design

Figure 715-01 (1).

Structure of Narragansett Bay Project Advisory Committees



of the research program through completion of the final *CCMP*. The Management Committee, which reported to the Executive Committee, also established subcommittees to advise Project staff and the Management Committee on specialized issues in different areas of expertise. Standing NBP subcommittees included the Policy, Public Education, and Science and Technical Advisory Committees. A technical staff housed within the RIDEM administered the daily activities of the Project and reported to the Management Committee. [A complete list of NBP subcommittee members is provided in Appendix B. A complete list of NBP staff is presented in Appendix B.]

01-04 Process of Plan Development

At the heart of the Narragansett Bay Project was an extensive research effort to objectively identify environmental problems and trends in the Bay and Bay watershed. This was coupled with a deliberate effort to reach common agreement about goals for Narragansett Bay and an open planning process. Public opportunities to participate in the planning process included conferences and "roundtable" discussions, a review of *CCMP* research and recommendations by the broadly representative NBP Management Committee and relevant Bay constituencies, a series of public information meetings on the draft *CCMP*, in association with a 101-day public comment period, and a formal public hearing conducted by the Rhode Island State Planning Council (Korch *et al.*, 1989:1).

The *CCMP* planning process involved four major steps which are described in more detail below:

1) Research and (early) implementation projects;

2) Public participation;

3) Planning and preliminary review; and

4) *CCMP* review and approval.

(A schematic illustrating the entire *CCMP* development process from research through the adoption of the *CCMP* is shown in Figure 715-01(2).)

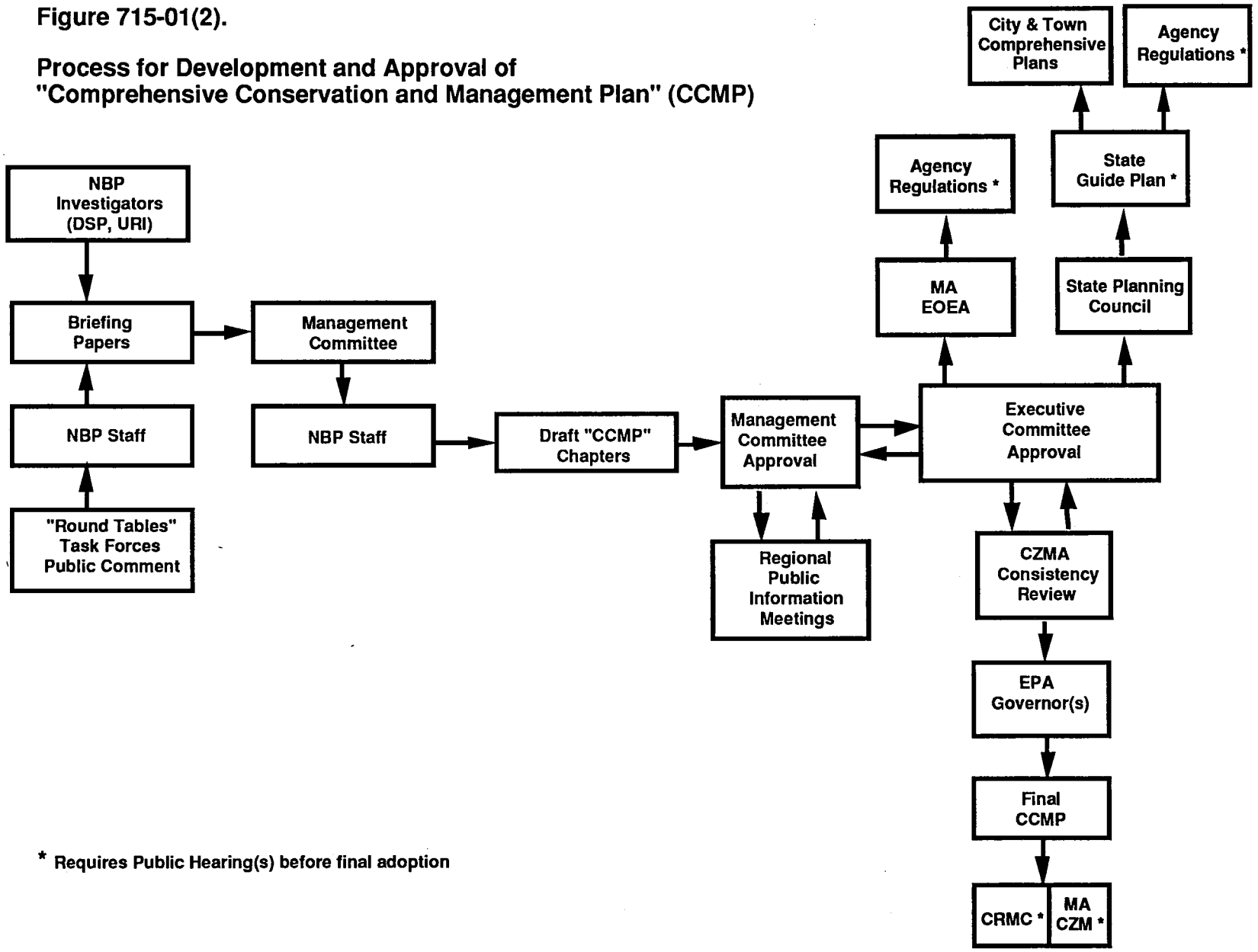
01-04-01 Research and (Early) Implementation Projects

The Narragansett Bay Project funded over 110 scientific and policy-related research projects from 1985 to 1991 in order to systematically examine the major issues of concern identified by the Management Committee and the general public. [See Section 01-04-02 regarding the NBP's process for identifying issues of concern and preliminary goals for restoring and protecting Narragansett Bay.] Research was conducted in the following areas: water and sediment quality, water quality modeling, land-use impacts on environmental quality, health and abundance of living resources and critical habitats, environmental policy and institutional analysis, and economics and public finance. [A bibliography of approved NBP research reports is given in Appendix C.] Approximately 75 percent of the NBP's entire budget went to supporting this research effort between 1985 and 1990. The remainder of the NBP budget went to program administration, public education, data management and supporting demonstration projects or "action plans". Beginning in 1990, the majority of NBP funds were used for development of the *CCMP*.

The NBP's research activities were planned by the NBP Science and Technical Advisory Subcommittee and the NBP staff, subject to Management Committee approval. Early studies focused on Bay-wide water quality trends and point source pollutant inputs. Later studies gradually narrowed to focus on specific geographic regions, pollution sources originating elsewhere in the watershed, and specific environmental problems and solutions. Every study was subject to extensive peer review and revision by the authors prior to publication. In addition, investigators were required to submit all original data for permanent archival in the Narragansett Bay Data System and/or the Rhode Island Geographic Information System (RIGIS). Copies of published technical reports were distributed to selected Rhode

Figure 715-01(2).

Process for Development and Approval of "Comprehensive Conservation and Management Plan" (CCMP)



* Requires Public Hearing(s) before final adoption

Island state depository libraries and major Rhode Island academic institutions. In 1988, the NBP received additional federal grant funds from the EPA to establish demonstration projects or "action plans". These demonstration projects were developed as pioneering efforts to begin implementation of eventual *CCMP* recommendations. The Hazardous Waste Reduction Project (HWRP) and the Land Management Project (LMP) were established in 1988; the Citizens' Monitoring Project (CMP) was started in 1990. The NBP also collaborated with various federal, state and local agencies during the *CCMP*-development process to secure funds to start implementation of some elements of the *CCMP*, and draft necessary legislation. These efforts are briefly described below.

The HWRP was designed to assist Rhode Island industries in reducing the use and disposal of toxic chemicals. The HWRP has since been incorporated into the RIDEM's Office of Environmental Coordination and has won several national and international awards for its pioneering efforts in working with area industries, universities and agencies to demonstrate the economic and environmental benefits of source reduction.

The LMP was developed to assist Rhode Island cities and towns in managing growth and development to control nonpoint sources of pollution. LMP staff also worked with state agencies to provide technical assistance to Rhode Island cities and towns during the development of local comprehensive land use plans. The LMP worked with municipalities and the development community to document 'best management practices' (BMPs) and test educational materials such as model growth management ordinances.

The CMP was established in 1990 to act as a liaison between citizens' monitoring groups and state water quality regulators. The CMP focused its early efforts on persuading state officials to use citizen-generated data in the *State of the State's Waters (305(b))* water quality planning report, and to identify water quality problems requiring possible regulatory action. The CMP was also instrumental in expanding the existing network of citizens' monitoring programs to include coastal waters.

The NBP also worked closely with various federal, state and local agencies during the *CCMP* planning process to begin early implementation of *CCMP* initiatives, where possible. In some cases, the NBP worked with other agencies to develop additional scientific information needed in order to begin implementation of the *CCMP*. For example, the NBP cooperated with the Massachusetts Coastal Zone Management Agency (MACZM) and the Rhode Island Coastal Resources Management Council (CRMC) to secure funds for water quality surveys in the tidal portion of the Taunton River to support future basin-planning efforts. The NBP worked with the EPA, the RIDEM and the Massachusetts Department of Environmental Protection (MADEP) in 1991 to perform river-wide water quality surveys of the Blackstone River to support future wasteload allocations for metals and nutrients.

The NBP also initiated or assisted with actual implementation of *CCMP* recommendations. For example, in 1990, the NBP was awarded a grant from the Rhode Island Aqua Fund Council to develop a preliminary basin plan for Greenwich Bay, and subsequently negotiated an interagency agreement between the RIDEM and the CRMC for completion of the basin plan. The NBP also worked with *Green Rhode Island* to develop draft legislation on mandatory water conservation; with the Governor's Blackstone Valley District Commission/Narragansett Bay Commission Study Committee on Regionalization to develop recommendations regarding the merger of two Rhode Island wastewater treatment authorities; and with the RIDEM to develop legislation on regulation of vessel discharges and designation of "no discharge areas". All three bills were passed by the Rhode Island General Assembly in 1991. NBP staff also drafted legislation for submittal in the 1992 or 1993 legislative session to require Rhode Island municipalities to establish wastewater management districts' to manage septage wastes generated by on-site sewage disposal systems. NBP staff are also working with the Rhode Island Association of Realtors to draft a

"seller disclosure" law to require property owners to report the status of on-site sewage disposal systems to prospective buyers.

01-04-02 Public Participation

From the Project's inception, the Management Committee and NBP staff conducted an open and accessible planning process to help draft a comprehensive plan that was principled, but also realistic and achievable. The Bay Project routinely sought advice from Bay user groups, including fishermen, quahoggers, boaters and industry trade organizations, as well as from environmentalists, scientists, developers, planners and government regulators. Representatives from these and other groups also participated in NBP-sponsored environmental review panels and public outreach programs, and on the Management Committee itself (Korch *et al.*, 1989:3).

There were three overall goals of the NBP's public outreach/education program in conformance with the mandate of the National Estuary Program. The NBP's first major public outreach initiative was to develop common agreements about issues of concern and goals for restoring and protecting Narragansett Bay. The NBP commissioned a public opinion survey in 1986 and a series of goal-setting workshops in 1987 in order to determine whether common agreements existed regarding goals for restoring and protecting Narragansett Bay. The results of these efforts were used by the NBP Management Committee to prioritize Project goals and define the scope of the Project's research and planning activities. The Project's goals were periodically reviewed by the Committee based on information from the studies and the NBP's on-going public outreach activities. The NBP conducted a follow-up public opinion survey in the fall of 1991 in order to determine whether the public's perception about Bay water quality, priorities for corrective action, or willingness to pay had changed since 1986.

The second major goal of the NBP's public participation program was to educate and inform the general public about the need for a comprehensive plan for Narragansett Bay. With advice from the NBP Public Education Subcommittee, the NBP made a concerted effort to inform the public about the NBP planning effort and the Project's major research findings. For example, the NBP maintained a 5,000 person mailing list, an information hot-line, and an extensive publications file. The Project produced and distributed news releases, fact sheets (*Current Facts*), a series of newspaper articles (*Baywatch* and *Bay Action Plans*), a newsletter (*Currents*), annual progress reports, and videotaped and arranged the broadcast of panel discussions on major issues. The NBP staff also gave presentations at national, regional and local meetings and participated in public events such as Earth Day, the Rhode Island Boat Show, and the Providence Waterfront festival. These public education/public information efforts were conducted continuously from 1985 through adoption of the *CCMP*. [A list of the NBP's public outreach activities is presented in Appendix D.]

The third goal of the NBP's public participation program was to establish general agreement on realistic and achievable strategies and schedules for implementing the *CCMP* in order to assure that the implementing authorities performed their obligations as described in the Plan (Planners Collaborative, Inc. *et al.*, 1990). Roundtable discussions were conducted with government officials and representatives from the shellfish, metals and recreational boating industries; Blackstone River constituencies; and the land development community beginning in 1990. The roundtables were used to present scientific findings and preliminary recommendations to concerned constituencies, and to develop early agreements about *CCMP* implementation strategies. The NBP also worked with the staffs from other agencies, including the NBP's demonstration projects, to disseminate information about workable techniques for controlling pollution sources. For example, in 1990 the NBP, in cooperation with the Land Management Project, the RIDEM Nonpoint Source Pollution Management Program, and other organizations, co-sponsored *Designs for a Better Bay*, an awards program to recognize achievements in environmentally sensitive land use

design and development. This effort generated broad interest that resulted in similar design competitions in other estuary programs. In addition, the NBP, in cooperation with RIDEM's Ocean State Cleanup and Recycling Program, produced a wallet-sized *Clean Water Shopping Guide* to help people choose environmentally safe household products. Over 65,000 wallet guides were distributed with the assistance of New England Electric, the Narragansett Bay Commission, and other sewer and water authorities. The NBP also worked with Save The Bay and area communities to stencil storm drains tributary to the Bay with a "no dumping" warning. Finally, the NBP coordinated public review and comment on the draft *CCMP* following its release on January 10, 1992 (See Section 01-04-04). [See Appendix D, Part 1 for a list of NBP public outreach activities related to the draft *CCMP*.]

01-04-03 Planning and Preliminary Review

In mid-1990, following the substantial completion of the NBP's scientific investigations, the NBP Management Committee began to develop recommendations for abating identified problems in Narragansett Bay. Because of the scope and complexity of the available scientific information, the NBP staff prepared seventeen 'briefing papers' that summarized the relevant scientific information and proposed alternative strategies for addressing identified environmental, public health and/or use-related problems. The briefing papers were subject to technical review prior to distribution to the Committee for discussion. The Committee generally limited its review to discussion of controversial recommendations that one or more Committee members disagreed with and were unable to resolve with the staff. After review and approval, each briefing paper was published with minutes of the Management Committee meetings, summaries of decisions, and lists of Committee participants. [See Appendix C for a list of NBP publications, including briefing papers.] Recommendations approved by the Management Committee were forwarded to the Rhode Island Division of Planning (RIDOP) for incorporation into the *CCMP*.

The Management Committee began the process of prioritizing *CCMP* goals and strategies in 1991 after approximately half the briefing papers had been reviewed and preliminary cost and public finance information became available. In a series of facilitated discussions in June and November 1991, the Management Committee prioritized goals and objectives, agreed on which strategies would be expected to produce the greatest and most cost-effective environmental benefit over a five to ten year planning horizon, and identified 16 specific actions as the highest priority for implementation in the first two years after *CCMP* approval. Related recommendations were subsequently combined into the ten priority actions presented in the Executive Summary. Related high priority recommendations are also identified in each chapter (715-04, 715-05) with a checkmark and bolded text. The Committee's deliberations resulted in the draft *CCMP* which was subsequently distributed for public review and comment in January 1992.

01-04-04: *CCMP* Review and Approval

The NBP Management Committee conducted public review and comment on the draft *CCMP* in four phases. As the *CCMP* was being developed, the Project organized briefing sessions with targeted interest groups, government officials, and citizens throughout the Narragansett Bay area. In addition, between October 1991 and February 1992, Project staff presented the entire draft *CCMP* to the Technical Committee of the Rhode Island State Planning Council. These sessions were used to develop preliminary agreements about recommendations in the Plan. The NBP also conducted a major outreach effort to acquaint the general public with the Project's findings and solicit comment on proposed solutions.

The second phase of public review and comment commenced with the official release of the draft Narragansett Bay *CCMP* at a Rhode Island State House ceremony presided over by Governor Bruce Sundlun on January 10, 1992. A public notice announcing the release of the draft *CCMP*, the duration of the comment period, and the time and location of public information meetings, was published in

the Providence-Journal Bulletin newspaper on the same date. The original comment period extended from January 10, 1992 to March 2, 1992. In response to agency requests, the comment period was reopened for 30 days beginning on March 20, 1992. The extension of the comment period was also published in the Providence Journal-Bulletin, effectively resulting in a 101-day public comment period. [See Appendix D, Part 1 for a complete list of NBP public outreach activities related to the release of the draft *CCMP* for public comment.]

In association with the release of the draft *CCMP*, over 100 copies of the draft plan were distributed to NBP Committee members, the Rhode Island State Planning Council, municipal representatives and others. The draft *CCMP* was also distributed to thirteen public libraries in Rhode Island and Massachusetts. In addition, over 12,000 brochures and 2,200 *CCMP* "pocket summaries" were distributed to the Project's mailing list and interested members of the public at the beginning of the public comment period in order to promote interest in the public information meetings. The NBP also promoted the availability of the draft *CCMP* and the public information meetings through radio and television interviews and public service announcements, and a series of press releases and newspaper articles. Between February 11th and April 9th, the NBP conducted six formal public information meetings in Rhode Island and the Massachusetts portion of the Bay watershed. The purpose of the public information meetings was to present an overview of the draft *CCMP* and invite public comment. Over 150 people attended these meetings. In addition, Project staff made presentations on the draft *CCMP* to various special interest groups, state agencies and public officials. [See Appendix D, Part 1 for a complete list of NBP public outreach activities related to the release of the draft *CCMP* for public comment; and Appendix G for a transcript of public comments and proceedings of public information meetings.]

The third phase of the *CCMP* approval process involved compiling and responding to comments received on the draft *CCMP*. Written comments were submitted by 38 individuals and organizations between January and May 1992. After Management Committee review and discussion of the staff's response to comments, the draft *CCMP* was revised and returned to the NBP Management and Executive Committees for approval. [See Appendix E for a summary list of commenting individuals and organizations; Appendix F for a summary of NBP response to comments; and Appendix G, Parts 1 through 4 for the full text of comments.] The revised final *CCMP* was then submitted to the EPA Administrator and the Governor of Rhode Island for approval.

The draft Plan was simultaneously presented to the Rhode Island State Planning Council for review as an element of the *Rhode Island State Guide Plan*, The public hearing scheduled by the Rhode Island Division of Planning as part of the State Planning Council's deliberations represented the fourth and final phase of the public review process. The notice of public hearing was published in the Providence Journal-Bulletin on May 28, 1992. The hearing, held on June 17, 1992, solicited public comment on the draft *CCMP*, including the NBP's *Response to Comments Received as of April 24, 1992* and the draft Narragansett Bay *CCMP Funding Strategy*. These comments were considered by the State Planning Council in making final revisions to the *CCMP* as an element of the *Rhode Island State Guide Plan.*

715-02 BACKGROUND: STATE OF THE BAY

Narragansett Bay is often referred to as "Rhode Island's most important resource." This statement acknowledges that the Bay and its associated watershed continue to supply the region with an abundance of seafood, secure transportation routes and sheltered harbors, and lovely places to live and play. However, Narragansett Bay and its tributaries are also "working" bodies of water because they are also relied upon to supply the region with energy, drinking water and a receptacle for receiving and diluting much of the region's industrial, commercial, and municipal wastes.

Like other urban and urbanizing estuaries, the health of Narragansett Bay has been compromised by some of these uses. However, in recent years, some of these threats have been abated or eliminated. For example, the U.S. Environmental Protection Agency (EPA) and the states of Rhode Island and Massachusetts have invested heavily in converting most of the region's wastewater treatment facilities to secondary treatment, resulting in improved water quality. In addition, many industries in the region have modified their manufacturing and disposal practices and have significantly reduced the discharge of toxic pollutants into the Bay and its tributaries. Many communities in the Bay watershed are also beginning to grapple with the environmental consequences of growth and development.

But other pressures continue to stress Narragansett Bay. Population growth and development throughout the region have increased pollutant loadings to suburban and rural as well as urban portions of the Bay. Fisheries stocks have declined, and sediments in some areas are severely contaminated. Environmental and public health problems related strictly to population growth are not likely to disappear, since population is expected to increase within the Narragansett Bay watershed, particularly in rural and coastal areas (RIDOA, 1989a).

Although there is evidence that water quality has improved in some areas of the Bay in recent decades (see, for example, Karp *et al.*, 1990; Nixon, 1990, 1991; Metcalf & Eddy, Inc., 1991b; Penniman *et al.*, 1991a, 1991b), the pressures posed by projected population growth and development in the Bay basin must be addressed. Federal, state and local government must prepare for the projected growth in the region by protecting critical habitats. Although many point sources of pollution have been controlled, government must begin to regulate important nonpoint sources of pollution and the environmental consequences of growth and development. In addition to addressing current problems, the region also must attempt to prevent future problems from emerging. All levels of government and the public will have to act systematically and in concert to protect and restore this "estuary of national significance."

The purpose of "State of the Bay" is to summarize existing background knowledge about the environmental problems facing Narragansett Bay in order to establish the framework for the corrective actions recommended in Parts 715-04 (Issues, Objectives, and Strategies) and 715-05 (Implementation) of the *CCMP*. Based on information collected by the Narragansett Bay Project (NBP) and others between 1985 and 1991, this section describes the (1) physiographic setting of Narragansett Bay; (2) the history and current uses of the Bay; (3) pollutant sources, status, and trends; (4) living resources and critical habitats; (5) public health concerns; (6) governance by federal, state, and local authorities; and (7) priorities for action.

02-01 Physiographic Setting

Estuaries are semi-enclosed bodies of water, open to the sea. Within estuaries, seawater is diluted by the fresh waters carried by rivers and draining from coastal lands. Estuaries are productive biological regions, habitats, and breeding grounds for fish, shellfish, and many other organisms.

Narragansett Bay covers 147 square miles of water surface (Figure 715-02(1)). Its water-

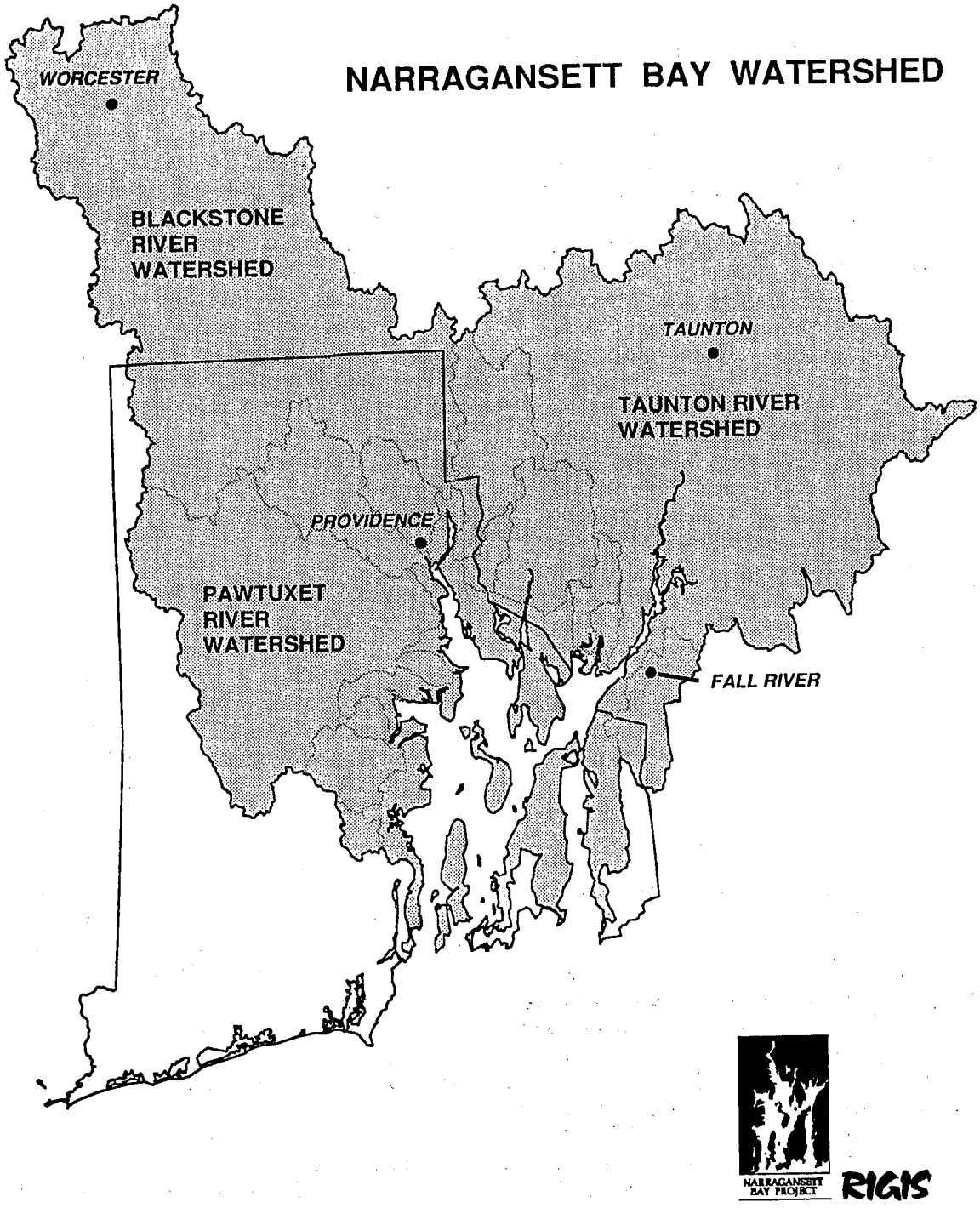


Figure 715-02 (1). **Narragansett Bay watershed in Rhode Island and Massachusetts. (Map provided by NBP, RIGIS.)**

shed comprises 1,657 square miles, 61 percent of which is in Massachusetts and 39 percent in Rhode Island. Major cities within the watershed include Worcester, Fall River, Taunton, and Brockton, Massachusetts; and Providence, Woonsocket, Cranston, Warwick, and Newport, Rhode Island.

When the last glaciers retreated northward from New England about 10,000 years ago, what is now Narragansett Bay was a series of streams and upland areas. The glaciers had reached as far south as the current Long Island, Block Island, and Martha's Vineyard. Those islands are all parts of terminal moraines, great mounds formed when the glaciers dropped the rocks, cobbles, gravel, and sand they had scraped off the New England landscape. Smaller moraines were formed farther inland, at points where the glaciers paused in their retreat. These moraines formed the low hills along the southern shore of Rhode Island.

As the glacial ice melted, sea level rose, flooding three river valleys and forming Narragansett Bay. Sea level continues to rise in the region, at a rate of about one foot each century. Some scientists believe that global warming could increase the rate of sea level rise to as much as eleven feet each century.

Narragansett Bay connects with Rhode Island Sound through the three ancient, drowned river valleys, the East and West Passages and the Sakonnet River (Figure 715-02(2)). East Passage is the deepest valley, averaging 50 feet (15.3 meters). In contrast, the average depth of the Bay is 27 feet (8.3 meters), and West Passage averages 25 feet (7.6 meters). East Passage provides deep water access for large vessels as far as Prudence Island, and dredged channels allow further passage to ports on the Providence and Taunton Rivers.

02-01-01 Freshwater Inputs

Total freshwater input to the Bay has been estimated to be approximately 2,400 million gallons per day (MGD) (Pilson, 1985; Ries, 1990). Most of the freshwater entering the Bay, about 80 percent of the total flow, comes from Bay tributaries which are recharged by approximately 46 inches of annual precipitation (Ries, 1990; Pilson 1991). Other freshwater sources include direct precipitation on the Bay (310 MGD), wastewater treatment facilities (WWTFs) (248 MGD or 98 billion gallons per year), and combined sewer overflows (CSOs) (4 billion gallons per year). Groundwater and suburban stormdrains also contribute an unknown volume of freshwater. The Blackstone, Taunton, and Pawtuxet Rivers account for 63 percent of the total measured input of freshwater. Smaller rivers and streams, including the Woonasquatucket, Moshassuck, Ten Mile, Palmer, and Hunt Rivers account for the rest of the riverine flow, but do not contribute substantially to the total flow of water (Figure 715-02(3)) (Ries, 1990).

Water flowing from the rivers in the system is modified by dams and diversion of water from stream basins. Important flood control and water supply reservoirs within the watershed include the West Hill Dam Reservoir on the West River, near Uxbridge, Massachusetts, and the Scituate Reservoir on the North Branch of the Pawtuxet River. Water from the Taunton River is diverted to supply the City of New Bedford with drinking water. Water from the Nashua River watershed is used to supply the City of Worcester with drinking water, which is subsequently discharged to the Blackstone River as effluent from the Upper Blackstone Water Pollution Abatement District (UBWPAD) WWTF (Ries, 1990).

Direct precipitation onto the Bay surface accounts for approximately 13 percent of the freshwater input (the equivalent of 310 MGD) to the Bay. An additional 10 percent, about 248 MGD, comes from the 33 WWTFs, that discharge directly into the Bay or Bay tributaries (Karp *et al.*, 1990; Ries, 1990). Of this amount, approximately 52 percent is from Rhode Island facilities, and the remainder is from Massachusetts. The Narragansett Bay Commission's (NBC) Field's Point and Bucklin Point facilities, and the UBWPAD contribute the greatest volumes of wastewater. Total annual inputs of freshwater

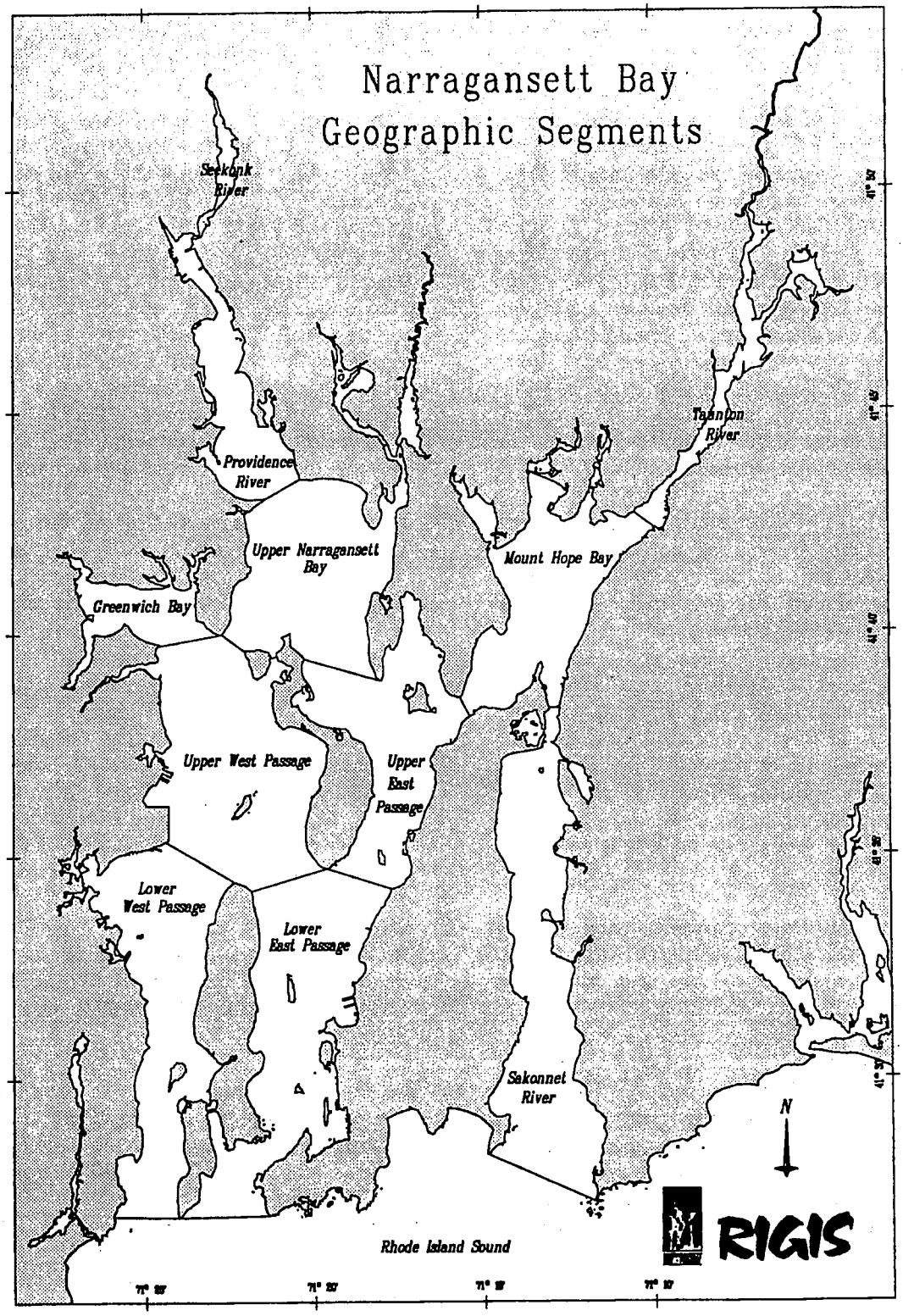


Figure 715-02 (2). Geographic segments of Narragansett Bay. (Map provided by NBP, RIGIS.)

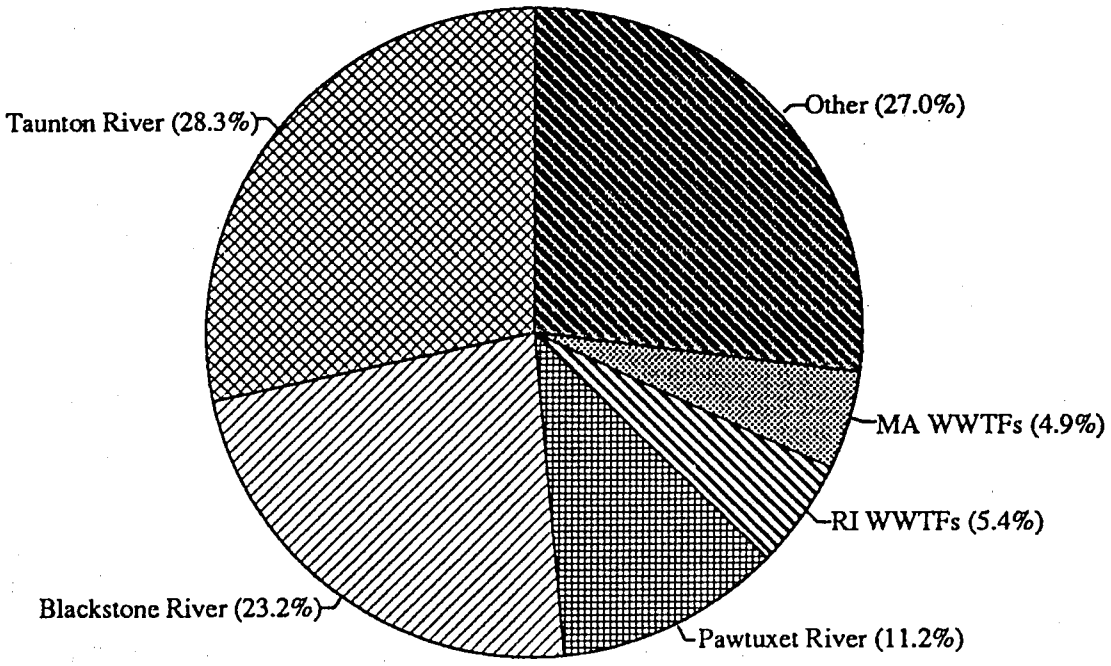


Figure 715-02 (3). Sources of freshwater to Narragansett Bay displayed as percentage of total annual freshwater input. (Data from Ries 1990 and Penniman *et al.*, 1991a.)

from CSOs (approximately 4 billion gallons per year) are small compared to inputs from the WWTFs (approximately 98 billion gallons per year), but during storms, they may contribute significant amounts of water (Metcalf & Eddy, Inc., 1991b). Flow of groundwater directly into the Bay has not been measured.

02-01-02 Circulation

Circulation of water within the Bay is complex, but important to understand because these circulation patterns affect the distribution of sediments, nutrients, pollutants, and microscopic floating plants and animals in the Bay. Because most freshwater sources are at the head of the Bay, there is a salinity gradient, with fresher waters in the Upper Bay and saltier water in the Lower Bay.

Freshwater is less dense than saltwater. Therefore, freshwater from the rivers tends to float on top of the saltwater, gradually mixing as it moves seaward. The currents, produced by this seaward flow, called nontidal currents, move at speeds of less than one half knot. They are, in part, responsible for moving water out of the Bay and into Rhode Island Sound, a process that takes between ten and 40 days. The average residence time of a molecule of water in the Bay is 26 days (Pilson, 1985).

Although the net movement of water in Narragansett Bay is downstream from the rivers to Rhode Island Sound, tidal currents also mix Bay waters. Tidal currents are the most important force mixing Bay waters and also help to move water in and out of the Bay. Tides are caused by the gravitational pull of the moon and the sun and the earth's rotation, and they cause the waters of the Bay to rise

and fall three to four feet every 12-and-a-half hours. Tides travel up the Bay like a wave, so high tide in Providence is about 20 minutes later than high tide in Newport. Tidal currents average one-and-a-half knots, and are even faster in certain areas.

Winds also play an important, although sporadic, role in circulation. During the summer, southwesterly winds dominate in the Bay. In the winter, most winds are northwesterly. Average wind speeds are highest in December and January, and result in accelerated movement of water out of the estuary and into Rhode Island Sound.

02-01-03 Sediments and Coastal Features

The glacial deposits of Narragansett Bay are overlain by a layer of material that has washed down into the Bay from its rivers. Rivers and the erosion of coastal bluffs provide most sedimentary material to the Bay. In general, there are finer-grained materials in the Upper Bay than there are at the mouth (Figure 715-02(4)) (McMaster, 1960; French *et al.*, 1992). The Providence River and protected harbors and coves of the Bay also contain finer-grained sediments. Areas with fine-grained sediments are likely sinks for particle-associated toxic pollutants in the Bay.

The cobble shores along most of Narragansett Bay are a reminder of the glacial deposits that helped form the area. The most common type of shoreline found around the Bay is a narrow beach of gravel and cobble that backs up to a scarp or bluff composed of glacial till. Sandy beaches are found along the ocean shores at the mouth of the Bay and in a few areas such as Conimicut Point in the Bay's interior. Rocky shorelines are found at Beavertail, Common Fence, and Brenton points. In protected areas where sediments accumulate, salt marshes fringe the shoreline (McMaster, 1960; French *et al.*, 1992).

Another important shoreline feature are the manmade structures that line approximately 25 percent of the shore. These structures include bulkheads or seawalls that were designed to prevent erosion. However, most coastal erosion in the Bay results from major storms, such as hurricanes. Sometimes these structures actually hasten erosion by concentrating the wave energy in the area of the barrier.

02-02 History and Uses of the Bay

The oldest signs of human habitation in the Narragansett Bay area are about 3,300 years old. These remains were discovered on Conanicut Island. Europeans may have come to the area as early as Viking times, and Narragansett Bay may have been visited by the Englishman John Cabot in 1498. However, the first confirmed exploration of the Bay was by Giovanni da Verrazano in the ship *Dauphine* in 1524.

In 1635, Roger Williams, banished from the Massachusetts Bay Colony for his zealous desire to reform its church, landed by canoe on a peninsula called "Mooshassuc," a point where the City of Providence now stands. He was welcomed by the local Indians, who according to legend invited him to dine upon succotash and boiled bass. In 1644 Roger Williams obtained an official charter, incorporating the "Providence Plantations In Narragansett Bay."

The history of Narragansett Bay is one of rapid and intense population growth, accompanied by changes in land use, industrialization, and increased use of the Bay. The many and varied commercial uses of Narragansett Bay (Table 715-02(1)) contribute to the economic value of the Bay to the State of Rhode Island and the region. However, these uses sometimes conflict resulting in the degradation of Bay resources, and consequently impairment of water quality dependent uses of the Bay.

02-02-01 Population Growth

At the beginning of the 1800s, the rate of population growth was greater in Rhode Island than in any other New England state. Today, partially as a result of the industries that have prospered in the region, 1.8 million people live within the Narragansett Bay watershed, about half in Massachusetts and half in Rhode Island (Figure 715-02(5)). The area is densely populated, with 1,109

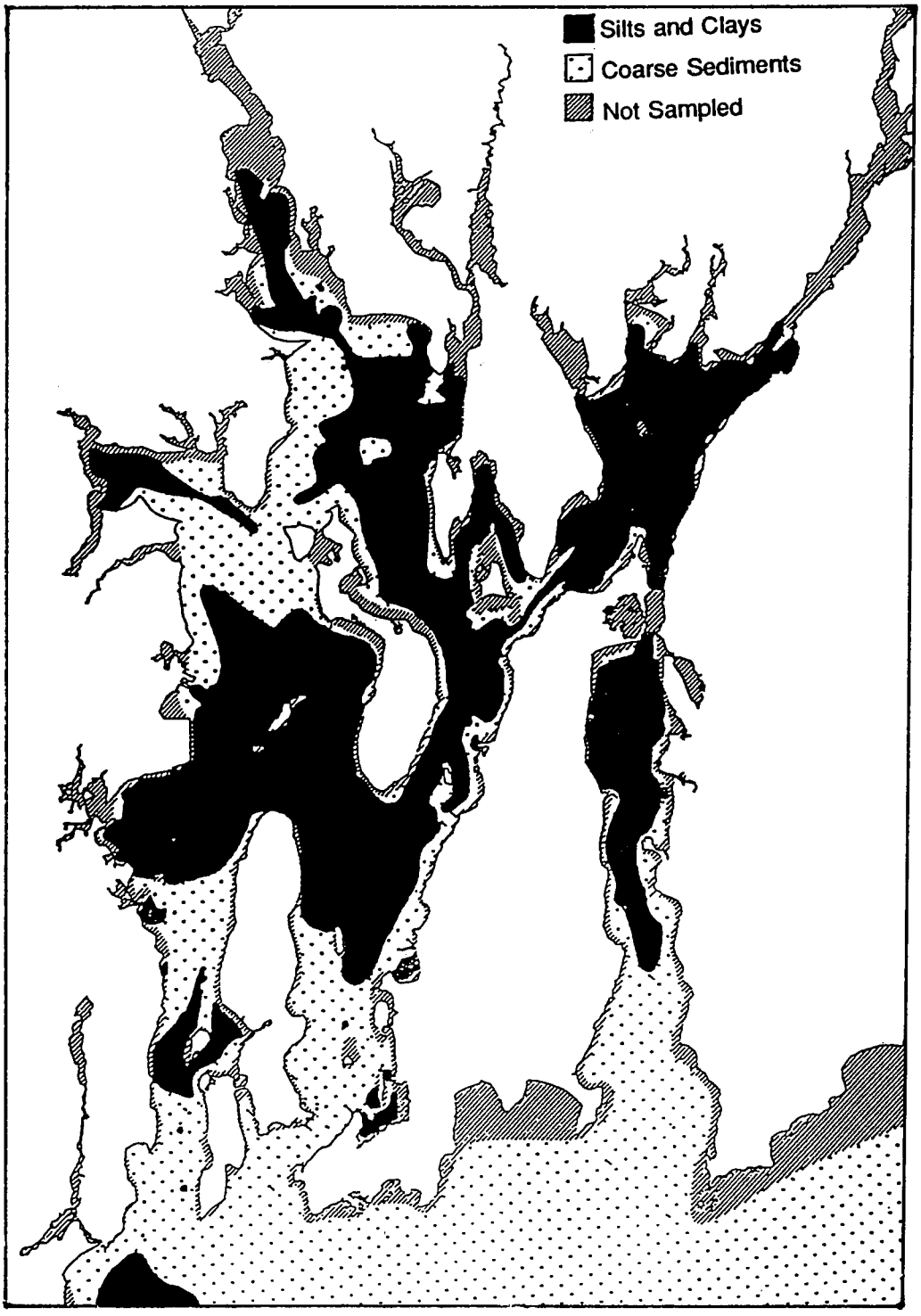


Figure 715-02 (4). Distribution of sediments in Narragansett Bay. (Data from McMaster, 1960.)

Table 715-02 (1). Estimated annual revenues associated with Narragansett Bay. (Data are from Rorholm and Farrell, 1992, and are in thousands of 1982-1984 dollars.)

SOURCE	1967	1979	1989
Navy, except education	646,132	103,004	383,123
Marine Education, R & D	106,919	251,891	220,759
Marine Transportation	144,234	199,927	140,968
Bridges	3,257	6,335	8,631
Commercial Fishing	6,611	34,444	42,308
Marine Industry	179,659	518,821	637,365
Marine Recreation	78,766	121,975	146,761
Waste Disposal	21,557	21,664	31,111
TOTAL	1,187,135	1,258,061	1,611,026

people per square mile. In comparison, the nearby Buzzards Bay watershed in Massachusetts has only 613 people per square mile (NOAA, 1990).

Although Providence, Fall River, Worcester, and Brockton remain the most populated areas in the Narragansett Bay watershed, population growth is now greater in the sub-urban and rural areas. From 1960-90, population in Rhode Island's cities actually decreased by an average of four percent, while it almost doubled in the average town (RIDOA, 1989a). Although population growth has slowed in recent years, it is expected to continue well into the twenty-first century, with statewide growth of 9.5 percent projected over the years 1985-2010. Population growth is expected to continue to be greatest in the coastal and rural towns of the watershed (RIDOA, 1989a).

02-02-02 Changes in Land Use

As the population of Rhode Island has grown, the look of its landscape has also changed. Native Americans cultivated some of the land before the arrival of European settlers. During colonial times, about 75 percent of the state was cleared for agriculture. By 1935, however, about a third of this cleared land was no longer cultivated, and forests grew back from fields (RIDOA, 1989a). Since then, much of the area has become urbanized, and now about 36 percent of the total land area of Rhode Island is developed, seven percent is agricultural, and with the remainder forest, wetlands, and "open space" (Dixon *et al.*, 1991; RIGIS, 1991).

The number of housing units in the Narragansett Bay watershed has grown even faster than its population (Figure 715-02(6)). In Rhode Island's cities, the average number

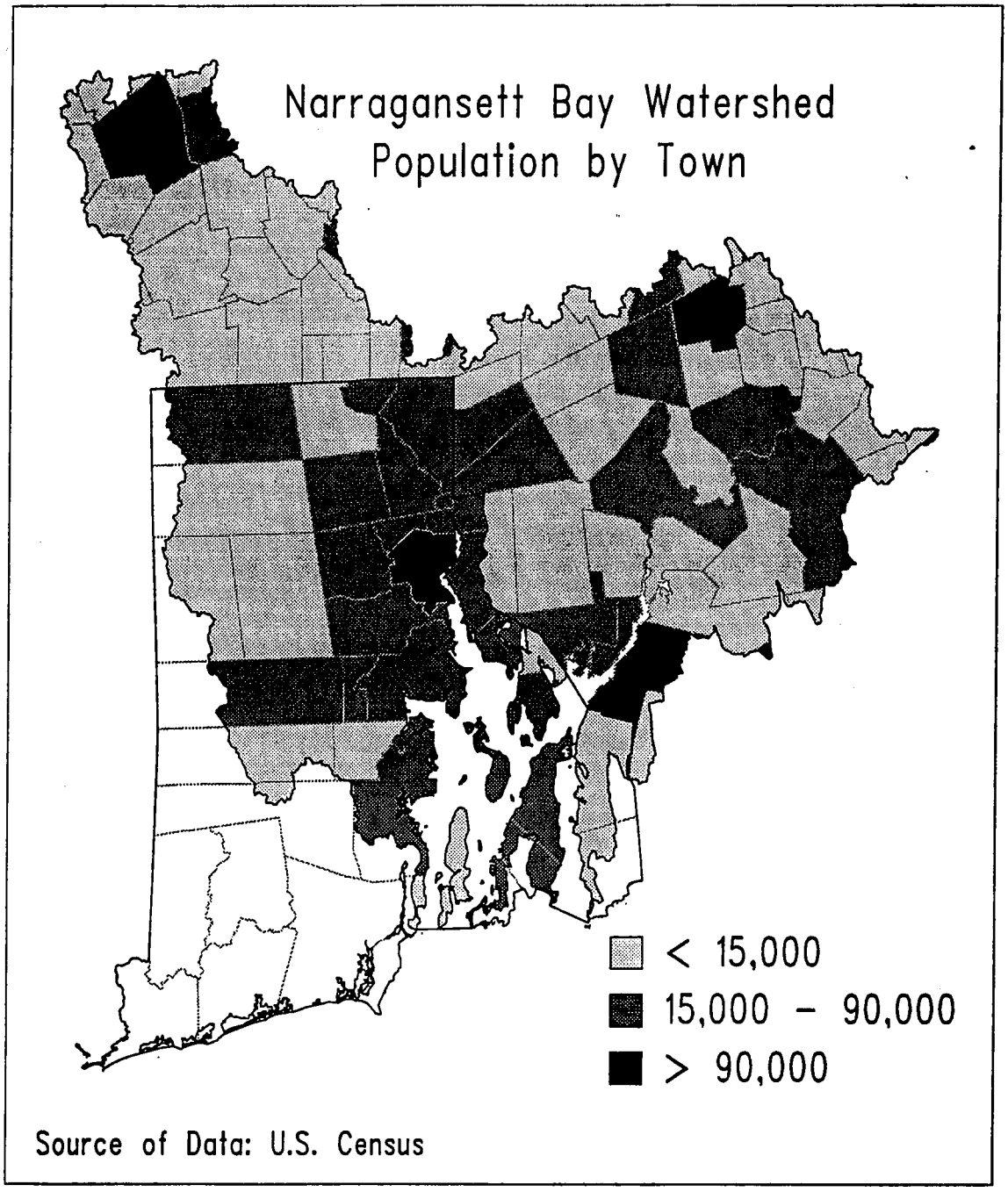


Figure 715-02 (5). **Narragansett Bay watershed population by municipality according to the 1980 census. (Map from NBP, RIGIS.)**

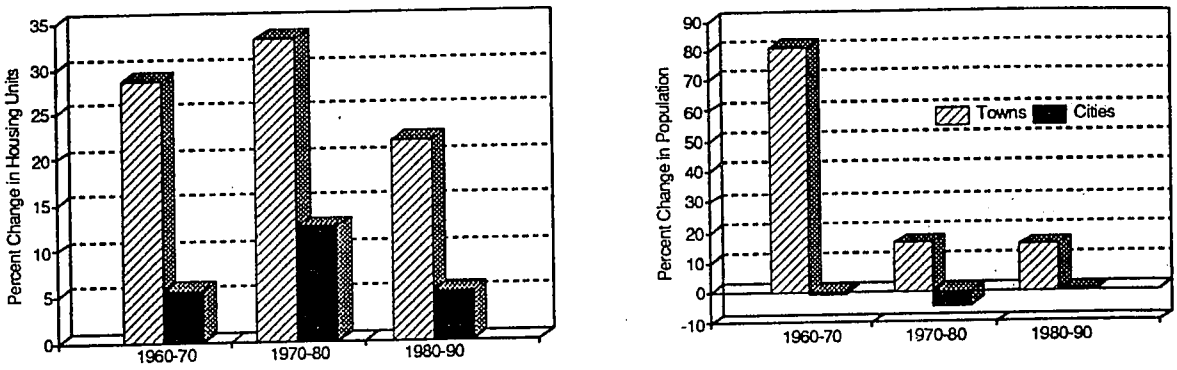


Figure 715-02 (6). Changes in population and number of housing units in Narragansett Bay cities and towns over 1960 to 1990. (Data from NBP.)

of housing units increased by an average of 27 percent during 1960-1990. In the towns, the average number of houses more than doubled during the same period. Similar to other areas of the country, the average size of a household has declined substantially since 1970. During the same period, average sizes of house lots have grown, spreading development farther into once-rural areas of the watershed. Growth is expected to be slower in the 1990s than it was in the 1980s, but increased pressures are expected to continue in rural and coastal communities (RIDOA, 1989a).

02-02-03 Ships, Shipping, and the Navy

Even before Rhode Island became a colony, Dutch settlers had established trading posts along Narragansett Bay. Shipyards were active by 1646, and the shipping trades of Newport and Providence prospered. During colonial days, shipping dominated the Rhode Island economy, largely due to the lucrative rum/slave trade.

During the 1830s, the economic influence in Rhode Island shifted from shipping to textile manufacturing. Although, shipping remained an important means for importing raw materials to the region and exporting textiles, shipbuilding declined substantially. Today, most shipping in the Narragansett Bay region consists of petroleum, automobile, and lumber imports. Oil imports reached a peak in 1973, just before the Arab oil embargo plunged New England into a period of oil and gas shortages.

Beginning in 1979, investments were made to bring container ships to Rhode Island, opening the state to nonpetroleum imports. Relatively few goods are now exported from Rhode Island by ship or barge. However, in Rhode Island in 1987 more than $64 million were spent on buying boats and boat-related equipment. Marine transportation revenues have been estimated as $171 million in 1989. Toll receipts at the bridges spanning the Bay totaled $8 million in 1989. Marine industry, including ship and boat building, marine equipment, and production of fresh and frozen fish products accounted for $679 million (Rorholm and Farrell, 1992).

A military presence has been important in Narragansett Bay since the Revolutionary War. Throughout most of the history of the United States, coastal forts were an important part of the defense of the nation. After World War I, such defenses became outmoded. However, the Navy maintained a strong

presence in Narragansett Bay which peaked in 1941 to 1946 during World War II. In 1973, the Navy substantially reduced its facilities in Narragansett Bay. However, Naval activities remain a significant part of the regional economy. The Navy is closing additional bases, some of which are potential EPA Superfund sites, because they are contaminated with toxic pollutants.

Wages and salaries for naval personnel, contracts and other procurements, and minor aid to local schools totaled $383 million in 1989. Approximately 29 percent of that amount was spent on direct personnel payments, the remaining 71 percent on contracts. This value represents an increase over the preceding decade, although the total spent by the Navy is less than it once was.

The Navy, along with federal and state governments, also funds marine education and research and development. Approximately $221 million in salaries, wages, supplies, and equipment was spent in naval education, federal laboratories in Narragansett, the University of Rhode Island's marine programs, and other state laboratories.

02-02-04 Industry

During the 1790s, Rhode Island became the center of the American Industrial Revolution. Samuel Slater's introduction of a primitive factory system to Moses Brown's textile mill in Pawtucket, Rhode Island, is often cited as the Industrial Revolution's beginning in the United States. The mill harnessed the energy of the Blackstone River to spin cotton into thread.

At first, the Industrial Revolution spread slowly, but with government needs for the War of 1812 and the inventions of the power loom and machinery to clean cotton, the Rhode Island cotton industry expanded dramatically. By 1860, both the woolen and the cotton industries were dominated by the factories that lined the shores of the Blackstone River.

With the growth of the textile industry came comparable growth in the production of machinery and machine tools. David Wilkinson, who made the castings for Slater's first carding machines and later developed the power loom, also invented the American industrial lathe and was an early experimenter with steam power. In 1793, he cast and assembled a steam engine that powered a paddleboat on the Providence River. He installed a steam engine in his own mill in 1810.

The expansion and diversification of the Industrial Revolution were apparent throughout the Narragansett Bay watershed, but were concentrated in the upper portions of the Bay and along the major rivers. Metal industries were interspersed with the textile industry along the Blackstone and Pawtuxet rivers and in Providence. Farther up the Blackstone River, the City of Worcester, Massachusetts, became a center for manufacturing textile machinery.

With the outbreak of the Civil War, Rhode Island began to manufacture munitions for the Union Army and boilers for the Navy, in addition to textiles. The return of peace brought an even greater prosperity, when firms that had become established during the war diversified into the manufacture of locomotives, tools, and sewing machines.

Providence jewelers also prospered after the Civil War, overtaking cotton manufacturing as the city's leading industry in 1880. The precious metals industry had its beginnings in the late 1700s, when Seril Dodge began to manufacture silver buckles, and his brother Nehemial Dodge opened a jewelry, clockmaking, and goldsmith shop. By 1880, Providence could call itself the "jewelry capital of the world."

In the more than a century that has followed 1880, industry has become more diversified, and manufacturing has declined to a smaller share of the economy of the region. In 1990, 332,000 Rhode Islanders were employed in the service industries, while only 118,000 were employed in manufacturing.

02-02-05 Fishing

Fishing was undoubtedly important to the Native Americans who lived along Narragansett Bay's shores before the arrival of European colonists. Archaeological excavations on Conanicut and Block Islands show the importance of seafood in the region. Tales from colonial times paint pictures of a Narragansett Bay teeming with sea life, of lobsters that could be caught by hand at low tide, of vast schools of bluefish and cod, and of dense beds of oysters and clams.

Early colonists caught fish on hook and line or with small seines. During the second half of the 1800s, floating and staked traps blocked large parts of the Bay. Concern that these traps could decimate fish stocks led to strict restrictions on their use. During the 1930s, trawlers began to drag the bottom of the Bay for fish.

Oysters were once abundant in Narragansett Bay. In the early days, they were among the staples of the colonial diet. As in most East Coast states, production of cultivated oysters in leased beds peaked around 1910. By the 1930s, decreased oyster production could no longer meet the continued, stable local demand. Explanations for this decline have been many and varied. Overfishing was noted in East Greenwich, Rhode Island, as early as 1766, and legislation controlling harvests was very strict by the 1860s (Desbonnet and Lee, 1991). Predators and pollution have also been implicated in oyster declines. The 1954 hurricane dealt the final blow to the already weakened industry, killing an estimated 90 percent of the oysters. The last oyster dealer in Rhode Island went out of business in 1957 (Desbonnet and Lee, 1991). Since then, the cultivated oyster business has not recovered, possibly because of additional environmental degradation and coastal development, and competition from other oyster-growing areas. However, there is recent anecdotal evidence of recovery of oyster beds near East Providence, Prudence Island, and areas of Mount Hope Bay.

Native shad, alewife and Atlantic salmon fisheries were also historically important. All three species depended on Bay tributaries for spawning. Dams, effluent from the textile and metal product industries, and sewage pollution almost eliminated shad from Narragansett Bay in the 1880s. Although shad populations remained small, catches peaked again in Rhode Island in the 1940s, a result of high fishing pressures during World War II. Subsequent catches fell rapidly, due to decreased demand and decreased availability, possibly due to overfishing. This brief period of high catches during the war was not a symptom of recovery of the fish but rather an artificial peak, produced by extreme demand and exploitation of the resource (Olsen and Stevenson, 1975). The alewife fishery was essentially gone by 1925. The salmon fishery had already collapsed by 1869, probably because there were no suitable upstream spawning grounds due to flow restrictions and/or water quality (USFWS, 1989).

Menhaden, which spawn within upper Narragansett Bay and Mount Hope Bay rather than upstream in freshwater have fared somewhat better than the shad, salmon, and alewives. Overfishing by fish traps caused the fishery to fail in the late 1800s. Since then, harvests have diminished (Oviatt, 1977). However, by weight, menhaden remains the largest commercial fishery in the Bay.

Today, the quahog, or hard clam, represents Narragansett Bay's primary commercial fishery. Other commercial fisheries include lobster, long-finned squid, scup, silver hake, squirrel hake, summer flounder, sand flounder, ocean pout, butterfish, and cod (Jeffries et al., 1989). There are also significant recreational fisheries for bluefish and tautog. Until recently, winter flounder supported economically important commercial and recreational fisheries. However, in 1991, because of concerns over drastic declines in abundance, largely due to overfishing, Rhode Island banned commercial and recreational fishing for winter flounder in Narragansett Bay, Little Narragansett Bay, and the coastal salt ponds.

Overfishing, habitat destruction and contamination by toxic pollutants represent ongoing threats to these resources. Total

landings of finfish declined from 72.5 million pounds in 1985 to 26.5 million pounds in 1989, with winter flounder accounting for 19 million pounds of the decrease (NOAA/NMFS, 1991). Total value of the finfish landings decreased from $33.2 million to $2.9 million during that period (NOAA/NMFS, 1991). Like the oyster and the shad, these fisheries also could be destroyed.

02-02-06 Recreation

Narragansett Bay's many small harbors and protected, sandy beaches contributed to its reputation as a recreation area. During the 1880s, Newport was perhaps the most affluent and extravagant resort area in the country. The extreme affluence ended with the 1929 stock market crash, and the 1938 hurricane destroyed many resorts along the Bay's southern shores. Beginning in the 1960s, however, family vacationing in the Narragansett Bay area began to boom, and this boom has continued.

Rhode Island residents and tourists today take part in sailing, world-renowned yachting regattas, music festivals, swimming, fishing, surfing, and picnicking. An estimated 32,000 people visit Rhode Island each day in the summer. Between 5 and 10 million tourists visit Rhode Island each year, primarily in the summer and primarily around the Bay. In 1989 more than $1400 million was spent by tourists in Rhode Island, much of it on Bay-related activities.

Tourism is now the State of Rhode Island's third largest employer. The state operates 25 state parks, and there are many shoreline campgrounds and picnic areas. One hundred and seventy marinas dot the coastline; tourist services and outlet stores line the major and minor highways; and an increasing number of conventions brings tourists to the state throughout the year.

02-02-07 Use of the Bay for Waste Disposal

Despite the importance of tourism to the region's economy, some areas of the Upper Bay are closed to swimming, other water-contact sports, and shellfish harvesting. These closures result entirely from pollution associated with population growth and urban-industrial development in near coastal areas. Municipal and industrial wastes and dredged materials have been disposed of in the Bay.

Human wastes have probably been discharged into the Bay as long as the area has been inhabited. In 1854, Providence was the seventh largest city in the United States. Most people used cesspools and privies, the contents of which were used as fertilizer or disposed of in landfills. The Moshassuck River, a branch of the Providence River, was used as an open sewer, and regular outbreaks of cholera claimed the lives of the people who dwelled along its shores. Population growth was enormous, and increasing quantities of sewage entered the river, along with wastes from slaughter houses and woolen mills.

A sewer system became a necessity for the City of Providence in 1871, when the city provided its residents with running water. Indoor toilets were connected to existing cesspools, and the increased volumes of water used in flushing overflowed the systems. Construction of a sewer system began immediately. That system discharged wastes directly into the rivers and the Bay.

In 1884, City Engineer Samuel M. Gray was dispatched to Europe to learn about the latest methods of treating sewage, and in 1901, the Providence Sewage Treatment System began operation at Field's Point. The system used chemicals to facilitate precipitation of sludge from the raw sewage. The sludge was then used as fertilizer, while the remaining effluent was discharged into the Bay (Nixon, 1990).

Within a decade of its opening, Providence had outgrown its sewage treatment system. The City began to barge the sludge and dump it into the Bay east of Prudence Island and about 14 miles south of the city. In addition, the chemical-precipitation method brought by Samuel Gray from Europe was proving an unsatisfactory sewage-treatment process.

In 1925, the Providence City Council visited eight cities throughout the United States to

learn about new sewage treatment methods. Conversion of the Field's Point facility to use an activated-sludge process was completed in 1934. Other improvements to the system were made in subsequent years.

By the 1970s, this system was again inadequate. The facility had become antiquated, an inadequately sized staff maintained it, and charges of political mismanagement were leveled at its directors. Raw sewage was regularly released into the Bay, and sewage solids were found on beaches. In 1980, a regional approach to managing the problems of sewage waste treatment was adopted with the creation of the Narragansett Bay Commission (NBC). With financial assistance from the EPA and the State of Rhode Island, the NBC has been able to reconstruct and upgrade the Field's Point facility.

The Bay also receives numerous discharges from the industries that flourish in the region. Today, 33 major industries in Massachusetts and Rhode Island continue to discharge directly into the watershed under federal National Pollutant Discharge Elimination System (NPDES) major permits or Rhode Island Pollutant Discharge Elimination System (RIPDES) permits. There are also numerous industrial and commercial discharges to sewer systems. These indirect discharges ultimately reach Narragansett Bay.

Sewage effluent and sludge are not the only materials that have been disposed of in Narragansett Bay. Because many parts of Narragansett Bay are shallow, regular dredging of channels and harbors has been conducted to maintain access for the small boats or large ships that use them. Materials dredged from the bottom were disposed of on salt marshes and other coastal lands until the 1960s. Many of Narragansett Bay's fringing salt marshes were filled to support coastal development.

Dredged material was also disposed in Narragansett Bay's deeper waters. Between 1949 and 1966, material was dumped off the southern end of Prudence Island, as well as at the Brenton Reef Disposal Area, near the mouth of Narragansett Bay in Rhode Island Sound. Dredged material is no longer disposed within Narragansett Bay waters because no site has been designated in the Bay. Upland disposal still occurs, subject to receipt of permits from the Rhode Island Coastal Resources Management Council (CRMC), the Rhode Island Department of Environmental Management (RIDEM), and the U.S. Army Corps of Engineers (USACOE).

02-03 Pollutant Sources, Status, and Trends

02-03-01 Pollutant Sources and Water Quality

Three major classes of anthropogenic pollutants are discharged to Narragansett Bay and the Bay basin: fecal wastes, potentially including pathogenic bacteria and viruses; excess nutrients and oxygen-demanding organic matter; and toxic pollutants, including trace metals and organic compounds. Although these pollutants are generated by industrial, commercial and domestic activities throughout the Bay basin, they enter the Bay from myriad point and nonpoint sources.

Point sources, such as the discharge pipes for WWTFs and industrial facilities, are a major route for delivery of pollutants to the Bay. Each year approximately 98 billion gallons of treated wastewater enter the Bay from 33 WWTFs serving over one million people in Rhode Island and Massachusetts. In addition, each year over 100 CSOs in the basin discharge approximately four billion gallons of untreated sewage and stormwater to the Bay waters (Figure 715-02(7)). Direct industrial discharges also contribute to the pollutant load.

Nonpoint sources are more diffuse and difficult to quantify. Nonpoint sources of contaminants to the Bay include runoff from highways, parking lots, farmlands and lawns. Seepage from on-site sewage disposal systems; discharges by ships and boats; accidental chemical spills; and resuspension of contaminated sediments also represent locally important sources of contaminated deposition.

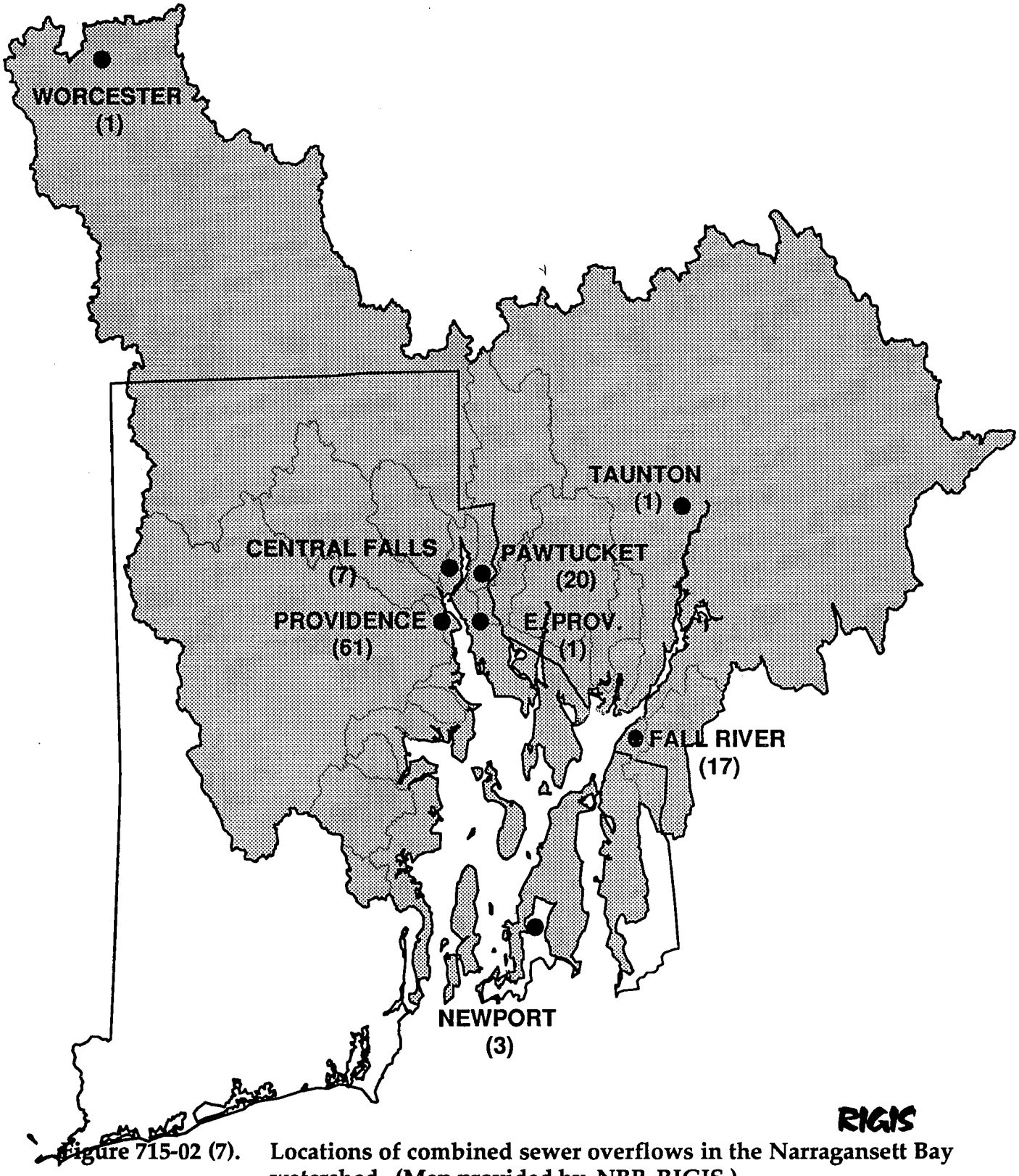


Figure 715-02 (7). Locations of combined sewer overflows in the Narragansett Bay watershed. (Map provided by NBP, RIGIS.)

The states of Rhode Island and Massachusetts classify the state's waters according to the condition and goals for the waters' uses. Seawaters are classified as follows:

Class SA	Suitable for bathing and contact recreation, shellfish harvesting for direct human consumption, and fish and wildlife habitat.
Class SB	Suitable for bathing and contact recreation, for shellfish harvesting for human consumption after depuration, and fish and wildlife habitat.
Class SC	Suitable for boating and secondary contact recreation, fish and wildlife habitat, industrial cooling, and aesthetic value.

Discharges into the waters must meet limitations necessary to ensure compliance with specific state water quality standards, which limit concentrations of specific pollutants in order to protect aquatic life and human health. The CRMC has established different water use classifications for Rhode Island's coastal waters in order to govern authorized uses of coastal waters. The CRMC's six water use categories are:

Type 1	Conservation area
Type 2	Low-intensity use
Type 3	High-intensity boating
Type 4	Multipurpose waters
Type 5	Commercial and recreational harbors
Type 6	Industrial waterfronts and commercial navigation channels.

02-03-02 Suspended Solids and Biochemical Oxygen Demand (BOD)

Rivers constitute the major erosional source of suspended solids. However, suspended solids and oxygen-demanding substances also enter the Bay from point and nonpoint source discharges to the rivers. Coastal wastewater treatment facilities are another major source of solids and BOD. CSOs and industrial discharges also contribute to BOD loadings.

Historically, BOD loadings have increased as a result of population growth. However, these loadings decreased throughout the basin with the implementation of secondary treatment of municipal wastes as required under the federal Clean Water Act. Secondary treatment employs biological methods to reduce the amount of organic material in wastewater. The trend toward improved oxygen concentrations in the Providence River can be correlated with improved BOD and suspended solids removal by the Blackstone Valley District Commission (BVDC) [Note that the BVDC WWTF is now the NBC Bucklin Point WWTF.] and the NBC Field's Point.

02-03-03 Pathogens

Pathogens are disease-causing organisms such as bacteria, viruses, and protozoa. Human pathogens, including the bacteria responsible for cholera and typhoid, and viruses responsible for infectious hepatitis and gastroenteritis can be present in human fecal wastes and may enter the Bay from WWTFs, CSOs, septic systems, and, in some areas, discharges from boats. Water-borne pathogens can be hazardous to swimmers and to people who eat raw or incompletely cooked seafood harvested from sewage-contaminated waters.

Rhode Island and Massachusetts open and close beaches and shellfish-growing areas based upon concentrations of one type of bacteria, fecal coliforms. These bacteria are considered "indicators," that is, while they are not pathogenic, they indicate the presence of fecal waste and the possible presence of

pathogenic bacteria. Another type of bacteria, enterococcus, has been proposed by EPA as a better indicator for marine swimming beaches, and the NBP has funded research on the potential use of alternative indicators of human fecal waste, such as the use of a male-specific bacteriophage and the spores of the bacterium *Clostridium perfringens* . Because the bacteriophage and *Clostridium perfringens* spores are more resistant to chlorination from wastewater treatment than other indicators, they may be more accurate environmental indicators of the presence of human fecal waste.

Fecal wastes and potential pathogens enter the Bay from WWTFs, bypasses to those facilities, CSOs, stormdrains, septic systems, stormwater runoff, and, in some areas, boater discharges. Although the dry weather loadings of fecal coliform bacteria are so large that more than 28 percent of Narragansett Bay is permanently closed to shellfishing, CSOs represents the greatest inputs of coliform bacteria to the Providence River and Mount Hope Bay during rainstorms. In rainy weather, WWTF bypasses and the CSOs in Providence, Pawtucket, and Central Falls are the major sources of untreated or partially treated sewage to the Providence-Seekonk River and the Upper Bay. Similarly CSOs in Fall River, MA, are the major source of untreated fecal waste to Mount Hope Bay. During rainstorms, sampling has shown that 95 percent of the fecal coliform bacteria entering Mount Hope Bay and 80 percent entering the Providence River come from CSOs. Annual loadings of coliform bacteria from CSOs are about 10,000 times higher than the loadings from wastewater treatment facilities and about 200 times higher than loadings from separated stormdrains.

Nonurban, developing coastal areas are also affected by discharges and releases of fecal wastes to coastal waters. Areas presumptively affected by boater wastes because of dense assemblages of marinas and mooring fields are seasonally closed to shellfishing. Improperly sited, poorly designed, inadequately maintained, and failing septic systems, and illegal sanitary cross connections to stormdrains also contribute fecal wastes to coastal waters and have resulted in local restrictions on shellfish harvesting.

02-03-04 Nutrients

Nutrients are essential to the functioning of the Narragansett Bay ecosystem. However, excessive inputs of nutrients, especially nitrogen and phosphorus can cause ecological problems and impairments to uses of portions of the Bay. Nutrients can stimulate blooms of microscopic plants, called phytoplankton. When these phytoplankton die, they decay. The bacteria causing the decay consume oxygen in the water, potentially leaving insufficient oxygen for shellfish, fish, and other animals. Blooms of larger macroalgae (seaweeds) can carpet coves and other enclosed areas. In extreme conditions, oxygen depletion related to nutrient loadings can kill fish and invertebrates and produce anoxic sediment conditions.

Nutrients enter the Bay from WWTFs, CSOs, individual septic systems, runoff from agricultural land and lawns, groundwater and the atmosphere (Figure 715-02(8)). The EPA and the National Oceanic and Atmospheric Administration (NOAA) have classified Narragansett Bay as receiving average amounts of nutrients compared to other estuaries in the northeast. However, the effects of excess nutrients are more important in coves and poorly flushed areas than in the open areas of the Bay. Unfortunately, few data are available for the small coves.

The lowest concentrations of dissolved oxygen in the Bay are found in the Providence, Seekonk, Pawtuxet, and Blackstone Rivers during the late summer (Pilson and Hunt, 1989; Penniman *et al.*, 1991b). Nitrates and phosphates are most concentrated in these areas and in the Taunton River because of major urban wastewater inputs of sewage (Figure 715-02(9)). However, pictures taken with a sediment-profiling camera have indicated that the aquatic communities living in portions of Greenwich Bay and Potowomut Cove are also stressed, perhaps as a result of excessive nutrient loads from point and nonpoint sources (Valente *et al.*, 1992).

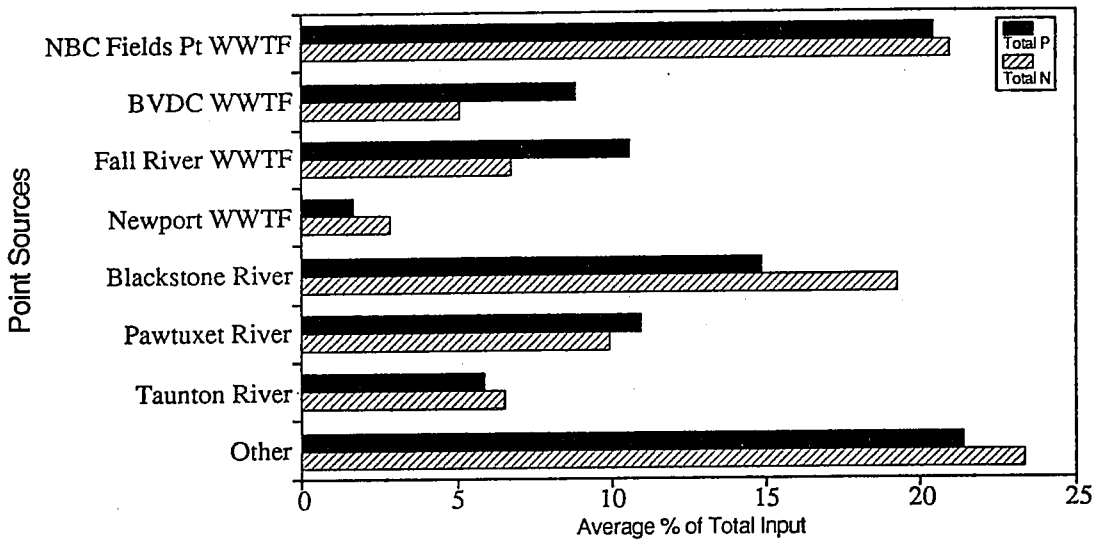


Figure 715-02 (8). **Point sources of nutrients to Narragansett Bay. (Data are from Pilson and Hunt, 1989. "Other" refers to other drainage areas.) [Note that the BVDC WWTF is now the NBC Bucklin Point WWTF.]**

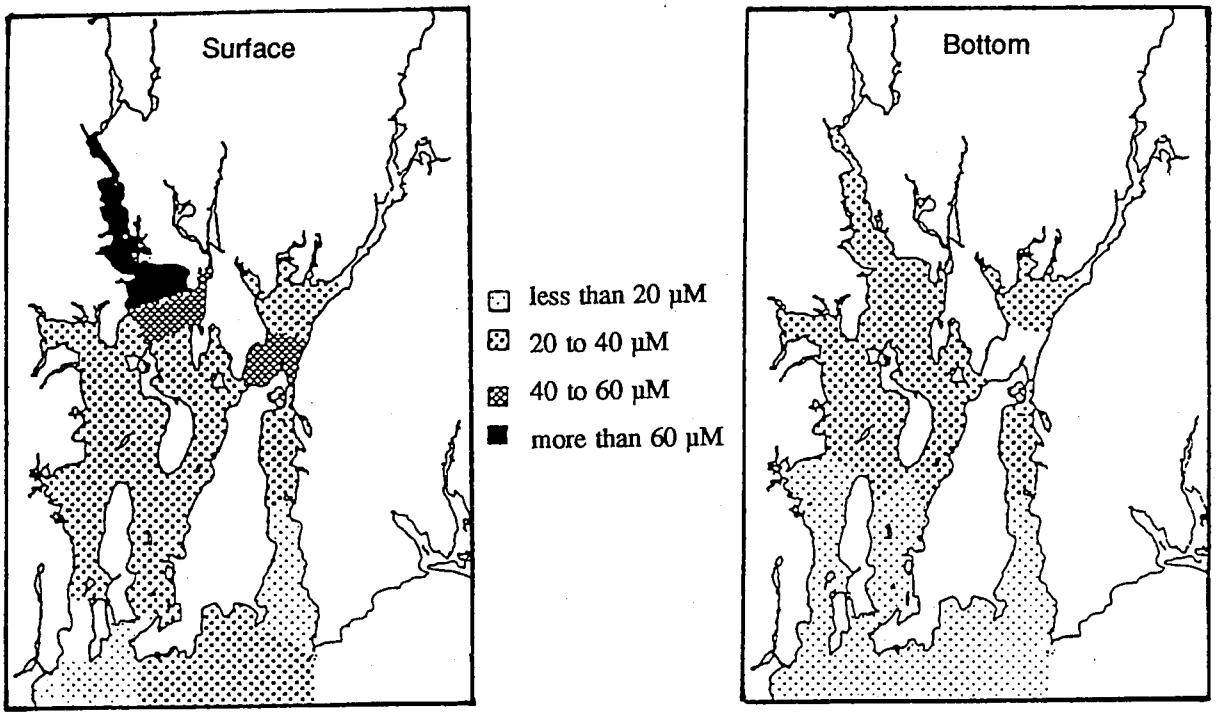


Figure 715-02 (9). **Nitrogen concentrations for surface and bottom waters in October 1985. (Data are from Pilson and Hunt, 1989.)**

02-03-05 Toxic Pollutants

Narragansett Bay has a long history of inputs of toxic metals and toxic organic compounds (Figure 715-02(10)). Many toxic metals and some toxic organic compounds exist naturally in low concentrations. Some toxic metals are often called trace metals, because they occur naturally in low concentrations and are essential nutrients for plants and animals. At higher concentrations, however, toxic metals and organic compounds can cause reproductive or metabolic disorders and death, and additionally may accumulate in the tissues of plants and animals. These metals and organic compounds are most toxic to sea life when they are dissolved in water. Metals that are adsorbed to sediment particles and buried in oxygen-poor sediments are relatively nontoxic unless the sediments are resuspended, re-aerated, and solubilized or consumed by organisms. However, many petroleum-based and synthetic organic compounds remain toxic when they are adsorbed to particles.

Toxic metals of particular concern in the environment include copper, cadmium, lead, zinc, chromium, silver, nickel, and mercury (Figure 715-02(11)). The largest anthropogenic sources of these metals originate in the most industrialized portion of the Bay watershed, where they are used in the manufacture of jewelry and other metal products, and the electroplating, cement, and textile industries. Copper also comes from copper water pipes used throughout the region in residential as well as commercial and industrial areas. The lead from solder used, until recently, to connect copper pipes can also leach into the water. In parts of the watershed where drinking water comes from reservoirs rather than groundwater, acid rain has caused the water to corrode the copper pipes and lead solder at a greater rate than normal. A major source of lead to the environment was from gasoline combustion until 1974, when unleaded fuel was required for all new automobiles. Burning of wood, coal, and oil has also contributed to increased environmental concentrations of metals.

During dry weather, most trace metals enter the Bay from the NBC Field's Point WWTF and upstream sources on the Blackstone River including the UBWPAD WWTF. During rainy weather, the major point sources are the NBC's Field's Point and NBC's Bucklin Point (formerly BVDC) WWTFs although the Blackstone and Pawtuxet rivers represent the largest metals loadings (Wright *et al.*, 1992a).

Concentrations of toxic metals are greatest in waters at the head of the Bay and decrease down-Bay toward Rhode Island Sound (Figure 715-02(12)). The highest concentrations of metals in the Upper Bay are found in the Seekonk River, where the Blackstone River enters the Bay (Bender *et al.*, 1989; Metcalf & Eddy, Inc., 1991a). Concentrations of dissolved nickel are 20 times higher in the Upper Bay than in Rhode Island Sound. Concentrations of cadmium are ten times higher, and concentrations of chromium are four times higher. Concentrations of copper and nickel are highest near the Field's Point WWTF and in the Blackstone River.

Toxic organic compounds include petroleum-derived contaminants known as petroleum hydrocarbons (PHCs) and polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and pesticides such as DDT. Petroleum compounds have many uses, such as for fuel or lubrication. PAHs are produced when wood, coal, or oil are burned. PCBs were widely used in electrical transformers until the domestic manufacture of PCBs was banned in 1977. DDT and some other persistent pesticides have also been banned from sale or use in the U.S. Today's pesticides generally degrade much faster than those used in the past. However, PCBs and DDT remain measurable in the Narragansett Bay ecosystem.

Petroleum compounds enter the Bay from large, catastrophic oil spills such as the *World Prodigy* spill which released 294,000 gallons of oil near the mouth of the Bay in June 1989. Although the amount of unrecovered oil from the *World Prodigy* was approximately equal to the amount of oil that enters

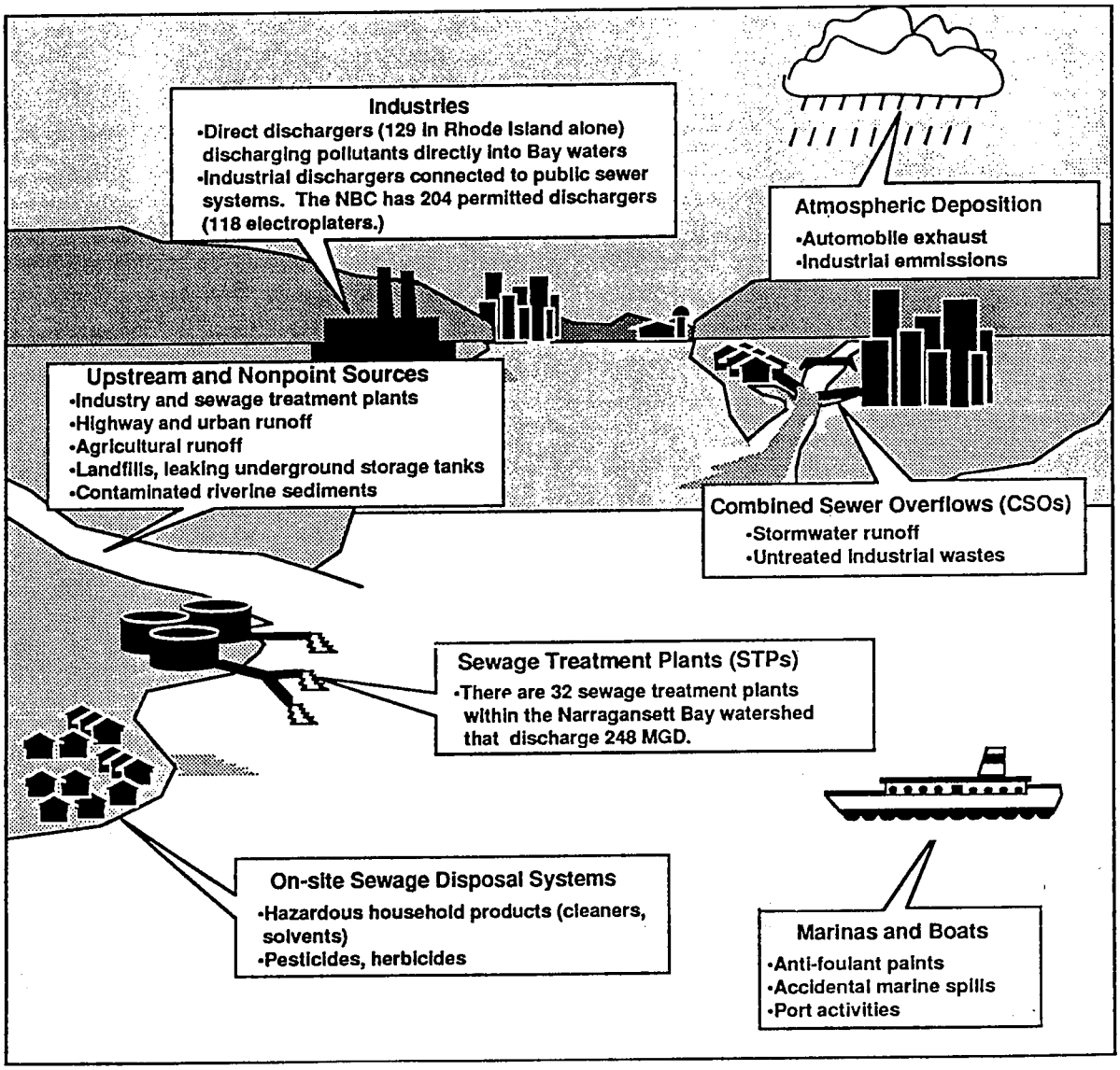


Figure 715-02 (10). Point and nonpoint sources of toxic contaminants to Narragansett Bay. (From NBP.)

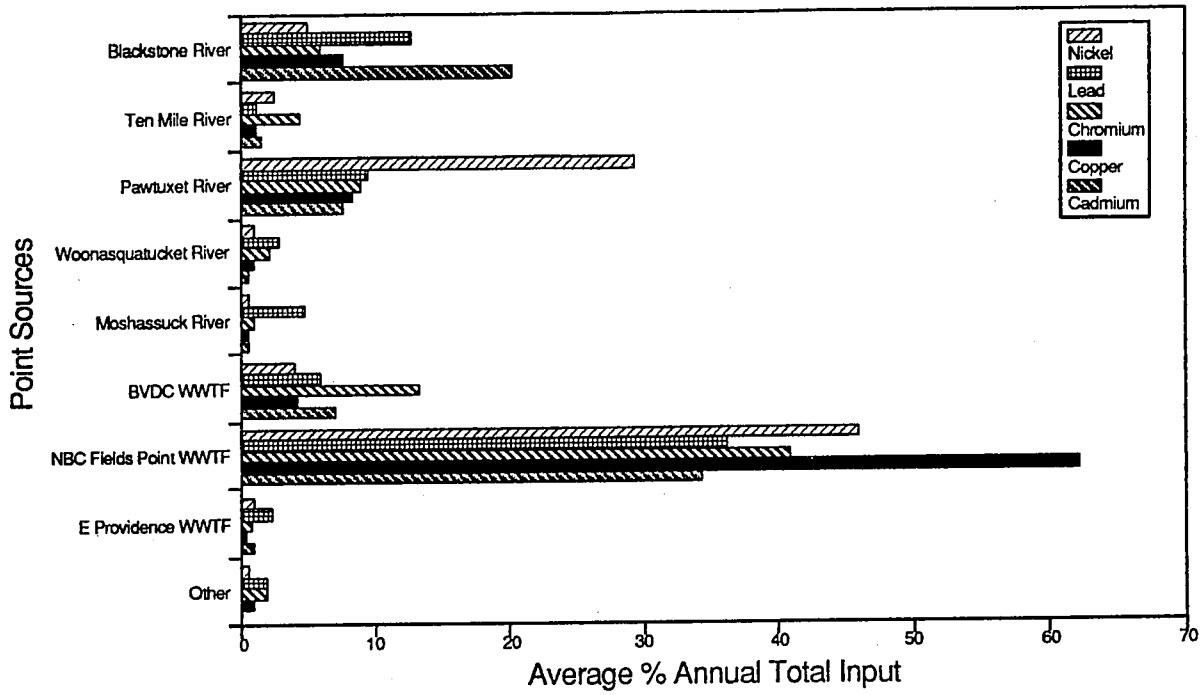


Figure 715-02 (11). Point sources of metals to Narragansett Bay. (Data from Metcalf & Eddy, Inc., 1991; "Other" includes BVDC CSO, BVDC Bypass, NBC CSO Area A.) [Note that BVDC is now part of NBC, and that the BVDC WWTF is now the NBC Bucklin Point WWTF.]

the Bay from all sources every two years, large, accidental spills represent only two percent of the annual average amount of oil entering Narragansett Bay. Therefore, persistent, chronic sources of petroleum to the Bay are of even greater importance. WWTFs and urban runoff are the largest contributors of these toxic organic compounds to the Bay. More than 60 percent of PHCs enter the Bay annually from WWTFs, primarily Field's Point. River inputs, mostly from the Taunton and Blackstone Rivers, account for more than 90 percent of PAHs (Metcalf & Eddy, Inc., 1991a).

Rivers also continue to contribute PCBs to the Bay, presumably from historic sources of contamination (Figure 715-02(13)). Water quality criteria for toxic pollutants, established to protect aquatic life, are exceeded in several locations within the Bay watershed primarily in the Blackstone, Pawtuxet, and Providence-Seekonk River basins (Table 715-02(2)) (Metcalf & Eddy, Inc., 1991a; Penniman *et al.*, 1991a).

02-03-06 Historical Trends and Current Status of Pollution in the Bay

The pollution history of urban estuaries such as Narragansett Bay can be told from undisturbed sediments (Corbin, 1989). Unless sediments have been disturbed by dredging, burrowing animals, or storms, the history of an area is shown in the layers of materials that are deposited on the sediment surface. The approximate age of sediments and sedimentation rates can be obtained using measurements of certain radioactive compounds.

Studies of Narragansett Bay's sediments have detected toxic metal pollution from the beginning of industrialization of the Providence area in 1750. Typical of most Narragansett Bay sediments, the sediments of the Seekonk River indicate sharp increases in

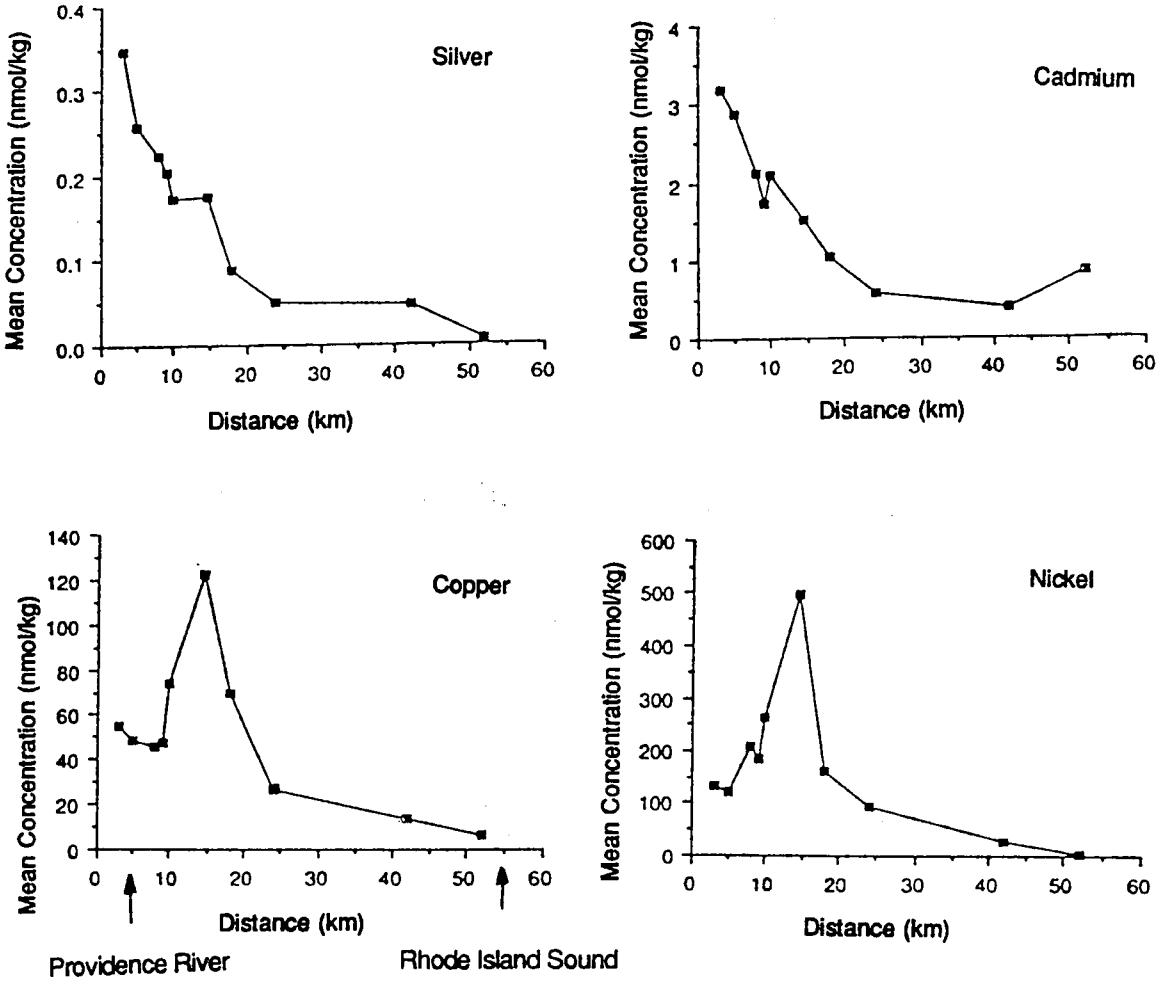


Figure 715-02 (12). Average concentrations (nanomoles/kg) of metals in Narragansett Bay as a function of distance (kilometers) from the Seekonk River. (Data are from Bender *et al.*, 1989, and are corrected for salinity effects.)

copper, lead, and silver loadings beginning in the 1860s, when metals use and processing increased dramatically, and ending abruptly in the late 1890s to 1900, around the time that the sewer system began discharging at Field's Point. The sediment cores indicate that metals inputs increased during the 1920s and 1930s (Figure 715-02(14)) (Corbin, 1989).

Concentrations of metals in the surface sediments show similar geographic trends to those in the water, with highest concentrations at the head of the Bay. However, there are also localized "hot spots," areas with especially high concentrations of contaminants not near centers of human activity. Such areas include Apponaug Cove, Brushneck Cove, Bullock's Cove, Greenwich Cove, Newport Harbor, Pawtuxet Cove, Warwick Cove, and Wickford Cove. Some of these sites reflect contamination from historic shipbuilding or industrial activity. A major "hot spot" is near Quonset Point where the Naval Air Rework Facility refurbished airplanes. Impoundments along the Blackstone River are the sites of some of the highest concentrations of metals ever measured in riverine sediments. Other sites, such as Bristol Harbor and Greenwich Cove, also receive toxic pollutants from residential, commercial, industrial, and agricultural activities.

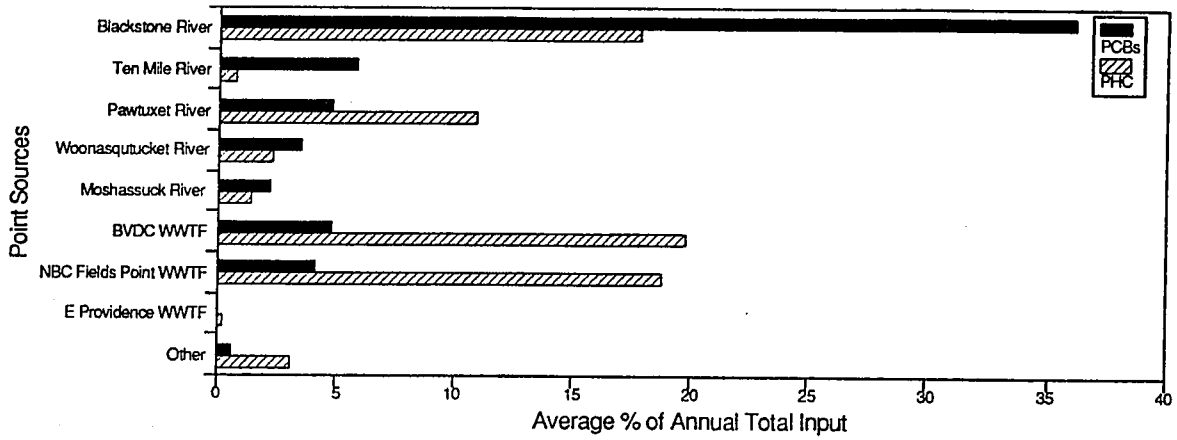


Figure 715-02 (13). Point sources of toxic organic contaminants to Narragansett Bay. (Data from Metcalf & Eddy, Inc., 1991a; "Other" includes BVDC CSO, BVDC Bypass, NBC CSO Area A.) [Note that BVDC is now part of NBC, and that the BVDC WWTF is now the NBC Bucklin Point WWTF.]

The deposition of organic pollutants has a different history from that of toxic metals. Concentrations of PHCs and PAHs both increase at points that coincide with increases in the use of fossil fuels in the late 1800s. At that time, coal and oil were burned in factories, and coal-fired passenger steamers cruised into the Bay. One sediment core from the East Passage has its highest concentrations of PHCs below the surface, possibly due to the disposal of dredged material that took place east of Prudence Island until 1965 (Corbin, 1989).

Some data show that inputs of some pollutants, notably PCBs and toxic metals, have decreased (Metcalf & Eddy, Inc., 1991a). For example, annual records from the Field's Point WWTF indicate that toxic metal inputs to the Bay decreased by 83 percent, from almost 1 million pounds to less than 200,000 pounds between 1981 and 1990 (Figure 715-02(15)). While recent trends show a decrease in concentrations of toxic metals, other evidence points to the need for continued monitoring and improvement. Data from the Providence River indicate that water quality standards for copper and nickel are exceeded. Concentrations of cadmium, copper, chromium, lead, and PCBs also exceed federal water quality criteria on many stretches of the Blackstone, Pawtuxet, Woonsocket, Moshassuck, and Ten Mile rivers (Table 715-02(2)).

Comparisons of studies conducted during 1977-1980 and 1985-1986 also show decreases in the concentrations of toxic metals found in sediments. There has been a fourfold decrease in copper concentrations in the surface sediments of the Providence River, and sediment nickel concentrations have decreased by 50 percent. In samples taken from Providence River sediments, there is no indication that inputs of cadmium or silver and, for some sites, lead have decreased (Corbin, 1989). However, sediment samples from the Seekonk River indicate a 71 percent decrease in lead since the 1950s (Corbin, 1989).

Recent declines in toxic metals loadings may be due in part to the industrial pretreatment programs implemented by 13 of Rhode Island's 19 WWTFs since 1982. Other reasons for the decline could be attrition of industries or changes in industrial processes in the watershed.

Table 715-02 (2). Areas exceeding aquatic life water quality criteria in Narragansett Bay. (Data are from Wright *et al.*, 1992a; Kipp and Zingarelli, 1991; and Metcalf & Eddy, Inc., 1991a.)

Substances	Areas Exceeding Water Quality Criteria for the Protection of Aquatic Life
PCBs	Blackstone River (MA) downstream of Upper Blackstone WWTF Blackstone River (RI) downstream of Woonsocket WWTF to tidal portion of the river Mouths of Pawtuxet, Moshassuck, and Ten Mile rivers
Cadmium	Pawtuxet River near Warwick and Cranston WWTFs Mouths of Blackstone, Pawtuxet, Ten Mile, and Woonasquatucket rivers Blackstone River (MA/RI) between Upper Blackstone and Woonsocket WWTFs
Copper	Blackstone River (MA) downstream of Upper Blackstone WWTF Blackstone River (RI) near Woonsocket WWTF Pawtuxet River below Cranston WWTF Mouths of Blackstone, Moshassuck, Pawtuxet, Ten Mile, and Woonasquatucket rivers Seekonk and Providence rivers
Chromium	Mouths of Blackstone, Moshassuck, and Ten Mile rivers
Nickel	Seekonk and Providence rivers
Lead	Blackstone River (MA) downstream of Upper Blackstone WWTF Blackstone River (RI) downstream of Woonsocket WWTF Pawtuxet River near Warwick and Cranston WWTFs Mouths of Blackstone, Moshassuck, Pawtuxet, Ten Mile, and Woonasquatucket rivers

A study of the effectiveness of three industrial pretreatment programs uncovered significant areas that need improvement (Sutinen and Lee, 1990). The study showed that permit requirements for pretreatment are not always met and that the UBWPAD WWTF in Worcester, Massachusetts, has increased its metals loadings to the Bay. Another study has indicated that metals loadings from the Fall River, Massachusetts, WWTF have also increased (Metcalf & Eddy, Inc., 1991a).

02-03-07 Pollutant Concentrations in Natural Resources

The presence of toxic pollutants in Narragansett Bay waters and sediments can impair the growth, reproduction, and general health of marine animals and plants. High concentrations of contaminants in marine fish and shellfish that are consumed by the public can cause human health effects. Shellfish such as mussels and quahogs concentrate pollutants above the levels found in their surroundings. Concentrations of contaminants in shellfish vary depending upon location of the animals within the Bay and their ability to metabolize individual pollutants.

In general, concentrations of toxic metal and toxic organic contaminants in shellfish are higher in the Providence River than in the middle or lower parts of the Bay (Metcalf & Eddy, Inc., 1991a). However, there are pock-

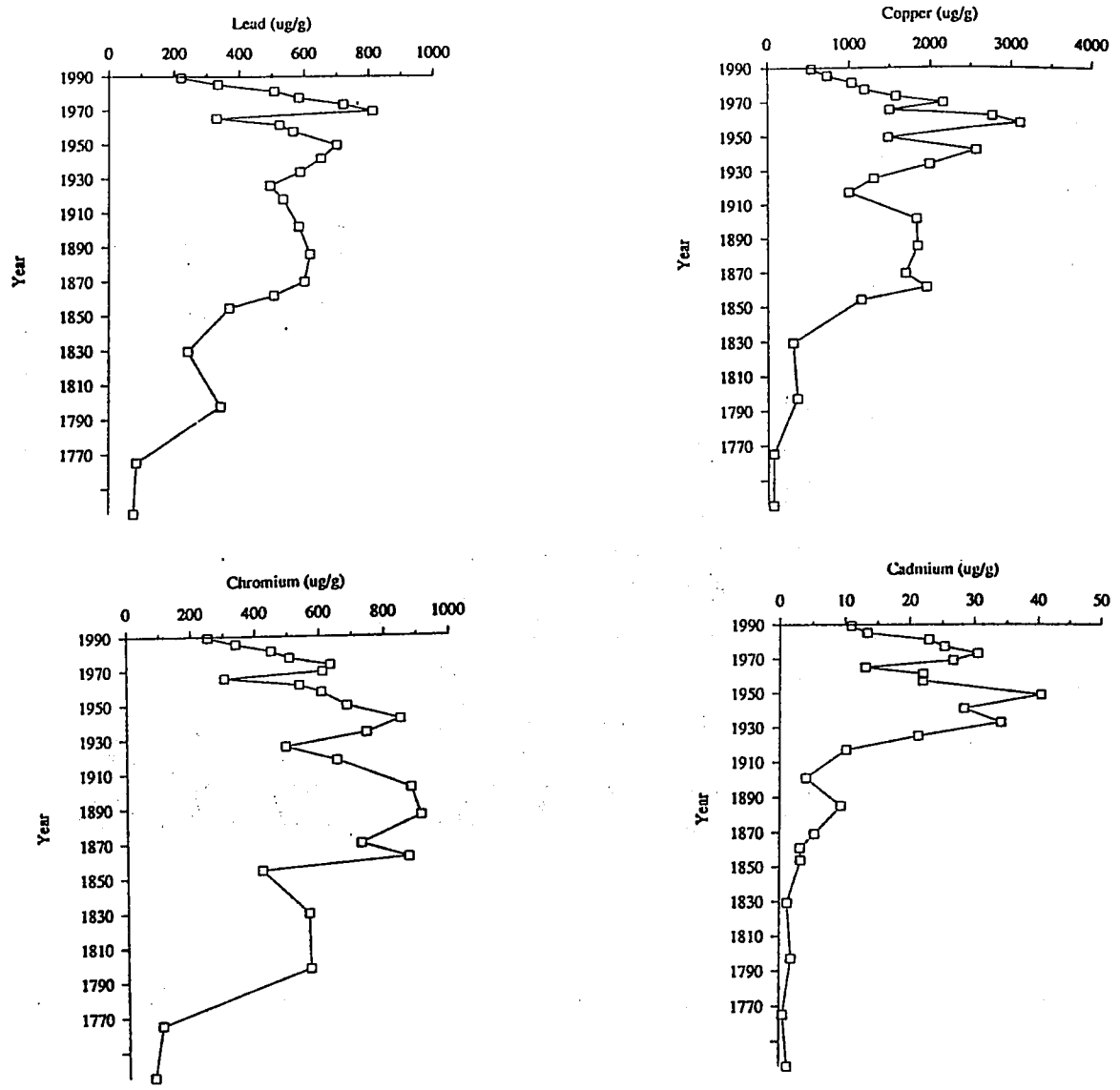


Figure 715-02 (14). Concentrations (micrograms metals/gram of sediment) of metals in sediment cores from the Seekonk River. (Data are from Corbin, 1989.)

ets of increased levels of toxic metals in areas thought to receive only local inputs of pollutants. For example, there are elevated concentrations of metals in shellfish from the area near the Naval Air Rework Facility at Quonset Point, an area that also has high concentrations of toxic metals and organic compounds in the sediments.

Concentrations of toxic organic compounds in shellfish trend from higher in the Upper Bay to low in the Lower Bay, although localized high concentrations of PHCs and PAHs have been found in shellfish from Allen Harbor, which is just north of Davisville and Quonset Point and near the site of an abandoned Navy landfill.

No historical trends in concentrations of contaminants in shellfish have been found. Concentrations of metals in quahogs have varied by a factor of less than two since 1971. This lack of a trend suggests that either exposure concentrations have remained relatively constant or that quahogs can metabolically control internal metal concentrations.

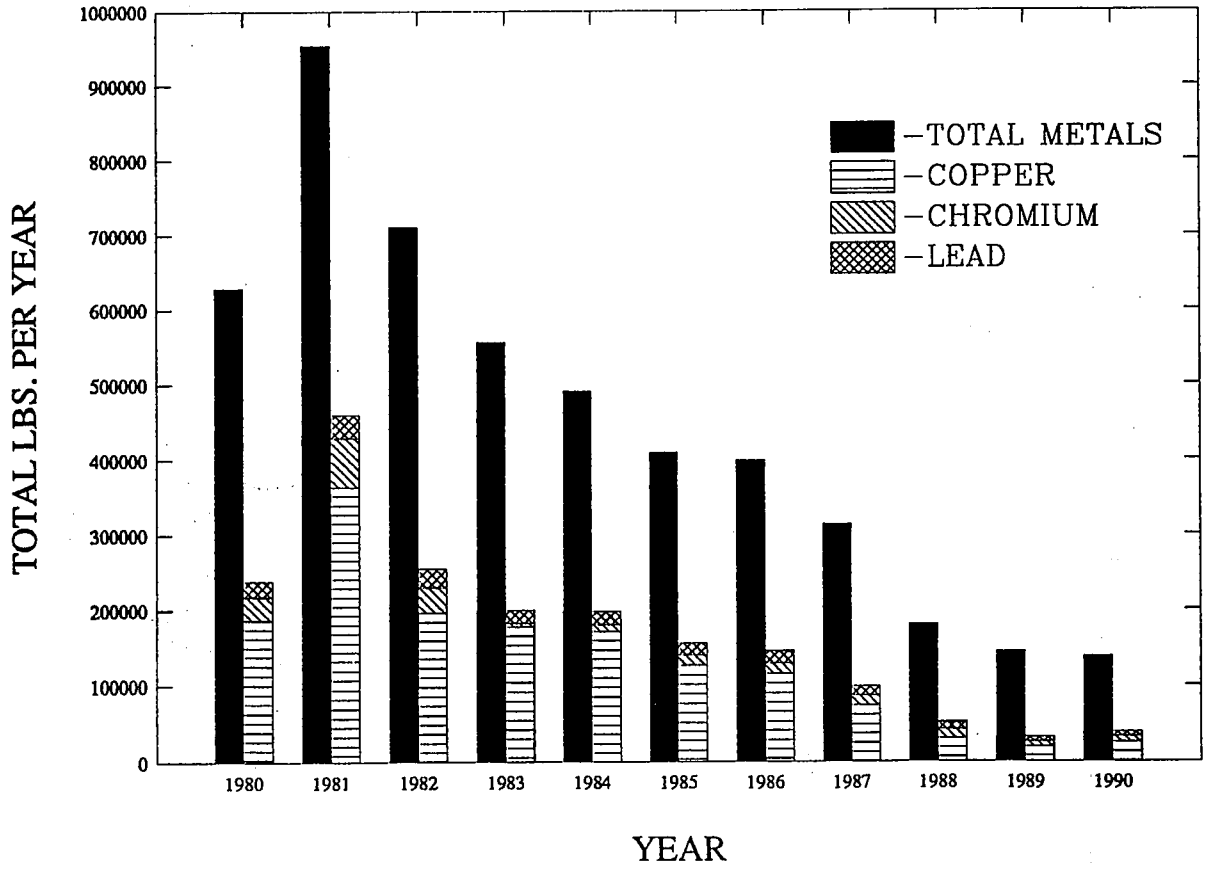


Figure 715-02 (15). Annual inputs of metals from the Field's Point WWTF. (Data are from the Narragansett Bay Commission, 1990.)

02-03-08 Comparisons to Other Estuaries

The National Status and Trends Program, conducted by NOAA, surveys more than 200 sites on the East, West, and Gulf coasts of the United States and Hawaii for concentrations of metals and organic contaminants in sediments and animals (Table 715-02(3)) (NOAA, 1989a, 1989b). Status and Trends Program data from 1984 to 1987 show that Narragansett Bay sediments are similar to other northeast, urban estuaries. For mercury, selenium, silver, and PAHs, sediments from Narragansett Bay rank among the 20-most-contaminated embayments measured by NOAA (NOAA, 1989a, 1989b).

Mussels collected in Narragansett Bay have ranked among the 20-most-contaminated of the National Status and Trends Program sites for copper and lead. In 1986, Narragansett Bay mussels were sixth-most-contaminated out of 72 for copper, eighth of 145 for lead, and twenty-fifth of 145 for nickel. Concentrations of contaminants in flounder livers ranked fourteenth of 42 for PCBs and sixth of 42 for lead (NOAA, 1989a, 1989b).

Table 715-02 (3). **Average concentrations of organic contaminants (nanograms of metals/gram) and toxic metals (micrograms of metals/gram) in selected estuaries. (Data are from NOAA National Status and Trends Program, NOAA, 1989a, 1989b. Tissues are blue mussel for all sites except Delaware Bay, where oysters were sampled.)**

	PAH	PCB	Copper	Chromium	Cadmium	Lead
Sediments*						
Narragansett Bay	3,890	151	87.1	148	0.565	88.2
Boston Harbor	19,300	673	172	308	2.02	178
Salem Harbor, MA	15,600	591	126	3,370	9.79	260
Delaware Bay	980	122	26.6	111	0.810	44.0
Elliot Bay, WA	11,000	902	243	214	2.47	70.3
Bellingham Bay, WA	1,640	10.0	58.9	207	0.440	13.5
Hudson-Raritan	5,830	539	179	216	2.12	230
Tissues**						
Narragansett Bay	160	270	9.00	1.70	1.30	4.45
Boston Harbor	1,520	820	12.2	2.00	1.32	9.70
Salem Harbor, MA	580	500	11.0	4.10	0.780	22.0
Delaware Bay	234	350	298	0.682	7.70	0.718
Elliot Bay, WA	4,200	700	10.0	1.60	2.60	3.10
Bellingham Bay, WA	330	100	11.0	3.40	3.10	1.20
Hudson-Raritan	1,600	1,990	15.3	5.16	5.90	10.9

*Average of 4-year mean concentrations from 3-4 sites
**Average of 3-year mean concentrations from 2-3 sites

02-04 Living Resources and Critical Habitats

02-04-01 Phytoplankton

Tiny, single-celled plants, phytoplankton, provide most of the energy for animals that live within Narragansett Bay (Kremer and Nixon, 1978; Kremer, 1990). Because Narragansett Bay is a relatively deep estuary, seaweeds, seagrasses and salt-marsh grasses are less important as food sources, although, to the extent these habitats have survived shoreline modification, they provide critical spawning and nursery habitat (French *et al.*, 1992). Phytoplankton, including diatoms and flagellates, are food for zooplankton, small animals that live in the water column, and for some fishes. Living and decaying phytoplankton also feed many of the animals living on the bottom of Narragansett Bay, including filter-feeding shellfish.

Typically, populations of phytoplankton bloom in late winter to early spring and again in the late summer, although this pattern may vary (Figure 715-02(16)) (Hinga *et al.*, 1989). Denser populations of plankton are found in the upper portions of the Bay than at the mouth, possibly because the nutrients in sewage act as fertilizer.

Few major changes in the numbers or kinds of phytoplankton over the past 35 years have been documented (Hinga *et al.*, 1989). One major event did occur in 1985 when a very small and previously unidentified alga, *Aureococcus anophagefferens*, bloomed (Smayda, 1988, 1989). The algae were so abundant that the event became known as a "brown tide." Because the brown tide algae were a poor food source, shellfish consumed them in great quantities but were unable to grow or thrive. Many shellfish died, particularly mussels and bay scallops. The cause of this bloom remains unknown, and it is not possible to attribute its appearance directly to pollution of the Bay. Another brown tide event occurred in 1986, although this bloom was limited to some coves and embayments, including Greenwich Cove.

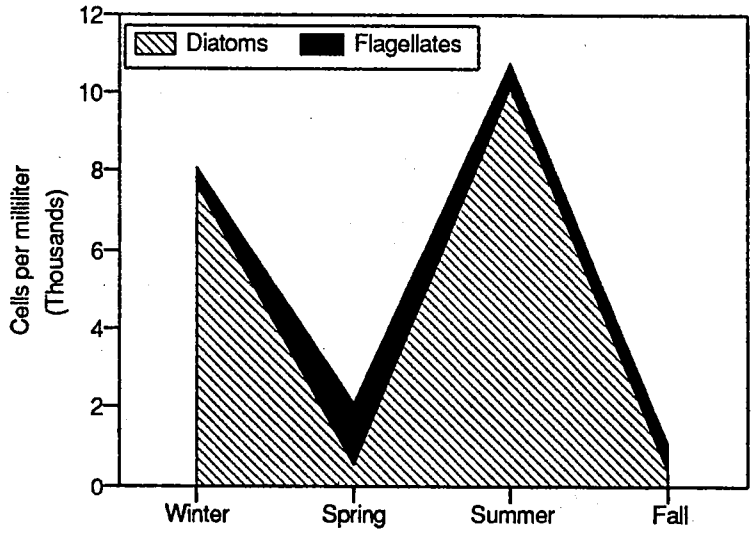


Figure 715-02 (16). Annual cycle of phytoplankton populations in Narragansett Bay. (Data are from Hinga *et al.*, 1989.)

02-04-02 Zooplankton

The zooplankton community of Narragansett Bay is similar to other open-water coastal areas in the Northeast (Durbin and Durbin, 1989, 1990). The community is dominated by two species of copepods, *Acartia hudsonica* and *Acartia tonsa*. Copepods are very small crustaceans, related to lobsters and crabs. No dramatic differences between the populations of zooplankton of the upper and lower parts of the Bay have been noted, nor do there seem to be any major historical changes in the community (Durbin and Durbin, 1989, 1990).

02-04-03 Bottom Animals

The bottom animals or benthos of Narragansett Bay have been studied since before the turn of the century (Frithsen, 1990). Because most attached or infaunal benthic animals live most of their lives in the same area, scientists think of them as good integrators of conditions at one location over long periods of time. However, changes in benthic populations along a gradient from the Upper Bay to the Lower Bay have been difficult to interpret (Frithsen, 1990). Pollutant concentrations decrease along that gradient, but salinity and loadings of organic matter also vary along the same pattern.

Among the animals living on the bottom of Narragansett Bay are several commercially important shellfish, including the hard clam (*Mercenaria mercenaria*), American lobster (*Homarus americanus*), surf clam (*Spisula solidissima*), blue mussel (*Mytilus edulis*), rock crab (*Cancer irroratus*), and Jonah crab (*Cancer borealis*) (French *et al.*, 1992). In the past, the soft-shell clam (*Mya arenaria*), bay scallop (*Argopecten irradians*), and American oyster (*Crassostrea virginica*) were also abundant in Narragansett Bay.

Of these shellfish, the hard clam or quahog fishery is the most important commercial fishery remaining in the Bay (Pratt *et al.*, 1992). Only the lobster fishery brings in more money to Rhode Island fishermen, although many lobsters are caught offshore (Figure 715-02(17)).

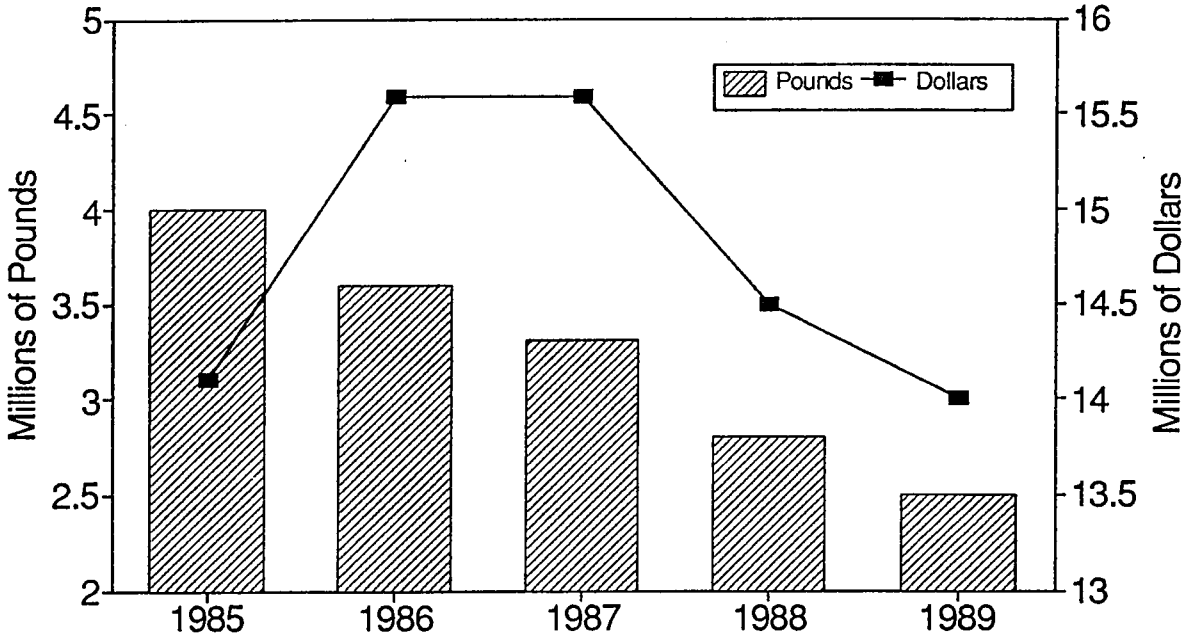


Figure 715-02(17). Commercial landings of Narragansett Bay quahogs. (Data are from NOAA/NMFS.)

The quahog is the most abundant animal of its size living within the bottom sediments of Narragansett Bay (Frithsen, 1990; Pratt *et al.*, 1992). The highest densities of quahogs are found in the mid and upper portions of the Bay, including the Providence River, an area that is currently closed to harvesting. Quahogs in the Providence River have the highest measured tissue levels of toxic contaminants in the Bay basin, although there is no histopathological evidence of disease related to pollutant exposure (Kern, 1990).

02-04-04 Fishes

Both bottom-dwelling and open-water fish inhabit or visit Narragansett Bay (Jeffries and Johnson, 1974; Powell 1989). Among the bottom fish, the most common commercial species used to be the winter flounder, *Pseudopleuronectes americanus* (Figure 715-02(18)) (Jeffries *et al.*, 1989). Winter flounder live year-round within the Bay and may migrate outside the Bay to Rhode Island Sound (Gray, 1991). Periodically, abundances of winter flounder have declined drastically. For example, from 1968-1976, the population declined to only 15 percent of its 1968 levels (Jeffries *et al.*, 1989). By 1979, the population had recovered, but it subsequently declined again. Although these cycles are not completely understood, they appear to be closely related to higher-than-average water temperatures during the development and growth stages of young fish (Jeffries and Johnson, 1974). Such population fluctuations may be quite normal. However, chronic overfishing and alteration of spawning habitat are now thought to be the primary cause for the declining winter flounder population (Figure 715-02(19)). Although pollution has not been directly implicated as a cause for winter flounder declines, the Narragansett Bay Project has found that abnormalities in flounder livers are more prevalent in the Upper Bay at Warwick Neck, than in the Lower Bay at Whale Rock (Lee *et al.*, 1991).

Other fishes, such as scup, menhaden, striped bass and bluefish, make seasonal migrations into Bay waters. Recreational fisheries exist for striped bass and bluefish. The commercial menhaden fishery is the largest in the Bay by weight.

02-04-05 Birds

Resident and migratory birds are common within the Narragansett Bay region (French *et al.*, 1992). Gulls and terns nest on islands and other isolated areas. The Bay is an important wintering area for many sea ducks and other waterbirds. Small shorebirds pass through the Narragansett Bay area as they migrate north in the spring and south in the fall. Raptors, such as osprey, historically nested along the coast in large numbers. Their populations were diminished by DDT and other pesticides and by habitat loss, but are currently rebounding. Sites on Sakonnet Point, Fort Wetherill, Prudence Island, Rose Island, Big Gould Island, Dyer Island, Hope Island, Little Gould Island, Hog Island and Spar Island are some of the important locations of colonial waterbird rookeries in the Bay (French *et al.*, 1992).

02-04-06 Habitats

Ecologically fragile habitats in the Narragansett Bay system include saltwater and freshwater wetlands, fish breeding and nursery grounds, inland surface waters, and shallow embayments that can be easily affected by excess nutrients, toxic compounds, solids (erosion), and outright destruction or modification.

Salt marshes provide a nursery ground for fish and shellfish, protection from coastal storms, and habitat for wildlife. Salt marshes cover about 2800 acres of land around Narragansett Bay. An additional 4400 acres are tidal flats. Within Narragansett Bay, there are approximately 80 km of narrow, fringing salt marsh, marshes that line the edges of rocky shores or developed areas (French *et al.*, 1992).

Freshwater wetlands provide habitats for plants and animals, filters for pollutants entering the groundwater, and protection from stormwater damage. Freshwater wetlands make up about 63,000 acres, six percent of the watershed.

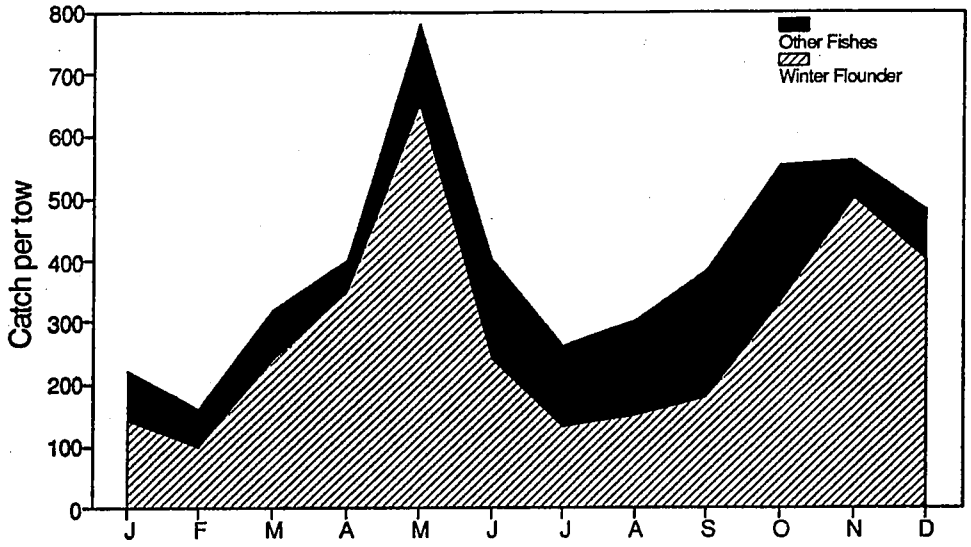


Figure 715-02 (18). **Annual fluctuations in fish populations in Narragansett Bay. (Data are from Jeffries *et al.*, 1989, and represent surveys rather than commercial harvests.)**

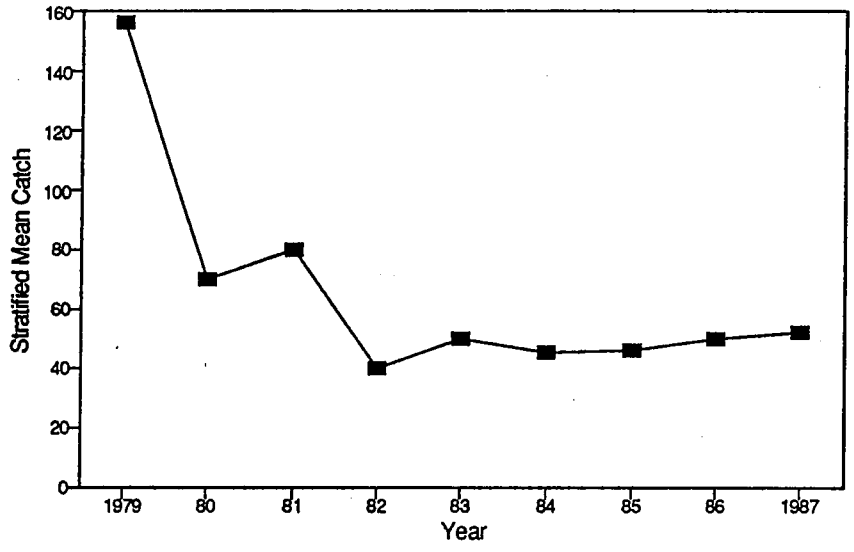


Figure 715-02 (19). **Winter flounder catches between 1979 and 1987. (Data are from NOAA/NMFS and reflect surveys rather than commercial harvests.)**

Fish habitats in Narragansett Bay include areas for anadromous fish runs; spawning and nursery areas for winter flounder, juvenile lobsters, and other fish and shellfish; and current and historic shellfish beds. Most winter flounder larvae are found in the Upper Bay (French *et al.*, 1992). One part of the National Estuarine Research Reserve, just offshore from Nag Creek Marsh, is thought to be a spawning site for flounder.

Nutrient-sensitive areas include embayments, salt ponds, freshwater ponds, bogs, and fens. These poorly flushed areas are particularly sensitive to development and commercial and recreational activities. These areas are not well-studied but are the areas that may be most affected by excess loadings of nutrients (Penniman *et al.*, 1991b).

02-05 Public Health Concerns

The major public health concern for Narragansett Bay, as for other coastal areas in the United States, is the safety of eating raw or incompletely cooked shellfish (quahogs, oysters) harvested from sewage-contaminated waters (Kipp, 1990). However, another public health concern exists with respect to the additive lifetime risk of contracting cancer for people who consume large amounts of seafood harvested from chemically contaminated areas of the Bay. A more minor public health concern for the region is the risk of infection from swimming in sewage-contaminated waters.

In the past, consumption of sewage-contaminated seafood led to outbreaks of bacterial and viral diseases, such as typhoid fever cholera, and hepatitis. Fortunately, such outbreaks have not occurred in the Narragansett Bay area for decades. Wastewater is now disinfected with chlorine to kill bacteria, and bacterial indicators of fecal contamination are routinely monitored in shellfish harvesting waters. Today, there is greater concern about sewage-derived viruses, such as those that cause infectious hepatitis and gastroenteritis since chlorine is a relatively ineffective viricide compared to alternative disinfection techniques.

Shellfish beds in Narragansett Bay are closed if the levels of fecal coliform bacteria indicate that sewage has contaminated the clams. Approximately 40 percent of the Bay is restricted to shellfishing. Twenty-eight percent of the Bay, including Mount Hope Bay, the Providence River, and several smaller areas are permanently closed, because the levels of fecal coliform bacteria are consistently higher than the state standard. Upper Narragansett Bay is a "conditional" area that is closed for at least seven days following a half inch of rain over a one-day period. These closures are made because of the great influx of untreated sewage from CSOs during rain. An additional 769 acres near marinas are closed during the summer months, because they can receive sewage discharges from boats. In 1991 an additional 40 acres in the Palmer River were closed, due to high levels of fecal coliform bacteria that have been attributed to septic systems and stormdrains as sources (Figure 715-02(20)) (Karp *et al.*, 1990).

The long-term cancer risk from eating fish and shellfish from Narragansett Bay is probably not currently a problem for most consumers, although concern for eating seafood harvested from urban estuaries remains a public health issue for all urban coastal areas (Kipp, 1990).

Narragansett Bay quahogs do not exceed U.S. Food and Drug Administration (FDA) alert limits for mercury, PCBs, chlordane, DDT, or DDT's breakdown products, DDE or DDD, the only contaminants for which such limits have been set. Using estimates of average and maximum consumption, the Narragansett Bay Project found that heavy consumers (15 g/day) of quahogs from the Providence River could be at a slightly greater risk of contracting cancer compared to average consumers (1.2 g/day) (Kipp, 1990). In comparison to other estuaries, consuming quahogs from Narragansett Bay is safer than eating fish from New York Harbor or Lake Michigan or clams, lobster or flounder from Quincy Bay in Massachusetts.

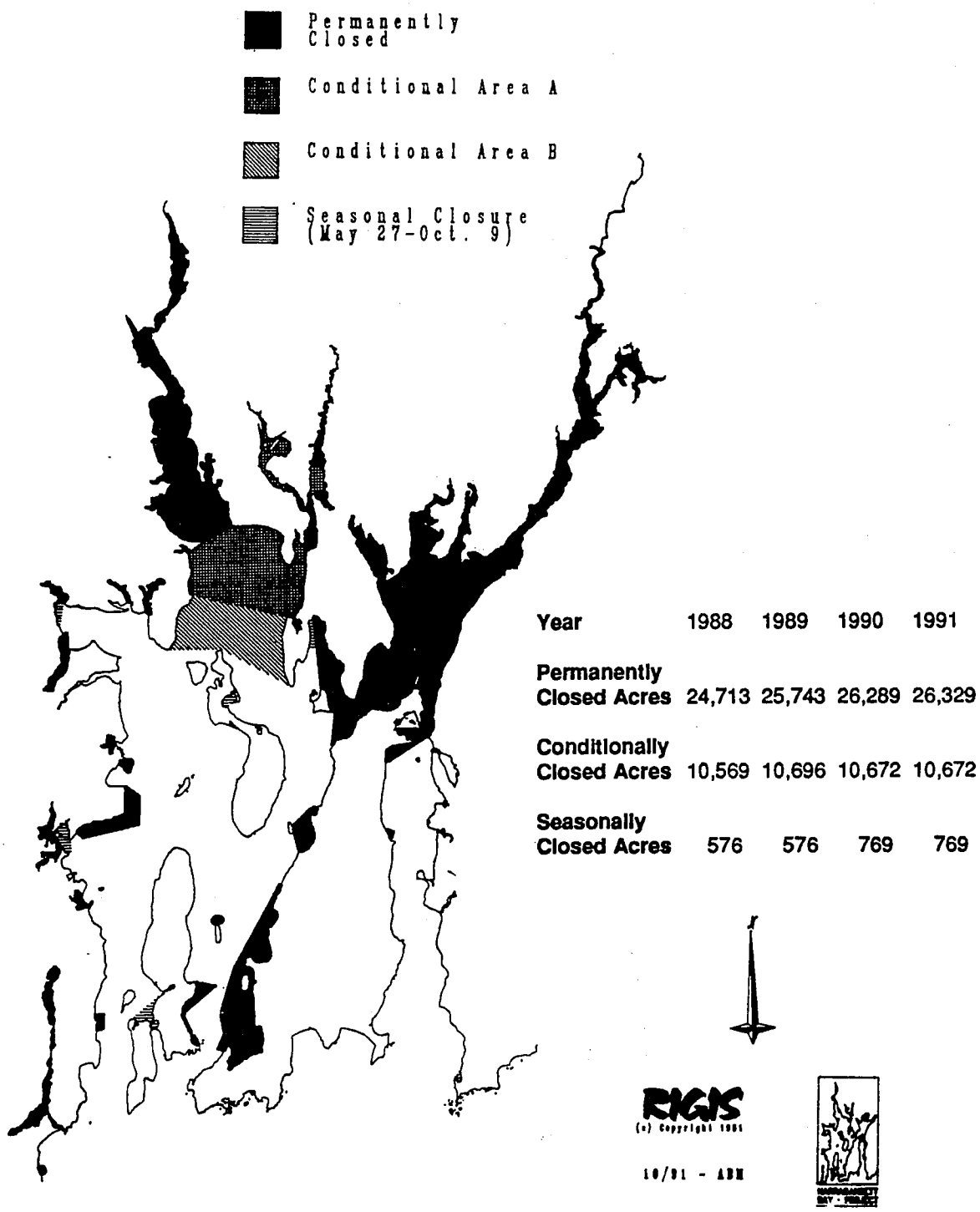


Figure 715-02(20). Shellfish closure areas in Narragansett Bay. (Data from NBP, RIGIS.)

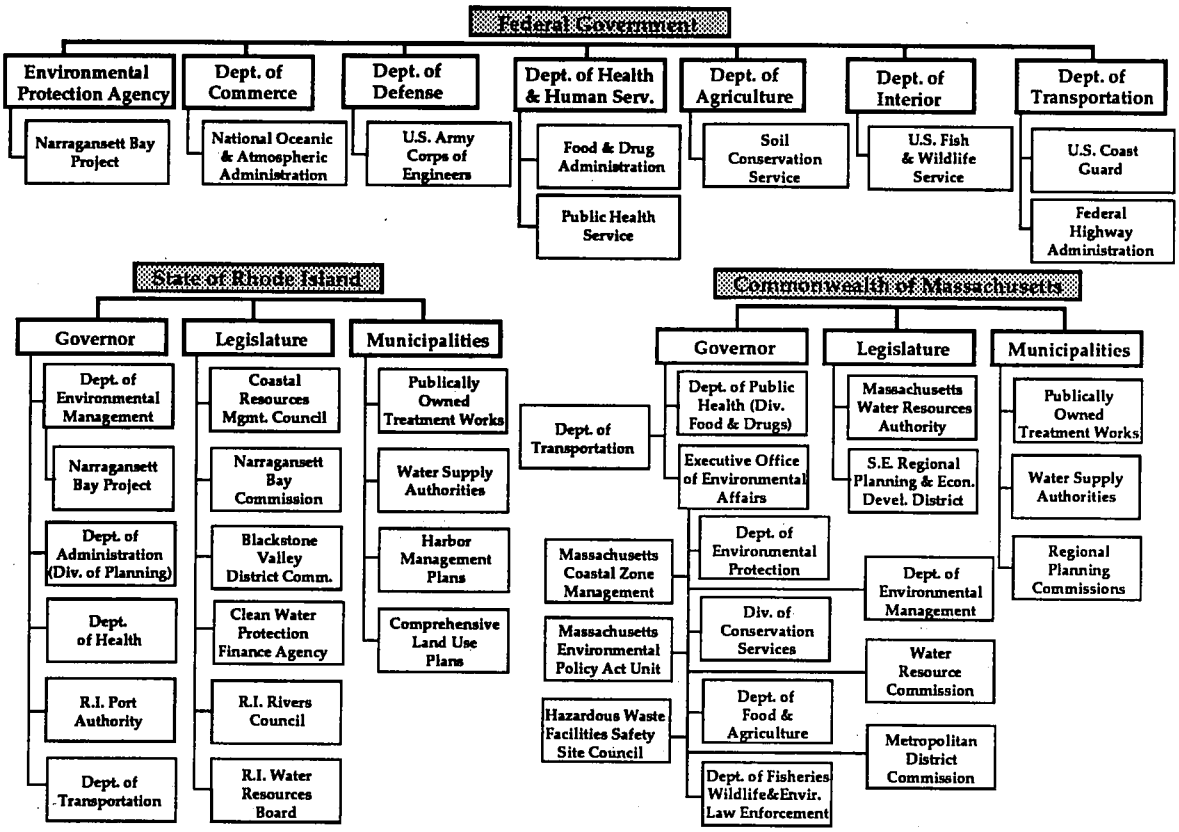


Figure 715-02 (21). Federal, state, and local agencies involved in Narragansett Bay planning and regulation.

For winter flounder, the pattern is similar to that for quahogs. Consumers of average amounts for flounder (1 g/day) are at no increased risk, while persons who consume large amounts of flounder (165 g/day) would be at slightly above what EPA believes is an acceptable risk (Kipp, 1990). Few data are available to calculate health risks of consuming other fish or shellfish from Narragansett Bay. However, the Rhode Island Department of Health (RIDOH) has issued a health advisory regarding consumption of bluefish and striped bass because of PCB levels. Since these species migrate along the entire East coast, their contamination is an issue for the entire region.

02-06 Bay and Watershed Governance

Resource management and pollution control in Narragansett Bay are governed by a complex network of federal, state and local authorities (Figure 715-02(21)). The State of Rhode Island takes the primary state-level role in governance of the Bay's open water. However, since 61 percent of the Narragansett Bay watershed is within Massachusetts, its environmental laws and policies also affect the Bay.

Congress's passage of the Clean Water Act (CWA) of 1972 firmly established the federal commitment to controlling pollution in coastal waters, and this legislation has controlled subsequent efforts by federal, state, and local agencies. EPA has the primary responsibility for the National Estuary Program, established by Congress in the amendments to the CWA in 1987.

Congress also enacted the Coastal Zone Management Act (CZMA) in 1972 to preserve,

protect, develop and enhance coastal resources. Activities conducted under this act are administered by NOAA and state Coastal Zone Management (CZM) programs. The CZMA was amended in 1990 to include much broader state responsibility for controlling nonpoint source pollution in the coastal zone.

Other federal laws that affect Narragansett Bay include the following:

- National Environmental Policy Act of 1965, which requires that any project involving federal legislation, funds, or activities that could significantly alter the quality of the human environment must be the subject of an environmental impact statement.

- Coastal Barrier Resource Act of 1982, which protects barrier beaches, wetlands, and nearshore waters and provides funds for maintenance, research, and public safety.

- Estuarine Areas Act of 1968, which provides for the preservation, protection, and restoration of valuable estuaries.

- Shoreline Protection Act of 1988, which protects coastal waters from litter and pollution by providing for permits to transport municipal and commercial wastes in coastal waters and regulates waste handling.

- Marine Protection, Research and Sanctuaries Act of 1972, which regulates ocean dumping of industrial and municipal wastes and dredged material.

- Submerged Lands Act of 1953, which allows states to manage, administer, lease, develop, and use submerged land and natural resources beneath navigable waters.

- Land and Water Conservation Fund Act of 1965, which provides funds for and authorizes federal assistance to states in planning, acquisition, and development of needed land and other areas and facilities.

- River and Harbors and Flood Control Act of 1970, which requires that all civil projects undertaken by the Army Corps of Engineers consider environmental, social, and economic effects.

- National Flood Insurance Act of 1968, which encourages state and local governments to make appropriate land-use adjustments to constrict the development of land that is exposed to flooding.

- Endangered Species Act of 1973, which identifies, lists, and protects endangered and threatened species and requires that all federal actions avoid destroying or modifying critical habitats.

- Fish and Wildlife Coordination Act of 1958, which requires that fish and wildlife conservation receive equal consideration and be coordinated with other features of water resources programs through planning, development, maintenance, and coordination of fish and wildlife conservation and rehabilitation.

- Fish and Wildlife Conservation Act of 1980, which provides funds and technical assistance to states for the development, revision, implementation, and monitoring of conservation plans and programs for nongame fish and wildlife.

- Migratory Bird Conservation Act of 1962, which provides funds and authorization for the acquisition of areas for the protection and management of migratory birds.

- Wild and Scenic Rivers Act of 1968, which provides for preservation of selected rivers.

- Magnuson Fishery Conservation and Management Act of 1976, which promotes domestic commercial and recreational fishing through sound conservation and management principles.

- Anadromous Fish Conservation Act of 1965, which provides for the conservation, development, and enhancement of fishes

that spawn in freshwater and live as adults in saltwater.

- Department of Transportation Act of 1966, which establishes a policy that special efforts should be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites.

- Water Bank Act of 1970, which implements a continuous program to prevent the serious loss of wetlands and preserves, restores, and improves wetlands.

- Safe Drinking Water Act, as amended in 1986, which authorizes the adoption of national standards and treatment technologies for public drinking water.

- Resource Conservation and Recovery Act, the 1976 amendment to the Solid Waste Disposal Act, which provides standards for treatment, storage, and disposal facilities for hazardous wastes, aimed at preventing contamination of surface and groundwater.

- Comprehensive Environmental Response, Compensation, and Liability Act of 1980, which established the Superfund program to clean up existing or closed hazardous waste sites.

Federal agencies that influence pollution control and resource management issues include not only EPA and NOAA, but also FDA, which sets allowable levels of contaminants in fish and shellfish consumed by humans; USACOE, which regulates dredging activities and runs the permit program which governs the discharge of dredged and fill material into navigable waters; the U.S. Coast Guard, which is responsible for enforcing vessel discharge prohibitions and responding to spills in navigable waters; the U.S. Navy which possesses numerous properties in coastal areas; the Federal Energy Regulatory Commission (FERC), which licenses hydroelectric facilities; and the U.S. Fish and Wildlife Service (USFWS) which is charged with managing and protecting indigenous fish and wildlife.

The State of Rhode Island enacted legislation as early as 1920 to "prohibit and regulate the pollution of waters of the state." RIDEM, formed in 1977, now has jurisdiction over water quality policy and management. RIDEM has also produced the *Non-Point Source Management Plan* and the *State Clean Water Strategy*. The *Non-Point Source Management Plan* specifies management approaches to decrease nonpoint sources of contaminants to the Bay. The *State Clean Water Strategy* will integrate assessment and management plans for point and nonpoint sources of contaminants.

Another Rhode Island state agency, CRMC, was established in 1971 as an independent planning and management authority. CRMC is charged with protecting and managing Rhode Island's coastal zone, and has the authority to develop and enforce plans related to the use of land and water in coastal areas. The CRMC, in collaboration with RIDEM and other nonpoint source planning programs, is expected to develop the State's Coastal Nonpoint Pollution Control Program (CNPCP) mandated under Section 6217 of the 1990 Amendments to the federal CZMA.

Other programs administered by the state include the following:

- ISDS permit process, which ensures that the siting, design, and operation of septic systems is protective of public health and environmental quality.

- Freshwater wetlands permit process, which protects water quality, groundwater recharge abilities, wildlife habitat, recreational values, and unique wetland characteristics.

- Water quality classification process, which classifies Rhode Island waters and sets forth policies for their use.

- Natural Heritage Program, which identifies habitats for rare or threatened species.

- Endangered Species of Plants and Animals Act, a state law that prohibits the sale of federal endangered or threatened species.

- Erosion and Sediment Control Act, which enables communities to require developers to submit erosion and sediment control plans.

- Groundwater Protection Act, which establishes state policies for groundwater protection.

- Wellhead Protection Program, which delineates wellhead areas in need of protection, identifies contaminant sources, develops management strategies and ordinances, guides siting of new wells, and provides contingency plans for events of well contamination.

- Underground Storage Tank Regulation, which implements a registration system and establishes design requirements, testing schedules and procedures, and measures for siting underground tanks.

- Hazardous Waste Regulation, which governs the storage, transport, treatment, and disposal of hazardous wastes.

- Hazardous Waste Management Facilities, which establishes a process for siting hazardous waste management facilities.

- Solid Waste Regulation, which authorizes prohibition of disposal of solid waste in groundwater aquifer areas.

- Underground Injection Control Program, which is intended to preserve the quality of the groundwaters of the state by assuring the proper location, design, construction, maintenance, and operation of injection wells and other subsurface disposal systems.

- Pesticide Control, which authorizes regulation of registration, sale, storage, transport, use, application, and disposal of pesticides.

- Public Drinking Water Protection Act, which allows public water supply authorities to impose a charge on water use.

One recent Rhode Island law affects land-use issues in the watershed and consequently will affect the water quality of the Bay. The Comprehensive Planning and Land Use Regulation Act, passed in 1988, requires all cities and towns to produce a comprehensive plan to guide development. The Zoning Enabling Act, enacted in 1991, expands local authority to enforce the plans developed under the Comprehensive Planning and Land Use Regulation Act.

The Commonwealth of Massachusetts has agencies and programs that mirror many of the activities carried out in Rhode Island. However, proposed projects affecting Narragansett Bay may meet different financial or political priorities in Rhode Island and Massachusetts. Many local zoning ordinances also address environmental protection and resource management.

Because environmental regulation often produces conflicts between public and private rights and expectations, the federal and state courts also play an important role in governance of the Bay. Also, although they have no official regulatory capacity, environmental groups, trade organizations, other special interest groups and the local universities also influence resource management and pollution control policies.

Each of these groups—federal, state and local governments, environmental groups, marine trade organizations, other special interest groups and the universities—have the best intentions for proper management and preservation of the Bay's resources. However, the number of organizations and laws that affect the Bay is complex. It is difficult to coordinate all interested parties and applicable laws and programs.

02-07 Priorities

Narragansett Bay is a complex natural system that supports varied and sometimes conflicting human uses. However, the Bay

ecosystem faces multiple environmental threats as a direct result of the intensity of human activity in the basin. These threats include, loss of overexploited fisheries, loss and degradation of critical natural habitats, and contamination of water, sediments, and living resources. In addition, unmanaged development and population growth, in combination with current waste disposal practices, have resulted in significant limitations on water quality-dependent uses of the Bay. Part 715-04 (Issues, Objectives, and Strategies) describes these problems in detail and recommends detailed policies and corrective actions to address them over the next five to ten years.

Three relatively distinct regions of the Bay and Bay watershed can be identified with respect to anthropogenic impacts and the need for restoration and protection. The first region, comprises the Providence River basin, Upper Narragansett Bay, and much of Mount Hope Bay. As described earlier, this area has the longest history and greatest magnitude of environmental insult of the entire Narragansett Bay basin which is related entirely to the history of urban and industrial development. For example, the Providence, Seekonk, Pawtuxet Rivers, and portions of the lower Taunton River have all experienced significant periods of low dissolved oxygen indicative of excessive BOD or nutrient loadings. This area also has elevated levels of various toxic pollutants in the water column, in some cases, which exceed federal and state aquatic life criteria. The long history of anthropogenic loadings of toxic compounds is apparent in the amounts of toxic materials remaining in the bottom sediments in this area. The Blackstone and Seekonk river sediments are particularly contaminated. For the Providence-Seekonk River and part of Mount Hope Bay, in particular, the volume of untreated wastewater released during rain events from CSOs carries with it huge amounts of fecal coliform bacteria and, potentially, human pathogens.

Point sources, *i.e.*, WWTFs, WWTF bypasses, CSOs, and storm drains are the major sources of pollution to this part of the Bay. In part because of this fact, control of several of these pollutants has progressed substantially. For example, BOD loadings from WWTFs have been dramatically reduced because of the mandatory secondary treatment requirements imposed pursuant to the CWA. Toxic pollutants entering the Bay have also declined dramatically, partially as a result of the CWA Industrial Pretreatment Program, part, as a result of changes in demographics, and part as a result of voluntary source reduction efforts by industry. However, as described above, water quality problems still remain. Thus, the environmental priorities are to:

- Continue to reduce the amounts of toxic pollutants entering this part of the Bay by enhancing and expanding the Industrial Pretreatment Programs, and, reducing the contributions from commercial and domestic sources.

- Determine if excessive nutrients, primarily from WWTFs, are the cause of eutrophic conditions in the Providence-Seekonk River and, if so, reduce loads of these pollutants.

- Abate the release from CSOs and WWTF bypasses of untreated wastewater that results in substantial contributions of fecal coliforms, suspended solids, and floatable wastes to this region.

The second region of the basin comprises areas that are experiencing rapid development or are already heavily developed but lack municipal sewers. For example, several sections of Narragansett Bay, such as Greenwich Bay, the Narrow River, and Wickford Harbor are increasingly being degraded by fecal wastes, nutrients, and toxic pollutants resulting in increasing limitations on water-quality dependent uses. Runoff and leachate from old, poorly designed and/or poorly maintained septic systems are believed to represent a significant pollution problem. In addition, the conversion of undeveloped land to impervious surfaces associated with development results in loss and degradation of natural habitats and greater volumes of stormwater runoff and stormwater runoff-borne pollutants. In some of the coves in this region, large numbers of boats may cause seasonal and local water

quality degradation related to boater discharges of fecal wastes, fueling operations, and other boatyard-related activities. In contrast to the Upper Bay, most of the pollutants in this region derive from nonpoint sources. Therefore, solutions to these problems are somewhat more complex and, to a great extent, involve planning efforts to better accommodate growth in this region in a more sustainable manner. These solutions include:

- Regulatory and technological mechanisms to reduce loadings of on-site sewage disposal system or OSDS-derived pollutants, to surface and ground waters. These measures include better regulation of septic systems, better maintenance schemes for septic systems (*i.e.*, through the establishment of wastewater management districts), and measures to address the cumulative effects of septic systems by considering and regulating OSDS density at a subwatershed level.

- Installing marina pump-outs to reduce boater discharges of fecal waste.

- Providing municipal officials with practical technical guidance on BMPs to control nonpoint source pollution, and innovative land use and growth management practices.

The third region of the basin is represented by those areas that are currently the most pristine or the least impacted by anthropogenic activities. These areas include parts of the Sakonnet River, many of the islands in Bay, and much of the lower Bay. Many of the problems described for the mid-Bay region are only just beginning to emerge in this third region. Thus, early and aggressive application of many of the initiatives outlined above will protect these more pristine areas from significant degradation or loss of natural resources. Efforts in this region should focus on land use and growth management initiatives to prevent the irreversible loss or degradation of critical natural resources and habitats.

Finally, a Bay-wide problem is the loss, and occasionally catastrophic declines, of living resources and habitats. The solutions to these problems are the development and implementation of scientifically-based management plans, not only for commercially or recreationally important species, but also for the ecologically important species and the significant habitats on which all these organisms depend. In addition, these solutions may require the modification of the concept of "free and common fisheries" in order to control the overexploitation of many living marine resources.

In summary, managers must not be deceived into thinking that Narragansett Bay's environmental, public health, and use-related problems can be solved by focusing on a single pollutant source, class of pollutants or remedial action. Although, in many cases, control of a single source will help to reduce inputs of several contaminant types, in others, multiple sources will have to be controlled to achieve significant reductions in a single class of pollutants. The major challenges for Narragansett Bay's managers will be to evaluate the relative environmental and social importance of these problems and balance these concerns against the technological, institutional, and economic feasibility of implementing solutions.

715-03 GOALS

The five goal statements listed below have been adopted by the Narragansett Bay Project (NBP) in order to guide future efforts to protect and restore Narragansett Bay.

Statement of the Goals for Restoring and Protecting Narragansett Bay

1. **The State of Rhode Island and the Commonwealth of Massachusetts, in conjunction with the Federal government and the municipalities, should act to prevent further degradation and incrementally improve water quality in developing coastal areas with deteriorating water quality.**

2. **The State of Rhode Island and the Commonwealth of Massachusetts, in conjunction with the Federal government and the municipalities, should act to protect diminishing high quality critical resource areas throughout the Bay basin.**

3. **The State of Rhode Island and the Commonwealth of Massachusetts, in conjunction with the Federal government, should act to more effectively manage commercially, recreationally, and ecologically important estuarine-dependent living resources.**

4. **The State of Rhode Island and the Commonwealth of Massachusetts, in conjunction with the Federal government and the municipalities, should act to rehabilitate degraded waters throughout the Bay basin and restore water quality-dependent uses of Narragansett Bay.**

5. **The State of Rhode Island and the Commonwealth of Massachusetts, in conjunction with the Federal government and the municipalities, should establish necessary interstate and interagency agreements and mechanisms to coordinate and oversee implementation of the Narragansett Bay Comprehensive Conservation and Management Plan.**

The Narragansett Bay goal statements mirror the overall goal of the EPA's National Estuary Program, which is to: "...restore and maintain the chemical, physical and biological integrity of the estuary, including restoration and maintenance of water quality, a balanced indigenous population of shellfish, fish and wildlife, and recreational activities in the estuary, and assure that the designated uses of the estuary are protected."

More specifically, however, the goals for protecting and restoring Narragansett Bay evolved from the NBP Management Committee's original list of "issues of concern", which are as follows:

- Impacts of toxic pollutants,
- Impacts of nutrients and eutrophication,
- Land-based impacts on water and habitat quality,
- Health and abundance of living resources,
- Fisheries management,
- Health risk to consumers of seafood, and
- Environmental impacts on commercial and recreational uses of Narragansett Bay.

Since the NBP's entire research and planning effort focussed on these identified "issues of concern", the goals for the protection and restoration of Narragansett Bay also reflect the NBP's

increasingly sophisticated understanding of the relationship between human activities throughout the Bay basin and the ultimate public health, environmental and ecological consequences for Narragansett Bay. As a result, the goal statements listed above integrate the NBP planning community's understanding of the problems facing Narragansett Bay with its collective judgment about technological, institutional, political, and economic factors affecting eventual *CCMP* implementation. However, it is extremely important to read these goal statements within the context of the entire *CCMP*. The agencies responsible for *CCMP* implementation, and the public, should continuously measure their progress in implementing the recommendations contained in Parts 715-04 and 715-05 of the *CCMP* against these goals for protecting and restoring Narragansett Bay.

715-04 ISSUES, OBJECTIVES, AND STRATEGIES

In conformance with Section 320 of the federal Clean Water Act, the overall goal of the Narragansett Bay *Comprehensive Conservation and Management Plan (CCMP)* is to:

> "...recommend priority corrective actions and compliance schedules addressing point and nonpoint sources of pollution to restore and maintain the chemical, physical and biological integrity of the estuary, including restoration and maintenance of water quality, a balanced indigenous population of shellfish, fish and wildlife, and recreational activities in the estuary, and assure that the designated uses of the estuary are protected."

Part 715-04, therefore, represents the core of the Narragansett Bay *CCMP*. Each chapter establishes a resource-related objective, and recommends detailed strategies for resolving a specific aspect of an identified environmental "issue of concern" for Narragansett Bay. The overall "issues of concern" for Narragansett Bay, as identified by the Narragansett Bay Project's governing committees in 1985-86, are as follows:

- Impacts of toxic pollutants,
- Impacts of nutrients and eutrophication,
- Land-based impacts on water and habitat quality,
- Health and abundance of living resources,
- Fisheries management,
- Health risk to consumers of seafood, and
- Environmental impacts on commercial and recreational uses of Narragansett Bay.

These general "issues of concern" dictated the scope of the NBP's entire $10 million research and planning effort since 1985. As a result, this part of the *CCMP* is based on the most contemporary scientific, social, legal and economic information available to the Narragansett Bay planning community as of 1991, including over 100 technical reports and 15 briefing papers commissioned and published by the NBP between 1985 and 1992. [See Bibliography and Appendix C.] All of these chapters were refereed by the NBP Management Committee and outside reviewers. In addition, many of these chapters were developed in consultation with representatives of affected Bay constituencies. [See 715-01-04 Process of Plan Development.] Part 715-04 of the Narragansett Bay *CCMP*, therefore, represents the planning community's best collective judgment about strategies for addressing the sources, and environmental and use-related consequences of identified Bay problems.

Since many interrelated anthropogenic activities contribute to observed Bay problems, Part 715-04 is divided into three sections: Source Control - Source Reduction (715-04-01); Resource Protection (715-04-02); and Areas of Special Concern (715-04-03). Section 715-04-01 (Source Control - Source Reduction) addresses major classes of pollutants (*e.g.*, toxics and nutrients); and major pollutant sources and pollutant pathways (*e.g.*, wastewater treatment facilities, combined sewer overflows, on-site sewage disposal systems, boater discharges, nonpoint pollution sources). Section 715-04-02 (Resource Management) focuses on human uses of the land and natural resources that affect the integrity, function and human use of the Bay ecosystem. Section 715-04-03 (Areas of Special Concern) addresses specific geographic regions of the Bay basin which require an integrated approach to address pollution, resource management and use-related concerns.

These chapters attempt to be objective and comprehensive with respect to existing environmental and use impairments, predicted environmental trends, and recommended strategies. However, the research community's understanding of basic estuarine processes and human interactions with the environment is not complete. [See Section 715-05-05 Unfinished Agenda.] In addition, the planning and regulatory community's ability to manipulate the environment and predict the outcome is also limited—partially by the lack of appropriate technology and/or

legal authority, partially by limited resources, and partially by fragmented geographic and/or subject matter jurisdiction. [See Section 715-05-02 *CCMP* Implementation and Governance.] As a result, the recommendations presented in Part 715-04 reflect existing scientific uncertainty about the Bay ecosystem, available technological and regulatory solutions, and the complexity of the existing structure of Bay governance. Therefore, implementing authorities and interested readers should use these chapters recognizing that the scientific community's understanding of Bay problems is continually improving, and that technological and regulatory solutions are continually evolving.

04-01 Source Control-Source Reduction

The Narragansett Bay basin has been continuously inhabited by humans for over 10,000 years. However, the earliest evidence of serious water quality and natural resource problems date from the colonial period, and are associated with population growth, modification of the landscape, and industrialization. Water quality in some limited regions of the Bay basin has improved in recent decades, primarily because of the large public investment in water pollution control technology, and most conspicuously in the Providence River. However, other near-coastal areas and tributaries show signs of deteriorating water quality and increasing impairment of water quality-dependent uses related to the trend toward suburbanization and development of rural areas of the Bay watershed.

Section 715-04-01 focuses on reducing current inputs of human fecal waste, toxic pollutants, and nutrients in order to restore threatened and degraded waters, and to restore water quality-dependent uses of the Bay. In addition, a combination of regulatory controls and non-regulatory, economic incentives are recommended in order to reduce future inputs of polluting substances associated with projected increases in population growth and development in the Bay basin. The Section also addresses significant pollutant sources and pollutant pathways (*i.e.*, combined sewer overflows, on-site sewage disposal systems, boater discharges, and nonpoint sources) responsible for discharging multiple classes of pollutants.

04-01-01 Source Reduction: Toxics

Objective for the Reduction of Toxics Inputs

The State of Rhode Island and the Commonwealth of Massachusetts should eliminate the discharge or release of toxic pollutants to the environment, from all sources, in order to protect public health and safety; the integrity of air, land and water resources; the health of aquatic and terrestrial plants and animals, and other economically viable uses of natural resources.

Introduction

The term "toxics", for the purposes of this discussion, refers to heavy metals and organic chemicals that may produce adverse human health or ecological effects when introduced into the environment at toxic levels. Human (or 'anthropogenic') sources of toxic pollutants to the Narragansett Bay basin include industrial, commercial and household wastes; agricultural and lawn chemicals; motor vehicle emissions and leaks; accidental releases and deliberate disposal.

The pathways by which toxic pollutants enter Narragansett Bay include rivers, publicly owned wastewater treatment facilities (WWTF), combined sewer overflows (CSO), direct industrial discharges, urban, highway and lawn runoff, groundwater discharge to surface waters, atmospheric deposition, and remobilization of contaminated sediments (Penniman *et al.*, 1991a).

Statement of the Problem

Although the metals and some of the organics occur naturally in low concentrations, they can accumulate in the tissues of plants and animals, causing physiological damage or death at elevated concentrations. On the other hand, synthetic organic chemicals, such as polychlorinated biphenyls (PCB) and chlorinated pesticides, often persist in the environment and can cause biological harm at low concentrations (Penniman *et al.*, 1991a:1).

Ambient concentrations of metals may be derived from the weathering of mineral de-

posits, or anthropogenically (and at toxic levels) from metal finishing and electroplating industry discharges and emissions, improper disposal of factory and domestic wastes, corrosion of copper and lead pipes, boat antifouling paints, *etc.* Toxic organic chemicals enter the Bay from the burning of fossil fuels, industrial and domestic discharges of organic solvents, chronic small chemical releases and from catastrophic spills, such as the *World Prodigy* spill of #2 heating oil in 1989. Many forms of toxic pollutants adsorb to particles that eventually settle to the bottom of the Bay, resulting in their accumulation in the sediments or tissues of marine organisms (Penniman *et al.*, 1991a:2). Others remain in solution, depending on temperature, salinity, pH, and chemical reactivity.

Biological Effects

Marine organisms, including fish and shellfish, can accumulate toxics in their tissues from the sediments and water to which they are exposed, and by consuming food that contains toxic pollutants. The effects of this accumulation can be both acute and chronic for organisms exposed to elevated contaminant levels. Acute toxicity, including death and population disruption, can occur in cases of extreme or persistent exposure to toxics. For example, lobster, mussel, benthic invertebrate and plankton kills in the intertidal and shallow subtidal areas heavily fouled by the *World Prodigy* oil spill represent an acute biological response to an extreme exposure to toxic petroleum derivatives (Pilson, 1990).

Sublethal exposures to toxic pollutants can cause carcinogenic, mutagenic and behavioral effects, organic tissue damage, general reduction in organism fitness and ability to reproduce, and change in community stability (Jeon and Oviatt, 1991; Penniman, 1991a). Elevated toxics levels in edible tissues of harvested seafood can also pose human health risks. For example, neurological disorders and an increased risk of cancer may be caused by chronic exposures to seafood contaminated with toxics (Kipp, 1990; Penniman *et al.*, 1991a:2-3). [See 04-02-04 Resource Protection: Public Health for further discussion.]

Temporal and Spatial Distribution

Chemical profiles from sediment cores show marked increases in metals' concentrations that coincide with the beginning of industrialization in the Narragansett Bay basin (Corbin, 1989; King, 1991; Penniman *et al.*, 1991a). The magnitude and environmental effect of industrial inputs have varied over time, however, due to changes in manufacturing, dam construction on tributaries, interception of industrial discharges to municipal sewers, improvements in wastewater treatment and industrial pretreatment technologies, as well as changes in disposal strategies for municipal sewage sludge (Penniman *et al.*, 1991a:1). For example, there is convincing evidence that significant reductions in inputs of some metals to the Providence River have occurred since the 1970s (King, 1991; Bender *et al.* 1989; Penniman *et al.*, 1991a:4). These reductions correspond to reductions in metals loadings to municipal WWTFs, changes in the metal finishing industry and reduction in use of leaded gasoline (Penniman *et al.*, 1991a:4).

Toxic metal and organic pollutant concentrations in Bay waters and sediments generally decrease along a down-bay gradient from the Providence and Seekonk Rivers to Rhode Island Sound (Doering *et al.*, 1989; Vandal and Fitzgerald, 1988; Bender *et al.*, 1989; Pilson and Hunt, 1989; Nixon, 1991; Metcalf & Eddy, Inc., 1991a). This gradient reflects distance from industrial and urban centers as well as Bay circulation patterns, depositional gradients and contaminant reactivity with seawater and suspended solids. Although total metals loadings to upper Narragansett Bay have decreased significantly in recent years (Penniman *et al.*, 1991a:5), marine aquatic life criteria for copper, nickel, and occasionally lead are still exceeded in the Providence and Seekonk Rivers. In addition, freshwater aquatic life criteria for copper, nickel, lead, chromium, cadmium, and polychlorinated biphenyls are persistently exceeded in segments of the Blackstone, Pawtuxet, Woonasquatucket, and Moshassuck Rivers and localized tox-

ics' "hot spots" still exist in other areas of the Bay basin related to local municipal, industrial, commercial, agricultural, and defense activities (Penniman *et al.*, 1991a:5).

Existing Policies

Discharges and releases of toxic metals and organic chemicals to the environment are regulated under a variety of federal laws, including the Clean Water Act (CWA), the Resource Conservation and Recovery Act (RCRA), the Clean Air Act (CAA), the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), and the Toxic Substances Control Act (TSCA). Discharges to freshwater and marine receiving waters are regulated under the CWA via the National Pollutant Discharge Elimination System (NPDES) and, indirectly via the National Pretreatment Program (NPP). Permitting authority may be delegated to the states for administration of both programs as is the case for Rhode Island (Penniman *et al.*, 1991a:10).

In addition, both Rhode Island and Massachusetts have established non-regulatory programs for reducing industrial discharges of toxics to the environment. These programs are described below. The State and the Commonwealth also participate, along with other New England states, and the States of New York and New Jersey, in the Northeast Waste Management Officials' Association (NEWMOA), which focuses on exchanging information regarding pollution prevention strategies (Penniman *et al.*, 1991a:15).

Water Quality Criteria

The Clean Water Act requires states to adopt water quality standards to protect public health, aquatic resources, and designated uses of state waters. These standards define the level of ambient water quality that must be achieved to support desired uses of the waterbody. Discharges into receiving waters are regulated, therefore, to ensure compliance with state water quality standards and protect designated uses of the state's waters.

In setting water quality standards, two sets of criteria are considered: aquatic life criteria and human health criteria. Aquatic life criteria are based on toxicity of specific chemicals to test animals. The U.S. Environmental Protection Agency (EPA) has developed aquatic life criteria for 30 toxic pollutants. Human health criteria, on the other hand, are based on toxic chemical concentrations in the tissues of edible organisms that could result in unacceptable, adverse health effects to human consumers, based on risk assessment analyses (Kipp, 1990). The EPA has developed human health criteria for 108 toxic pollutants.

Massachusetts has recently adopted, by reference, both aquatic life and human health criteria. Rhode Island has adopted criteria for the protection of aquatic life and is currently promulgating criteria for the protection of human health. However, some differences exist between Rhode Island and Massachusetts with respect to the designated uses and water quality standards of shared waterbodies such as Mount Hope Bay and the Blackstone River (Penniman *et al.*, 1991a:11).

Regulation of Discharges to Receiving Waters

In Rhode Island, the EPA has delegated primary authority for administering the NPDES permit program to the state, which issues "RIPDES" permits. The Rhode Island Pollutant Discharge Elimination System or RIPDES permits (and NPDES permits in Massachusetts, a "non-delegated" state) set effluent discharge limits for direct municipal and industrial wastewater dischargers to protect receiving water quality. Permit requirements typically include effluent monitoring, chemical toxicity testing, and periodic priority pollutant scans. Monthly monitoring and quarterly noncompliance reports are submitted to the state and EPA Region I. Failure to comply with permit limits or monitoring and reporting requirements is considered a violation of the Clean Water Act (and state water quality protection laws) and subject to enforcement action. The Rhode Island Department of Environmental Management (RIDEM) is primarily respon-

sible for permitting and enforcement in Rhode Island. In Massachusetts, NPDES permits are issued and enforced jointly by EPA and the Massachusetts Department of Environmental Protection (MADEP) (Penniman *et al.*, 1991a:10).

RIDEM regulates 129 direct dischargers to Narragansett Bay via RIPDES permits, 25 of which are "major" permittees based on flow, effluent, and receiving water characteristics. There are 116 permittees in the Massachusetts portion of Narragansett Bay watershed; 34 in the Blackstone River basin, 56 in the Taunton River basin and 15 along the Ten Mile River. Thirty-six of the Massachusetts dischargers are classified as "major" (Penniman *et al.*, 1991a:13).

Pursuant to the National Pretreatment Program (NPP), industrial discharges to WWTFs are regulated by local WWTFs under state and/or EPA supervision. WWTFs, or "local control authorities", issue enforceable discharge permits to industrial users that specify industry-specific effluent limits, general prohibitions on discharging materials that may adversely affect worker health or WWTF operation, and local limits that reflect the WWTF's own RIPDES (NPDES) permit limits, operating requirements, and/or receiving water quality standards. (Penniman et al., 1991a:14)

In Rhode Island, the EPA has delegated supervisory responsibility for industrial pretreatment programs to the state, and administrative responsibilities to the WWTFs. Thirteen of Rhode Island's 19 WWTFs have established industrial pretreatment programs as of 1991. In Massachusetts, these responsibilities are delegated directly to the WWTFs (as opposed to the Commonwealth), subject to EPA oversight. Seven of the 17 Massachusetts WWTFs in the Narragansett Bay basin have industrial pretreatment programs as of 1991 (Penniman *et al.*, 1991a:14).

Source Reduction

Rhode Island has established several programs that focus on reducing the use and release of toxic pollutants to the environment ("pollution prevention") rather than end-of-pipe regulation. Two Rhode Island laws specifically address reducing the discharge or disposal of toxic wastes. The Hazardous Waste Reduction, Recycling, and Treatment Research and Demonstration Act of 1986 (R.I.G.L. 23-19.10-1 *et seq.*) provides grants and low interest loans to industry for the development and demonstration of waste reduction and recycling technologies. The Hard-to-Dispose Material—Control and Recycling Act of 1989 (R.I.G.L. 37-15.1-1 *et seq.*) levies a surcharge on "hard-to-dispose" materials, such as organic solvents, oil, antifreeze, batteries, *etc.*, in order to encourage recycling and decrease use of hazardous materials (Penniman *et al.*, 1991a:15). These programs are administered by the RIDEM Office of Environmental Coordination's Hazardous Waste Reduction Program (HWRP). The HWRP also performs waste reduction assessments for Rhode Island industries, recommends more effective waste minimization practices, and tracks cost savings achieved by industries that implement pollution prevention practices (Penniman *et al.*, 1991a:16).

Other waste reduction programs in Rhode Island include the statewide *Capacity Assurance Plan* which will update waste reduction targets for hazardous wastes, including metals, and develop disposal strategies to account for the total volume of hazardous waste generated in Rhode Island; and EPA's Industrial Toxics Project, under which the state has agreed to work with industry to reduce total environmental releases of 17 pollutants by as much as 50 percent by 1995 (Penniman *et al.*, 1991a:16). The RIDEM also participates in a newly-created coalition of government, environmental groups, and industry representatives called the Rhode Island Pollution Prevention Council (RIPPC). The RIPCC is developing economic and regulatory incentives to increase source reduction, identifying markets for recycled materials, recommending priorities for research and development, and coordinating educational and technical assistance efforts (Penniman *et al.*, 1991a:16-17).

The Commonwealth of Massachusetts has initiated comparable source reduction pro-

grams. The Massachusetts Toxics Use Reduction Act, enacted in 1990, calls for a 50 percent reduction in toxic waste produced statewide by 1997 and emphasizes source reduction as opposed to end-of-pipe permitting to achieve this goal (Penniman *et al.*, 1991a:17). In addition, Massachusetts established the experimental Blackstone Project in 1989 to provide technical assistance to industries along the Commonwealth's portion of the Blackstone River. The Blackstone Project also works with state regulatory agencies to test the feasibility of regulating a facility's entire manufacturing process under a single consolidated discharge permit with respect to discharges, releases, and off-site transfers of toxics to all media (Penniman *et al.*, 1991a:17).

Analysis

At present, the most serious water quality degradation related to toxic pollutants occurs in the Providence River and its major tributaries—the Blackstone, Pawtuxet, Woonasquatucket, Moshassuck, and Ten Mile Rivers. However, elevated concentrations of some toxic substances also occur in other less urban areas of the Bay. For example, elevated mercury concentrations have been measured in Mount Hope Bay sediments, and sediment cores recently collected from the center of Greenwich Bay and Apponaug Cove show recent copper concentrations at five to 20 times above pre-Colonial levels. In addition, copper levels in Greenwich Bay have decreased by only five to ten percent compared to 67 percent in the Seekonk River over the same time period (King, 1991; Penniman *et al.* 1991a:4). Importantly, mussel tissue samples collected from relatively clean sites in Narragansett Bay (near Spar Island in Mount Hope Bay) were found to be the sixth most contaminated of 72 sites in the United States for copper and the eighth most contaminated of 145 estuaries sampled for lead (NOAA, 1987). Based on these findings, the use and discharge of toxics substances should be reduced throughout the Bay watershed.

Federal and state regulations governing the use, discharge, emission, and off-site waste transfer of toxic materials focus on industrial sources and are administered according to the environmental medium (air, land, water) that receives the waste. This regulatory approach may inadvertently 1) create incentives for shifting toxic wastes to other media in response to changing regulatory requirements; 2) create inconsistent or redundant regulatory requirements; 3) discourage development and testing of new treatment technologies; and 4) confound the agencies' ability to measure progress in achieving net reductions in toxics loadings to the environment. Existing regulatory policies may also inadvertently create incentives for industrial users to relocate away from highly regulated urban areas to areas with inadequate infrastructure (water, sewer) and/or less stringent regulatory requirements.

As noted above, toxic substances enter the Narragansett Bay watershed via a variety of pathways and derive from numerous natural and anthropogenic sources. WWTFs, followed by rivers, are the major pathways for the discharge of toxics to Narragansett Bay, although both receive wastes from direct (*e.g.*, industry, households) and indirect or nonpoint (*e.g.*, contaminated groundwater, runoff) pollutant sources. Since Rhode Island's Industrial Pretreatment Program, in combination with industry efforts, has resulted in significant reductions in industrial toxics loadings to WWTFs, up to 40 percent of the total metals discharged to the Narragansett Bay Commission (NBC) Field's Point facility at the present time could derive from non-industrial sources, including residential and commercial dischargers , corrosion of water supply conveyance systems, contaminated groundwater and runoff (Metcalf & Eddy, 1990a). Therefore, as industry continues to reduce its use and disposal of toxics, non-industrial sources such as commercial, agricultural, municipal and domestic users of toxic chemicals (including fossil fuels), urban and highway runoff, and groundwater discharge to surface waters may represent an increasingly significant contribution of toxics throughout the Bay basin.

Finally, human health and aquatic life criteria presently exist for a small subset of the

chemical compounds that are potentially of concern in marine systems. An even smaller subset of these anthropogenically—produced pollutants are presently controlled through the regulatory permit process—many WWTFs in the Narragansett Bay basin do not have effluent metals limits and even fewer have organic chemical limits (Penniman *et al.*, 1991a:17). However, there are numerous industrial, commercial, agricultural, and domestic sources of these non-regulated chemicals in the Narragansett Bay basin, and the regulatory problem may become increasingly serious in the future as new industries with "exotic" wastestreams, *e.g.*, bioengineering and pharmaceutical companies, become established. Consequently, source reduction and regulatory strategies should be developed that apply to a broader spectrum of potentially toxic chemicals rather than addressing only those toxic substances for which local data are available.

In summary, the existing trend toward industrial source reduction offers great potential for overall, permanent reductions in toxics loadings to upper Narragansett Bay. However, toxics-related problems in the Narragansett Bay basin are not limited to a single geographic region, a single category of users or a small group of toxic compounds. As a result, both regulatory and non-regulatory approaches should be evaluated in order to achieve basin-wide reductions in toxics use and discharge to the Bay.

Recommended Policies and Actions and *Estimated Cost of Implementation* are presented in the following pages.

RECOMMENDED POLICIES AND ACTIONS
SOURCE REDUCTION: TOXICS

CODE	POLICY	AGENCIES	STATUS
I.	The State of Rhode Island and the Commonwealth of Massachusetts should reduce total toxics loadings to Narragansett Bay basin from all sources by maximizing conservation of natural resources and minimizing the use, generation, and discharge of toxics to the environment.		
I.A.	Comprehensive Regulation of Toxics		
I.A.1.a.	The U.S. Environmental Protection Agency (EPA), the State of Rhode Island, and the Commonwealth of Massachusetts should assure that inconsistent, unclear or inappropriate regulatory policies and requirements do not create unnecessary impediments to achieving source reduction or reductions in toxics loadings to the environment. In order to implement this recommendation, the EPA, the Rhode Island Department of Environmental Management (RIDEM) and Massachusetts counterparts should prepare a report within one year following approval of the Narragansett Bay *Comprehensive Conservation and Management Plan* (*CCMP*) that evaluates potential conflicts among regulations pertaining to toxic pollutants, and formulates strategies to resolve identified conflicts. On an ongoing basis, these agencies should publish summary explanations of policies and/or regulations identified by interagency advisory groups as possibly interfering with progress toward source reduction. EPA Region I should appoint a single individual to receive notification and coordinate responses to federal policies or regulations that have been so identified. Examples of regulatory and program requirements that should be reviewed include: i. The Resource Conservation and Recovery Act (RCRA) permitting and reporting requirements regarding "hazardous waste treatment" that have been construed to apply to industries that install *zero discharge* recycling systems. ii. Federal and state discharge requirements that have been construed to apply to pilot scale research and development projects. iii. Federal program requirements that have been construed to prohibit the issuance of facility-based permits and consolidation of reporting requirements.	EPA, RIDEM, MADEP, NEWMOAA, RIPPC, Local control authorities	RIPPC, NEWMOAA, and R.I. local control authorities have identified several possible conflicts.

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I.A.1.b.	The EPA, the State of Rhode Island and the Commonwealth of Massachusetts should continue to participate in interagency pollution prevention advisory groups that review regulations and regulatory programs, recommend pollution prevention strategies and goals, review scientific and technological advances, exchange information on new technologies, and act as a liaison to industry.	EPA, RIDEM, MADEP, MADEM	[See RIDEM "Preliminary Agreement," Section 715-05-06.]
I.A.1.c.	The Commonwealth of Massachusetts should hire a Massachusetts Pretreatment Coordinator to act as a liaison with other states, local control authorities, and interagency pollution prevention advisory groups as soon as possible.	MADEP and/or MADEM	[See RIDEM "Preliminary Agreement," Section 715-05-06.]
I.A.2.	To assure that waste minimization practices and best available technologies (BATs) are used wherever practicable to minimize cross-media transfer of toxic chemical wastes, the EPA, RIDEM, and Massachusetts counterparts should encourage better training of program staff in all aspects of toxic materials regulation. These agencies should: a. Provide regulatory staff with continuing education in the municipal, industrial and manufacturing processes they regulate. b. Train regulatory staff to conduct coordinated, facility-wide inspections for all discharges, releases, and off-site transfers of regulated wastes.	EPA, RIDEM, MADEP, MADEM	[See RIDEM "Preliminary Agreement," Section 715-05-06.]
I.A.3.	a. The State of Rhode Island should be included on EPA Region I, Massachusetts Department of Environmental Protection (MADEP), and Massachusetts Coastal Zone Management (MACZM) lists of automatic reviewers of Massachusetts' discharge permits within the Narragansett Bay basin. b. The State of Rhode Island should be included on EPA Region I, Massachusetts Department of Environmental Protection (MADEP), and Massachusetts Coastal Zone Management (MACZM) lists of automatic reviewers of Massachusetts' water withdrawal permits within the Narragansett Bay basin. c. RIDEM, the Rhode Island Coastal Resources Management Program (CRMC) and the Rhode Island Division of Planning (RIDOP) should identify appropriate agency contacts to receive notice and provide reviews consistent with their jurisdiction and mandates under Coastal Zone Management Act Section 307, Executive Order 12372 and other sources of federal consistency review authority.	EPA, MADEP, MACZM, RIDEM, CRMC, RIDOP	

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I.A.4. ✓	To the fullest extent of their authority, the EPA, RIDEM, and MADEP should require all regulated municipal and industrial dischargers to minimize the use, generation, and disposal of toxic substances to the maximum extent practicable. In order to implement this recommendation: a. The EPA should develop a waste minimization report form that consolidates the requirements of the *Capacity Assurance Plan* (RIDEM, 1989a) and the *Rhode Island Hazardous Waste Reduction and Reporting Manual* (Center for Environmental Studies, 1989). b. By December 1995, the EPA and RIDEM should, to the fullest extent of their authority, require the completion of a waste minimization report by all significant industrial users subject to industrial pretreatment program requirements and should incorporate relevant portions of waste minimization plans into discharge permits, including schedules for implementing pollution prevention and toxics use reduction practices. The RIDEM should provide affected dischargers with assistance in completing the waste minimization report form to be developed by the EPA in order to educate and train industry personnel and improve compliance with regulatory requirements. c. The EPA, RIDEM, MADEP, and local control authorities, to the maximum extent possible, should revise existing industrial pretreatment regulations to require all significant industrial users found to be in significant noncompliance with industrial pretreatment discharge standards to undergo a formal on-site waste reduction assessment, and to submit a waste minimization report. The waste minimization report should establish short-term (three to five years) and long-term (greater than five years) goals for source reduction and treatment options and should quantitatively report actual reductions in use and disposal of toxics in all media, biennially, for the next five years. ["Significant noncompliance" is defined in 40 CFR § 403.8 (f) (2) (vii) (A) (B) for the purposes of this recommendation.] d. The federal government, the State of Rhode Island, and the Commonwealth of Massachusetts should establish economic incentives to encourage private investment in research, development, and implementation of pollution reduction technologies. (See Rec. IE)	EPA, RIDEM, MADEP	[See RIDEM "Preliminary Agreement," Section 715-05-06. re: possible revision to Industrial Pretreatment regulations, the R.I. Clean Air Act, and the R.I. Hazardous Waste Mgt. Act re: waste reduction assessments and waste minimization reports.]

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I.B.	WWTFs and Direct Industrial Dischargers		
I.B.1.	The EPA, RIDEM, and MADEP should effectively regulate direct toxic pollutant discharges to Narragansett Bay and its tributaries. In order to implement this recommendation:		
I.B.1.a. ✓	**The EPA, RIDEM, and Massachusetts counterparts should establish a basin-wide *Narragansett Bay List of Toxics of Concern*. The list should be based on documented exceedances of human health and aquatic life criteria anywhere in the Bay basin, all compounds regulated in existing permits, and best professional judgment of agency personnel. Based on existing information, the following chemicals should be included on the *List:* cadmium, chromium, copper, lead, mercury, nickel, zinc, cyanide, total petroleum hydrocarbons (PHC), polyaromatic hydrocarbons (PAH), and polychlorinated biphenyls (PCB).**	**EPA, RIDEM, MADEP, RIDOH, MADPH**	**[See RIDEM "Preliminary Agreement," Section 715-05-06.]**
I.B.1.b. ✓	**The EPA, RIDEM, and MADEP should issue National Pollutant Discharge Elimination System/Rhode Island Pollutant Discharge Elimination System (NPDES/RIPDES) permits to wastewater treatment facilities (WWTF) and direct industrial dischargers that are presently operating under expired permits, and, to the extent allowed by current regulations, revise existing permits to include effluent limits for all toxic metal and organic pollutants of concern in the Narragansett Bay basin sufficient to achieve water quality standards.** **i. The following NPDES/RIPDES discharge permits have expired and should be reissued as soon as possible: Douglas (Mass.), Upper Blackstone Water Pollution Abatement District (Mass.), Narragansett Bay Commission Field's Point (R.I.), Narragansett Bay Commission Bucklin Point (R.I.), and Woonsocket (R.I.), Smithfield (R.I.) and Warren (R.I.).** **ii. To the extent allowed by current regulations, the following NPDES discharge permits should be revised as soon as possible to include enforceable numeric, chemical-specific effluent limits for all metal and organic chemicals of concern: Grafton (Mass.), Hopedale (Mass.), Millbury (Mass.), and Uxbridge (Mass.).**	**EPA, RIDEM, MADEP**	**Smithfield RIPDES permit issued 1992; Draft NBC Bucklin Point RIPDES permit issued Dec. 31, 1990; Draft NBC Field's Point RIPDES permit issued June 1992.**

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I.B.1.c.	By December 1993, the EPA, RIDEM (or RIDOE), and MADEP should cooperatively perform a metals wasteload allocation for the Blackstone-Seekonk-Providence River basin and Upper Narragansett Bay in order to identify waters and sediments impaired by metals, and develop individual control strategies for identified point source dischargers. NPDES/RIPDES permits with enforceable, numeric, chemical-specific effluent limits, revised to the extent allowed by current regulations, shall be issued to all dischargers in the affected basin within two years following completion of the waste load allocation.	EPA, RIDEM, MADEP	Dryweather survey completed Summer 1991. [See EPA Region I and RIDEM "Preliminary Agreements," Section 715-05-06. re: commitment to wet weather survey, WLA.]
I.B.2.	The EPA, RIDEM, and MADEP should effectively measure direct toxic pollutant discharges to Narragansett Bay and its tributaries in order to allow systematic comparisons of temporal and spatial trends in pollutant loadings and receiving water quality. To the fullest extent of their authority, the EPA, RIDEM, and MADEP should: a. Require all dischargers subject to NPDES/RIPDES permits in the Narragansett Bay basin to routinely report monthly influent and effluent concentrations and loadings of all permitted toxic pollutants on the *Narragansett Bay List of Toxics of Concern* ; and b. Implement a receiving water monitoring program that is adequate to determine compliance with federal and state water quality standards, and evaluate regional trends in water quality. [See 05-02-04 CCMP Implementation and Governance: Long-Term Monitoring for related recommendation.]	EPA, RIDEM, MADEP	

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I.B.3 ✓	**The EPA, RIDEM and MADEP should effectively enforce limitations on direct toxic pollutant discharges to Narragansett Bay and its tributaries. These agencies should take the following actions to increase compliance with existing discharge requirements:** **a. Increase the frequency of unannounced on-site inspections and compliance monitoring at all WWTFs and direct industrial dischargers.** **b. Take timely and appropriate enforcement action for persistent noncompliance (more than three consecutive months) with chemical-specific effluent and toxicity limits, including monetary penalties that remove all benefits of noncompliance.** **c. Require WWTFs and businesses found to be in significant noncompliance with NPDES or RIPDES permits to publish notices in newspapers of general circulation identifying the violation, the penalty, and measures taken to prevent future violations.** **["Significant noncompliance" is defined in EPA Quality Noncompliance Report Workshop, December 1985 for the purposes of this recommendation.]**	**EPA, RIDEM, MADEP**	**[See EPA Region I and RIDEM "Preliminary Agreements," Section 715-05-06 re: inspection and enforcement.]**
I.B.4.	In order to increase compliance with existing discharge and other permit requirements, Rhode Island and Massachusetts state agencies should seek legislative expansion of federal and state "citizen suit" jurisdiction under the Clean Water Act (CWA), RCRA, Clean Air Act (CAA), Toxic Substances Control Act (TSCA), and state equivalents, as necessary to provide legal standing to citizen "watchdog" organizations to enforce, where applicable, all permit requirements regarding toxics discharges, releases, and off-site waste transfers to all media. In addition, state agencies should seek to establish federal and state "citizen suit" jurisdiction under the CZMA, Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), and state implementing programs.	RIDEM, CRMC, Mass. counterparts	

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I.C.	Industrial Users		
I.C.1.	The EPA, RIDEM, and local control authorities, including their Massachusetts counterparts, should verify, on an ongoing basis, that all industrial users subject to industrial pretreatment requirements are operating pursuant to discharge permits. In order to ensure that Massachusetts, Rhode Island, and local regulators are covering all industrial sources: a. Facilities files maintained by local control authorities and regulatory divisions of RIDEM and Massachusetts counterparts should be compared. b. Water use records should be examined for evidence of above-average water consumption in residential areas to detect unregulated manufacturing operations. c. Records of the Rhode Island Department of Economic Development and its Massachusetts counterpart, tax records, and all other appropriate public records listing manufacturing firms registered in Rhode Island and Massachusetts [SIC codes 20 to 39] should be examined. d. The State of Rhode Island and Commonwealth of Massachusetts should *not* offer a one-time amnesty for presently unregulated businesses to comply voluntarily with federal and state permitting requirements for wastewater, solid or hazardous waste disposal, and air emissions.	EPA, RIDEM, MADEP, local control authorities	RIDEM reviews WWTF Industrial Pretreatment program operations annually.

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I.C.2. ✓	In order to reduce the rate of noncompliance with industrial pretreatment program requirements, the EPA, RIDEM, local control authorities, and their Massachusetts counterparts should rigorously enforce industry compliance with existing industrial pretreatment program requirements, including all chemical-specific and toxicity-based discharge limits, and monitoring and reporting requirements. ["Significant noncompliance" is defined in 40 CFR § 403.8 (f) (2) (vii) (A) (B) for the purposes of this recommendation.] In order to implement this recommendation: a. RIDEM and MADEP should require training and/or certification for municipal industrial pretreatment program staff, including inspectors and industry personnel charged with overseeing industrial wastewater pretreatment operations. b. These agencies should take timely and appropriate administrative, civil, and criminal enforcement action against all regulated industrial dischargers found to be in significant noncompliance with chemical-specific effluent and toxicity limits, as defined in 40 CFR § 403.8 (f) (2) (vii) (A) (B), including monetary penalties that remove all benefits of noncompliance, and jail sentences for principals of firms found to be in violation of criminal provisions of the industrial pretreatment program requirements. c. All regulated industrial dischargers found to be in significant noncompliance with federal, state, and local discharge limitations, as defined in 40 CFR § 403.8 (f) (2) (vii) (A) (B), should be required to publish notices in newspapers of general circulation identifying the violation(s), the penalty, and measures taken to prevent future violations. d. Within the limits of their jurisdiction, a "whistle-blower" statute should be drafted, or existing statutory authority amended, to reward individuals who provide information regarding industries that are presently operating without required regulatory oversight. This statute should be patterned after federal "whistle-blower" measures and should include job-protection provisions. e. These agencies should formally review the administration and enforcement of any industrial pretreatment program where more than or equal to 15 percent of the regulated industries are in significant noncompliance with program requirements.	EPA, RIDEM, MADEP, local control authorities	[See RIDEM and EPA Region I "Preliminary Agreements," Section 715-05-06 re: enforcement and audits of Industrial Pretreatment programs.]

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I.C.3. ✓	The EPA, RIDEM, local control authorities, and their Massachusetts counterparts should systematically encourage regulated industrial dischargers to use and implement source reduction practices. In order to implement this recommendation, these agencies should: a. To the fullest extent of their authority, require completion of a waste minimization report by all significant industrial users subject to Industrial Pretreatment Program requirements; and revise existing industrial pretreatment regulations to require all dischargers found to be in significant noncompliance with industrial pretreatment standards, as defined in 40 CFR § 403.8 (f) (2) (vii) (A) (B), to receive a complete, on-site waste reduction assessment. [See Recommendation I.A.4.] b. Require certified design drawings of source reduction, reclaim, and recycle plans to be submitted as a requirement of the permitting process. Design drawings should be certified by a registered Professional Engineer or any individual formally approved by either the State Board of Registration for Professional Engineers or RIDEM to certify industrial process design drawings. c. Require industry-wide implementation of proven, affordable technologies or processes that reduce the use or generation of toxic pollutants without shifting waste to another medium, (*e.g.*, the use of substitutions for chlorinated and/or fluorinated degreasers), unless an industry can demonstrate that an equally effective alternative exists. d. Pending clarification of RIDEM's authority, the RIDEM should implement the requirements of the Chemical Purchasing Act of 1990 (R.I.G.L. 42-110), as amended, to assure that companies that purchase restricted chemicals are licensed by RIDEM based, in part, on the company's spill contingency plans and permit compliance record.	EPA, RIDEM, MADEP, local control authorities	[See EPA Region I and RIDEM "Preliminary Agreements," Section 715-05-06 re: emphasis on source reduction.]

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I.C.4.	Within two years following approval of the *CCMP*, the EPA should authorize, establish, and oversee pilot facility-based permitting projects in both Rhode Island and Massachusetts to test procedures for streamlining the permitting process and achieving overall reductions in pollutant loadings to all environmental media, *i.e.*, each participating industrial user should receive a single permit covering discharges, releases, and off-site waste transfers to all media rather than separate permits for dischargers to air, land, and water. Within one year following completion of the demonstration project the EPA should: a. Prepare a written evaluation of the administrative and regulatory success of the pilot projects, including the Blackstone Project, compared to conventional regulation of industrial dischargers. b. Determine whether the pilot project should be expanded, modified, or discontinued. c. Identify sections of relevant federal and state statutes and regulations that would have to be amended to allow complete implementation of facility-based permitting.	EPA	[See EPA Region I "Preliminary Agreement," Section 715-05-06 re: technical assistance to states on whole facility permitting.]

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I.D.	Other Generators of Toxic Pollutants		
I.D.1.	In order to measure adequately and to begin regulating non- industrial sources of toxic pollutants:		
I.D.1.a.	The RIDEM, local control authorities, and their Massachusetts counterparts, with technical assistance provided by EPA, should expand the categories of commercial enterprises subject to industrial pretreatment program requirements to include any discharger that discharges more than 500 gallons per day of mixed sanitary and process wastewater or generates more than ten kilograms per month or one 55-gallon drum per year of hazardous waste. [Activities to be considered include, but are not limited to, auto body shops, hospital, dental, medical, and photo laboratories, and dry cleaners.] All other commercial enterprises that discharge directly to sewers or generate septage that is ultimately discharged to a WWTF should be evaluated for inclusion in pretreatment programs by December 1995. These policies should be consistently implemented on a watershed-wide basis. The following policies should also be implemented as soon as possible:	RIDEM, MADEP, EPA, local control authorities	[See EPA Region I "Preliminary Agreement," Section 715-05-06 re: technical assistance to local control authorities for expansion of Industrial Pretreatment Program.]
I.D.1.a. i.	The establishment of enforceable pretreatment standards for toxic metals and organic chemicals in septage, and enforcement of existing state prohibitions on the discharge of non-domestic waste to on-site sewage disposal systems (OSDS). RIDEM and its Massachusetts counterparts should consider requiring an annual report from non-residential property owners served by OSDSs regarding manufacturing and service activities on-site that result in any discharge to the OSDS.	RIDEM, Mass. counterpart	
I.D.1.a. ii.	The expansion of existing household toxic waste collection, recycling, and disposal centers to allow collection of wastes generated by *tiny-quantity waste handlers* on a cost-recovery basis. The EPA, RIDEM, and Massachusetts counterparts should review their regulations to assure that unnecessary regulatory impediments to proper waste collection, recycling and disposal are modified or removed. [For the purpose of this recommendation, *tiny quantity waste handlers* are defined as "individuals or small businesses that produce less than ten kg per month, or less than one 55 gallon drum per year, of hazardous waste" (Roque, 1991), and are <u>not</u> subject to State hazardous waste or industrial pretreatment program requirements.]	EPA, RIDEM, Mass. counterpart	

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I.D.1.a. iii.	The reinstitution of the RIDEM household toxic waste collection, recycling, and disposal program as soon as possible. The RIDEM should evaluate alternative financing options to institute this program permanently.	RIDEM	RIDEM re-instituted program in 1992 and is seeking permanent funding
I.D.1.b.	The State of Rhode Island and Commonwealth of Massachusetts should require more rigorous annual motor vehicle inspections for air emissions and fluid leaks, including oil leaks, and should link annual motor vehicle registration fees and/or State excise taxes to EPA-rated gasoline mileage in order to promote the use of gasoline efficient vehicles. The State of Rhode Island and Commonwealth of Massachusetts should develop public education materials regarding the environmental effects of chronic oil leaks and highway runoff.	R.I. and Mass.	R.I. House Bill #8589 (1992) will require RIDEM to promulgate vehicle emission regulations, if passed.
I.D.1.c.	On an ongoing basis and within the limits of their jurisdiction, the EPA, the State of Rhode Island, the Commonwealth of Massachusetts, and consumer groups should make every reasonable effort to reduce household use of toxics by: i. Identifying environmentally safe substitutes for commonly used household chemicals. ii. Assessing "hard to dispose" taxes on household products containing toxic metals or organic chemicals. Revenues generated by the "hard to dispose tax" should be deposited in a RIDEM restricted receipt account and dedicated to future source reduction efforts in the State of Rhode Island. iii. Providing options for safe collection, recycling, and disposal, where possible, for household products containing toxic metals or organic chemicals, including oil. iv. Reducing the use of products containing chemicals in amounts that could be toxic to humans or aquatic life, or will interfere with WWTF processes or sludge disposal.	EPA, RIDEM, MADEP, MADEM, consumer groups, environ-mental advocacy groups	

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I.E.	Economic Incentives and Disincentives		
I.E.1.	The federal government, including the EPA, the State of Rhode Island, and the Commonwealth of Massachusetts should develop and apply market incentives for toxics that make wasteful or environmentally unsound use and disposal practices expensive. For example: a. Rhode Island and Massachusetts should adjust existing water rate structures to remove subsidies and encourage conservation, *i.e.*, by establishing use fees that increase with the volume of water consumed. [Note, legislation encouraging water conservation and recommending inclining block rates for water use was passed by the Rhode Island General Assembly in 1991, amending R.I.G.L. 46-15.4.] b. Local control authorities in Rhode Island and Massachusetts should assess discharge fees on industrial wastewater discharges based on volume, pollutant loading, toxicity and/or receiving water quality, *e.g.*, 50 percent of the fee charged based on the volume of discharge and 50 percent charged based on loadings of conventional and toxic pollutants in the wastestream. c. Rhode Island and Massachusetts should tax raw materials and/or products that are either individually toxic or are toxic in combination with other materials in order to promote conservation and recycling, *e.g.*, Rhode Island's "Hard to Dispose Materials" Act of 1989, Massachusetts "Toxic Use Reduction Act". d. Massachusetts should establish a deposit-refund system on items such as batteries, automobile tires, *etc.*, modeled after Rhode Island's "Battery Deposit and Control Act," in order to discourage improper disposal. e. Rhode Island and Massachusetts should actively inform the public about health and environmental risks associated with pollutant discharges and the industrial, commercial, and agricultural use of chemicals by advertising the existence of federal and state *Community Right to Know* resources.	EPA, R.I., Mass., local control authorities	[See RIDEP, RIDOH "Preliminary Agreements," Section 715-05-06 re: enforcement of water conservation measures in Water Supply Management Act (1991).]

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I.E.2.	The federal government, including the EPA, and the State of Rhode Island, and Commonwealth of Massachusetts should encourage and reward private investment in pollution-reduction technologies. In addition, new regulatory initiatives regarding the mandatory use of BATs should be coupled with financial assistance programs to the extent possible in order to facilitate industry conversion to pollution reduction technologies. For example: a. Rhode Island and Massachusetts should consider offering tax credits to industries that are in compliance with their discharge permits and can document reductions of greater than or equal to 25 percent in discharges, releases, and off-site transfers of toxics relative to 1989 levels. The tax credit should reward source reduction initiatives and should not compensate for reduced production. The amount of the tax credit should be proportional to actual reductions in use and disposal achieved. b. Public interest groups and government agencies, within the limit of their authority, should promote environmentally safe products and/or develop a "Seal of Approval" for products of environmentally-sound manufacturing processes. Relevant federal and state authorities should develop regulations to govern the marketing of products as "environmentally safe." [See Rhode Island's "Waste Recycling" Act that provides for the adoption of a "distinctive logo to identify materials that are composed of recycled materials, recyclable materials or which are packaged in a source-reduced manner" (R.I.G.L. 23-18.8-3)]. c. Rhode Island and Massachusetts should establish and maintain a state-funded, low-interest revolving loan fund to stimulate research and development into new technologies and waste reducing processes, and to enable qualified small-to-medium-size businesses to invest in pollution control technology. Grants should be available to support research and development. Loans should be available to enable qualified companies to invest in proven technologies. [Note: Rhode Island enacted the "Hazardous Waste Reduction, Recycling, and Treatment Research and Demonstration Act of 1986" with a $2 million appropriation for these purposes.]	EPA, R.I., Mass.	R.I. Hazardous Waste Demonstration Act bond fund (1986) has $1.5 million remaining as of 3/92; R.I. Aqua Fund bond fund (1989) has $3.8 million remaining as of 3/92 as grants and low interest loans for industry.

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I.E.3.	The federal government, including the EPA, the State of Rhode Island, and the Commonwealth of Massachusetts should protect the states' economic welfare and environmental integrity by promoting the development of *green* business. For example: a. Rhode Island and Massachusetts should establish *small business incubators,* in conjunction with universities and the private sector, to provide capital, research, and marketing support to promote the development of commercially viable *green* technologies and products. [The incubators would provide i) Low-interest loans to small manufacturing concerns in reclaimed and recycled materials, products manufactured from reclaimed or recycled materials, or innovative production or waste treatment technologies; ii) research facility assistance for developing innovative processes and/or products; iii) governmental assistance in processing necessary permits; iv) private assistance in marketing or private investment.] b. Rhode Island and Massachusetts should foster markets for reclaimed and recycled materials as well as for products manufactured from reclaimed and recycled materials. Rhode Island and Massachusetts should consider adopting legislation requiring the state government to purchase products manufactured from reclaimed and recycled materials, if available, and to the extent that agency budgets are adjusted accordingly. c. To the extent permitted by federal and state law, trade organizations in Rhode Island and Massachusetts should be encouraged to consider pooling resources to purchase raw materials, shared equipment, and contractual services, to reduce the amount of hazardous materials in inventory, and to achieve economies of scale that would improve the region's competitive advantage. The EPA, RIDEM, and MADEP should work with trade organizations to identify appropriate areas for pooling resources. d. Rhode Island and Massachusetts should require imported manufactured goods to meet the same federal and state production standards as locally-produced goods, or label country or state of origin.	EPA, R.I., Mass., industry trade organiza-tions, industry	

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I.F.	Information Exchange and Technology Transfer		
I.F.1.	The EPA and the State of Rhode Island should continue to provide financial support to the Rhode Island Hazardous Waste Reduction Program (HWRP). Similar technical assistance and clearinghouse programs should continue to be supported in Massachusetts. The technical assistance programs should: b. Establish procedures within industry to promote environmentally protective, cost-effective technologies and conservation measures, *e.g.*, see the HWRP's "quality circle" approach. c. Encourage industry and professional trade organizations to share the experiences of *home-grown* source reduction techniques. d. Organize demonstrations by consultants and vendors of new pretreatment and source reduction technologies. In addition, the Rhode Island Pollution Prevention Council (RIPPC) and/or the HWRP should establish a *Technology Review Board* to review emerging pollution reduction technologies. e. Provide waste reduction assessment services for large, medium, and small businesses that are significant industrial users subject to industrial pretreatment standards in order to identify cost-effective managerial, manufacturing, pretreatment and disposal options that will, if implemented, result in a net reduction in use of natural resources and toxics discharge. f. Work with government, industry, and academia to test full scale *demonstration models* of experimental production or pretreatment processes in working Rhode Island plants. g. Assist and work with regulators to develop standardized monitoring, reporting, permitting, and inspection procedures.	EPA, R.I., Mass., HWRP, RIPPC, Mass. counterparts	RIDEM HWRP receives ongoing state support for these activities. [See RIDEM "Preliminary Agreement," Section 715-05-06 re: cooperative agreement with URI to test experimental source reduction techniques in R.I. businesses.]

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I.G.	Treatment		
I.G.1.	To achieve net reductions and to prevent cross-media transfers of pollutants, all source reduction options should be considered *before* considering treatment for removal of toxics from a municipal, industrial, or commercial wastestream. The EPA, RIDEM, and Massachusetts counterparts should, however, follow developments in chemical, biological, and/or physical technologies for the degradation of toxic compounds into environmentally safe forms.	EPA, RIDEM, MADEP	
I.G.2.	The State of Rhode Island and the Commonwealth of Massachusetts should establish and maintain a state-funded low interest revolving loan fund to enable qualified small to medium size businesses to invest in proven source reduction technologies. Grants should be available to stimulate and support research and development.	R.I., Mass.	R.I. Hazardous Waste Demonstration Act and Aqua Fund bond funds have over $5 million remaining but temporarily frozen (1992).
II.	The State of Rhode Island and the Commonwealth of Massachusetts should make every reasonable effort to reduce industrial emissions, discharges and off-site waste transfers of the following chemicals to 50 percent of 1989 levels by 1995: cadmium, chromium, copper, lead, mercury, nickel, silver, zinc, cyanide and their compounds.		
II.A.	The EPA, RIDEM, and Massachusetts counterparts should establish numeric, water quality-based effluent limits for cadmium, chromium, copper, nickel, lead, mercury, silver, and zinc for all WWTFs operating in the Bay watershed that 1) have identified sources of these metals in their service areas, and/or 2) contribute to violations of public health or aquatic life criteria for these metals.	EPA, RIDEM, MADEP	

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II.B.	As part of their triennial review of water quality regulations, RIDEM and MADEP should evaluate whether existing water quality criteria for cadmium, chromium, copper, nickel, lead, mercury, silver, and zinc are appropriate based on evidence of toxicity, bioaccumulation, water quality or habitat degradation, or existing or desired uses of the waterbody, and determine whether site-specific human health or aquatic life criteria should be developed for these compounds. 1. In no case shall an existing aquatic life criterion be relaxed for any waterbody or segment of the waterbody unless the RIDEM or MADEP, with EPA approval, demonstrates that the pollutant in question does not contribute to observed toxicity, bioaccumulation, water quality or habitat degradation, or limitations on existing or desired uses of the waterbody. 2. In no case shall site-specific criteria developed for a limited segment of a waterbody be extrapolated to another waterbody without an explicit comparison of their hydrologic, ecological, and physiographic conditions. 3. In no case shall public funds be used to assist a non-governmental entity to develop site-specific criteria.	RIDEM, MADEP, EPA	The UBWPAD is evaluating use of site-specific criteria for Upper Blackstone (1992).
II.C.	The RIDEM, local control authorities, and Massachusetts counterparts should require regulated industries throughout the Narragansett Bay basin to use the best available technology (BAT) to reduce the use, generation, release and disposal of cadmium, chromium, copper, nickel, lead, mercury, silver, zinc, and cyanide. (For the purpose of this recommendation, BAT shall be defined as a practicably available, proven technology or process that can achieve the most stringent limits currently in use within the watershed.) The requirement to use BAT should be implemented independently of "local limits" established by a state or local control authority in order to: a) develop uniform incentives for source reduction, b) remove competitive advantages resulting entirely from differing regulatory requirements, and c) remove economic and regulatory incentives for industries to locate or relocate in the basins of relatively uncontaminated receiving waters in order to take advantage of less stringent "local limits".	RIDEM, MADEP, local control authorities, EPA	

✓ - High Priority Action

RECOMMENDED POLICIES AND ACTIONS
SOURCE REDUCTION: TOXICS

CODE	POLICY	AGENCIES	STATUS
II.D.	To the fullest extent of their authority, the EPA, RIDEM, local control authorities, and Massachusetts counterparts should require all industrial dischargers subject to industrial pretreatment program requirements to file a waste minimization report by 1995 that sets short-term (three- to five-year) goals for reducing discharges, releases and off-site transfers of cadmium, chromium, copper, nickel, lead, mercury, silver, zinc, cyanide and related compounds. Industrial dischargers that can document reductions in loadings before 1989 should receive credit for reductions already achieved.	EPA, RIDEM, MADEP, local control authorities	[See RIDEM "Preliminary Agreement," Section 715-05-06.]
II.E. ✓	**The EPA, RIDEM, HWRP, and Massachusetts counterparts should emphasize raw material substitution techniques, modifications of standard manufacturing processes, and best-available technological processes for reducing industrial use and/or discharge to the wastestream of cadmium, chromium, copper, nickel, lead, mercury, silver, zinc, and cyanide.**	**EPA, RIDEM, HWRP, Mass. counterparts**	
II.F.	Where copper or lead concentrations in the water supply are identified as important background sources of total copper or lead, the RIDEM, the Rhode Island Department of Health (RIDOH), and their Massachusetts counterparts shall require the water supply authorities to reduce copper or lead concentrations by reducing or eliminating corrosion of the conveyance system, eliminating the use of copper-based algaecides, and/or eliminating any anthropogenic inputs of copper or lead into the water supply, as appropriate.	EPA, RIDEM, RIDOH, Mass. counterparts	[See RIDOH "Preliminary Agreement," Section 715-05-06 re: enforcement of Safe Drinking Water Act requirements for copper, lead.]
II.G.	The State of Rhode Island and Commonwealth of Massachusetts should condition the use of copper-based herbicides to treat human-induced eutrophication of surface waters tributary to Narragansett Bay on the submittal of a management plan that addresses the feasibility of alternative control measures, including septic system repair or replacement, vegetative buffers, stormwater controls, density controls, and other land management options. In addition: 1. The EPA should make every effort to reconcile requirements of the Safe Drinking Water Act and the Clean Water Act with regard to human health and aquatic life criteria for copper. 2. The State of Rhode Island and Commonwealth of Massachusetts should discourage the use of copper-based herbicides on surface waters tributary to Narragansett Bay.	EPA, USDA, RIDEM, CRMC, Mass. counterparts	

✓ - **High Priority Action**

RECOMMENDED POLICIES AND ACTIONS
SOURCE REDUCTION: TOXICS

CODE	POLICY	AGENCIES	STATUS
III.	The State of Rhode Island and the Commonwealth of Massachusetts should make every reasonable effort to reduce industrial emissions, discharges and off-site waste transfer of the following chemicals to 50 percent of 1989 levels by 1995: benzene, carbon tetrachloride, chloroform, dichloromethane, dioxin, methyl ethyl ketone, methyl isobutyl ketone, tetrachloroethylene, toluene, trichloroethylene, xylenes, 1,1,1,-trichloroethane.		
III.A.	Industry trade organizations should endorse the RIDEM's effort to encourage voluntary industry participation in meeting the toxics reductions targeted in the EPA's *Industrial Toxics* ("33/50") *Project.* To evaluate the state's success in meeting the targeted reductions, toxics loadings should be quantitatively measured and reported. Massachusetts should be encouraged to participate voluntarily in the *Industrial Toxics* ("33/50") *Project*.	RIDEM, Mass. counterparts, industry	
IV.	The State of Rhode Island and the Commonwealth of Massachusetts should make every reasonable effort to reduce industrial discharges, releases, including accidental releases, and off-site waste transfers of the following chemicals to 50 percent of 1989 levels by 1995: petroleum hydrocarbons (PHC) and polycyclic aromatic hydrocarbons (PAH).		
IV.A.	By December 1993, the EPA and/or the U.S. Food and Drug Administration (FDA) should develop national aquatic life criteria and human health criteria, including action levels for human consumption of seafood, for PHCs and PAHs.	EPA, FDA	

✓ - **High Priority Action**

RECOMMENDED POLICIES AND ACTIONS
SOURCE REDUCTION: TOXICS

CODE	POLICY	AGENCIES	STATUS
IV.B.	The EPA, the Federal Highway Administration (FHWA), the State of Rhode Island, and the Commonwealth of Massachusetts should undertake the following actions to reduce motor vehicle-related discharges, releases and emissions of PHCs and PAHs to the Narragansett Bay basin: 1. The State of Rhode Island and the Commonwealth of Massachusetts should emphasize pollution prevention as the preferred long-term strategy for reducing petroleum inputs to Narragansett Bay. Pollution prevention measures could include more rigorous regulation of air emissions and motor vehicle fluid leaks, and incentives to encourage the use of fuel efficient motor vehicles, mass transit, and alternatives to fossil fuels. 2. The FHWA, the State of Rhode Island and the Commonwealth of Massachusetts should require the use of best management practices (BMP) as an absolute condition of new road construction or major upgrades where any road drainage would otherwise be discharged to Narragansett Bay or its tributaries. The state Departments of Transportation should use BMPs identified by EPA and the states' Section 319 and 6217 Nonpoint Source Management Programs until the FHWA promulgates new guidelines consistent with the 1991 Internal Surface Transportation Efficiency Act. 3. The FHWA, EPA, and state Departments of Transportation should support additional research into the design of BMPs to capture and treat road runoff consistent with the mandate of the 1991 Internal Surface Transportation Efficiency Act.	EPA, FHWA, RIDEM, RIDOT, CRMC, Mass. counterparts	[See "Preliminary Agreements," Section 715-05-06; RIDEM re: promulgation of vehicle emission regulations; USDA SCS re: provision of site inspection services to RIDOT; Mass Conservation Districts.] R.I. received $13 million "demonstration" grant from FHWA for runoff abatement projects on I-95 and other coastal highways draining to Narragansett Bay. Non-federal match of $3.6 million required.

✓ - High Priority Action

RECOMMENDED POLICIES AND ACTIONS
SOURCE REDUCTION: TOXICS

CODE	POLICY	AGENCIES	STATUS
IV.C.	The federal government, the State of Rhode Island and the Commonwealth of Massachusetts should make every reasonable effort to reduce the risk of accidental marine spills of petroleum products and other chemicals in Narragansett Bay and its tributaries. Implementation efforts should include: 1. Development of appropriate federal and state legislation governing tanker hull design, use of satellite navigation in Rhode Island waters, and the professional qualifications and use of pilots in Rhode Island waters. 2. Establishing State causes of action and remedies for spill-related harm to the public's interest in natural resources, including the cost of restoring natural habitats and living resources. 3. Development of appropriate federal and state regulations to: a. govern fuel hose fittings on vessels and marine facilities with fueling stations; b. require all marine facilities with fueling stations to have formal plans to deal with accidental oil or gasoline spills; and c. require all marine facilities with fueling stations to maintain spill containment equipment on site, and provide trained personnel to implement spill containment measures. 4. Preparing, as soon as possible, updated *Oil Spill Contingency Plans* for emergency spill response and environmental damage assessment, with provisions for responding to oil and chemical spills related to the bulk storage of chemicals in the floodplain of Narragansett Bay, near Bay tributaries, and within the Narragansett Bay watershed. 5. Design, engineering, and deployment of tailored oil booms for critical areas such as tidal creeks and rivers, salt marshes, coves, and developed harbors.	U.S. Congress, EPA, R.I., Mass.	[See RIDEM "Preliminary Agreement," Section 715-05-06 re: update of *Oil Spill Contingency Plan*.]
IV.D.	The State of Rhode Island and Commonwealth of Massachusetts, in conjunction with local governments, should provide continuing support for local facilities to collect waste oil from homeowners' automobiles and boats.		

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RECOMMENDED POLICIES AND ACTIONS
SOURCE REDUCTION: TOXICS

CODE	POLICY	AGENCIES	STATUS
V.	Within two years following approval of the *CCMP*, the EPA, U.S. Department of Agriculture (USDA), RIDEM, and their Massachusetts counterparts shall review existing guidelines governing the use of pesticides and herbicides in the Narragansett Bay basin and recommend revised regulations or requirements, as necessary.		
V.A.	Within one year following approval of the *CCMP*, the EPA, USDA, RIDEM, and their Massachusetts counterparts should prepare a preliminary survey of the areal extent, magnitude, and ecological and public health risk associated with pesticide and herbicide use (including both commercial and over-the-counter sources) in the Narragansett Bay basin. Existing data should be used to the maximum extent possible.	USDA, EPA, RIDEM, Mass. counterparts	[See USDA SCS "Preliminary Agreement," Section 715-05-06 re: pesticide use survey.]
V.B.	Within one year following approval of the *CCMP*, the State of Rhode Island and Commonwealth of Massachusetts should prepare a comprehensive survey of pesticide and herbicide use in the Narragansett Bay basin, including name, active ingredient(s), method of application, and target species for each chemical; type and number of users; amount of each chemical used per unit area based on land use type; and total amount of each chemical used per year.	RIDEM, Mass. counterparts	[See USDA SCS "Preliminary Agreement," Section 715-05-06 re: pesticide use survey.]
V.C.	The USDA Soil Conservation Service and affiliated Cooperative Extension Programs should increase assistance to farmers in planning for pest management and develop homeowner programs to reduce the use of pesticides.	USDA, Coop. Extension	[See USDA SCS "Preliminary Agreement," Section 715-05-06 re: pest management, pesticide labeling.]

✓ - High Priority Action

Estimated Cost of Implementation—Source Reduction: Toxics

Table 715 -04(1) summarizes the estimated costs associated with the implementation of this chapter's recommendations. The major initial costs incurred by implementation of Element I (Comprehensive Regulation of Toxics) include hiring a Massachusetts Pretreatment Coordinator, development and distribution of a consolidated waste minimization report form, and providing technical assistance to dischargers in the completion of the waste minimization report. Coordination and training costs are to be spread over the five-year period. Element IB (WWTFs; Direct Dischargers) focuses on regulations of municipal and industrial dischargers. Major actions include a metals wasteload allocation for the Blackstone, Seekonk, and Providence River basin at approximately $700,000 ($100,000 of this cost exclusive of monitoring conducted by the Narragansett Bay Project, has been provided by the EPA). Other major costs for this element include inspection and enforcement. One possible major cost associated with meeting more stringent limits on toxics is the upgrading of the Upper Blackstone Water Pollution Abatement District (UBWPAD) facilities; UBWPAD estimates that, based on a Camp, Dresser, and McKee analysis (which is not an engineering study), the cost of WWTF upgrade necessary to meet such limits (possibly utilizing reverse osmosis technology) could be as high as $150 million. Element IC (Industrial Users) includes a recommendation requiring that waste reduction, reclamation, and recycling plans submitted by industrial users be certified by a Professional Engineer; this could result in additional costs to the private sector. Other private costs could result from the recommended requirement that industries implement alternative waste reduction technologies.

Element ID (Other Generators) includes provisions for the expansion of the Industrial Pretreatment program, an action that would require WWTFs to obtain additional personnel for permitting and enforcement (increased fees could cover additional costs). Additionally, this element recommends that the RIDEM Household Hazardous Waste Collection Program be expanded to include "tiny quantity" commercial and industrial waste generators. This recommendation was not costed since it is expected to operate on a cost-recovery basis. Another recommendation from this section that could operate on a cost-recovery basis is the establishment (in both Rhode Island and Massachusetts) of a stringent auto inspection program for air emissions and fluid leaks. It should be noted that the success of cost-recovery programs can be limited by political opposition, the ability of those affected to pay, and the concerns that the institution of fees could put certain industries at a competitive disadvantage. Major costs in Element IE (Economic Incentives) include annual costs associated with promoting source reduction and providing technical assistance to industries in the Bay basin. The fiscal impacts of providing economic incentives cannot be determined until such measures are specifically designed. Additionally, this chapter recommends that imported manufactured goods be required to meet the same federal and state production standards as locally-produced goods; it is possible that this action could raise the cost of some goods to consumers. Element IF (Information Exchange) contains a recommendation that the HWRP establish a Technology Review Board; it is intended that members will serve on a voluntary basis.

Elements II and III (Metals and Toxic Organics) include recommendations that standardized effluent limits for certain metals and organics, based on the most stringent limits currently in use, be applied to specific industry categories. It is possible that this requirement could result in additional costs to some industrial dischargers. Also, a recommended requirement that water suppliers reduce copper and lead concentrations within their conveyance systems could place significant financial burdens on these suppliers.

Element IV (PAHs and PHCs) contains a recommendation that state departments of transportation support research into the design of BMPs to treat road runoff; a possible existing source of funding for this is the funding available from the 1991 Internal

Surface Transportation Efficiency Act. Funding resulting from this act is providing $13 million to Rhode Island for nonpoint source pollution abatement projects on the Pawtuxet River; a non-federal match of $3.6 million is required.

The remaining elements contain actions geared toward the setting of effluent limits, the development of water quality criteria, efforts to prevent or reduce petroleum inputs to the Bay, and a survey of pesticide use in the watershed.

WWTFs, RIDEM, and MADEP are the primary implementing authorities. These agencies would need to coordinate many of the *CCMP* implementation activities with the EPA.

For further details regarding the *CCMP* cost estimation process and funding strategies, refer to the *Narragansett Bay CCMP Cost Estimation and Funding Report* (Apogee Research Inc./NBP, 1992).

Table 715-04(1)

ESTIMATED COST OF IMPLEMENTATION
SOURCE REDUCTION: TOXICS

COST ESTIMATES BY ELEMENT

	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
IA-Comprehensive Regulation	162,500	5,000	90,000	5,000	90,000	5,000	90,000	5,000	90,000	5,000	522,500	25,000
IB-WWTFs; Direct Dischargers	65,000	0	212,500	0	323,500	1,046,000	323,500	346,000	323,500	346,000	1,248,000	1,738,000
IC-Industrial Users	82,500	0	45,000	0	45,000	0	45,000	0	45,000	0	262,500	0
ID-Other Generators	298,750	6,000	265,000	6,000	292,500	6,000	277,500	21,000	277,500	21,000	1,411,250	60,000
IE-Economic Incentives	423,750	24,000	70,000	24,000	80,000	24,000	80,000	24,000	80,000	24,000	733,750	120,000
IF-Information Exchange	0	0	0	0	0	0	0	0	0	0	0	0
IG-Treatment	25,000	0	0	0	0	0	0	0	0	0	25,000	0
II-Metals and Cyanide	175,000	0	15,000	0	65,000	0	15,000	0	15,000	0	285,000	0
III-Toxic Organics	0	0	0	0	0	0	0	0	0	0	0	0
IV-PAHs and PHCs	62,500	720,000	10,000	720,000	10,000	720,000	10,000	720,000	10,000	720,000	102,500	3,600,000
V-Pesticides and Herbicides	237,500	0	12,500	0	12,500	0	12,500	0	12,500	0	287,500	0
		0		0				0				
TOTALS	1,532,500	755,000	720,000	755,000	918,500	1,801,000	853,500	1,116,000	853,500	1,116,000	4,878,000	5,543,000
TOTAL BY YEAR		2,287,500		1,475,000		2,719,500		1,969,500		1,969,500		10,421,000

COST ESTIMATES BY AGENCY

	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
RIDEM	736,250	23,000	305,000	23,000	265,000	513,000	235,000	23,000	235,000	23,000	1,776,250	605,000
RIDOH	0	0	0	0	12,500	0	0	0	0	0	12,500	0
URI	12,500	0	12,500	0	12,500	0	12,500	0	12,500	0	62,500	0
RI Legislature	3,750	0	0	0	0	0	0	0	0	0	3,750	0
RIDOT	0	720,000	0	720,000		720,000	0	720,000	0	720,000	0	3,600,000
MADEP	306,250	12,000	142,500	12,000	140,000	222,000	122,500	12,000	122,500	12,000	833,750	270,000
MADPH	0	0	0	0	12,500	0	0	0	0	0	12,500	0
MA Legislature	3,750	0	0	0	0	0	0	0	0	0	3,750	0
WWTFs	470,000	0	260,000	0	476,000	346,000	483,500	361,000	483,500	361,000	2,173,000	1,068,000
TOTALS	1,532,500	755,000	720,000	755,000	918,500	1,801,000	853,500	1,116,000	853,500	1,116,000	4,878,000	5,543,000
TOTAL BY YEAR		2,287,500		1,475,000		2,719,500		1,969,500		1,969,500		10,421,000

04-01-02 Source Reduction: Nutrients

Objective for the Reduction of Nutrient Inputs

The State of Rhode Island and the Commonwealth of Massachusetts should manage point and nonpoint sources of nutrients to the Narragansett Bay watershed in order to prevent eutrophication and to minimize undesirable nutrient-related effects to Narragansett Bay and its tributaries, and reduce loadings where nutrient-related water quality impacts have been demonstrated.

Introduction

Nutrients are essential for plant and animal growth. The availability of two such nutrients, nitrogen and phosphorus, may limit plant growth in aquatic systems. In freshwater, phosphorus is generally thought to be the limiting nutrient; in most marine and estuarine waters, the limiting nutrient is nitrogen (Penniman *et al.*, 1991b:1). When introduced into aquatic systems in excessive amounts, however, these nutrients may cause a variety of detrimental effects. One such effect is the rapid growth of microscopic algae (*i.e.*, phytoplankton), seaweeds, or other aquatic plants. Decomposition of this organic matter by bacteria may consume enough oxygen in the water to cause fish kills or other detrimental effects on the biota. There may also be more subtle impacts, such as changes in the numbers and types of species living on and in the bottom sediments or in the water column (Penniman *et al.*, 1991b:1-2, 6).

Anthropogenic loadings of excessive nutrients arise from both point (*e.g.*, principally wastewater treatment facilities) and nonpoint sources (*e.g.*, septic systems, fertilizers, animal wastes, and atmospheric deposition). Because phosphorus is the limiting nutrient in freshwater environments and nitrogen in marine and estuarine systems, control strategies will depend upon whether the receiving waters are fresh or saline (Penniman *et al.*, 1991b:6).

Statement of the Problem

The impacts of excessive nutrient loadings to aquatic systems in the Narragansett Bay watershed are determined, in great part, by the sources of the nutrient loads, the hydrographic characteristics of the receiving waters, and whether the receiving waters are fresh or saline. Thus, the Providence-Seekonk River and parts of the Blackstone and Pawtuxet rivers have displayed periodic low dissolved oxygen concentrations measured during a number of surveys over a period of many years (Penniman *et al.*, 1991b:13-23). The low dissolved oxygen concentrations in the Providence-Seekonk region have contributed to detrimental changes to the community of organisms living on the bottom of the river (Germano *et al.*,1992) and have periodically resulted in fish kills, at least historically. Most recently (August 1991) lowered dissolved oxygen concentrations were observed throughout the Providence-Seekonk River in the Upper Bay as far south as Rocky Point-Rumstick Point (McKenna, 1991:1-2). Other regions of the Bay that periodically and, increasingly, have experienced low dissolved oxygen concentrations include Greenwich Bay, Mount Hope Bay, Apponaug Cove, and several other poorly flushed embayments around the Bay (Penniman *et al.*, 1991b:13-23; Dettmann *et al.*, 1992).

Riverine and wastewater treatment facility (WWTF) inputs are the major sources of nitrogen to the Providence-Seekonk River and Upper Narragansett Bay (Oviatt, 1980; Metcalf & Eddy, Inc., 1991b; Penniman *et al.*, 1991b:2, 24). In other areas, like many of the small coves along the shores of Narragansett Bay where there are no direct WWTF discharges, nonpoint sources are the primary contributors. These nonpoint sources include fertilizers that are washed overland by stormwater or leached to the groundwater, nutrients from functional and failed septic systems that are carried either by stormwater or groundwater flow, and nitrogenous compounds in the atmosphere—the combustion products of gasoline and other fossil fuels—that are deposited by precipitation (Penniman *et al.*, 1991b:2).

In homes served by on-site sewage disposal systems (OSDS), high-phosphate laundry detergents may be responsible for half of the phosphorus loadings to the septic systems, while garbage disposals may contribute significantly to biochemical oxygen demand (BOD) and suspended solids (EPA, 1980; EPA, 1991a; Penniman *et al.*, 1991b:55). It should be noted that low phosphate detergents are readily available, and that Indiana, Maryland, Michigan, Minnesota, New York, and Wisconsin currently have restrictions on the phosphate content of laundry and/or dishwasher detergents. The extent of phosphorus (*i.e.*, phosphate) movement in groundwater is limited under most conditions by natural soil processes. The contact time for the effluent in unsaturated soil (determined largely by percolation characteristics and OSDS hydraulic loading rates) and the age of the system influences the effectiveness of phosphate removal. Excessive, long-term loadings can saturate the soils' adsorptive capacity. Additionally, with phosphorus-sensitive waterbodies (*i.e.*, primarily freshwater), even limited additional loadings may cause eutrophication.

Unlike phosphate, nitrogen, in the form of nitrate from OSDS effluent, moves freely through the coarse-textured soils common to much of Rhode Island once it is below the depth where plant roots occur, and is only attenuated by dilution with surrounding groundwater. Since nitrate can travel significant distances in groundwater (*e.g.*, at least 330 feet, Penniman *et al.*, 1991b: 34), in general only limited biological, physical, or chemical processes will act to attenuate groundwater nitrate. Thus, controls over the numbers of OSDSs in a watershed and OSDS setback requirements reduce total nitrogen loading rates and, to a more limited extent, increase dilution with available groundwater.

Measurements of dissolved inorganic nitrogen and phosphorus and chlorophyll *a* (as an indication of phytoplankton biomass) show elevated concentrations in the Providence River decreasing down-Bay to Rhode Island Sound (Doering *et al.*, 1988a; Doering *et al.*, 1988b; Penniman *et al.*, 1991b:20-21). As described above, the Blackstone and Providence-Seekonk Rivers experience periodic *hypoxic* (low oxygen) and in some cases *anoxic* (no oxygen) conditions due to nutrient and BOD loadings from WWTFs. Greenwich Bay and Mount Hope Bay have had similar incidents of low dissolved oxygen. Potential pollution sources to Greenwich Bay and adjoining coves include the East Greenwich WWTF, stormwater runoff, OSDSs, and boats (Penniman *et al.*, 1991b:3, 18).

Wherever water circulation is restricted and vertical stratification of the water column occurs, nutrient loadings may be particularly critical in causing low dissolved oxygen concentrations. Following an algal bloom, the replenishment of the oxygen taken out of the water by bacterial decomposition may be limited to the upper layer of water, where photosynthesis and re-aeration from the atmosphere occur. Lower layers may tend toward anoxic conditions. The problem is particularly acute in the summer, because warm water holds less oxygen than cold water (Penniman *et al.*, 1991b:3-4). Poorly flushed embayments subject to this phenomenon include Apponaug Cove; vertically stratified waters occur in the Providence-Seekonk River (Penniman *et al.*, 1991b:8).

Greenwich Bay and adjacent coves have been demonstrated to have degraded benthic habitats and communities, possibly attributable to high organic and nutrient loadings from anthropogenic sources. Several coves around Greenwich Bay suffer from seasonally-persistent low dissolved oxygen concentrations, algal blooms, and fish kills (Germano and Rhodes, 1989; RIDEM, 1990a; Nowicki and McKenna, 1990). In addition, Greenwich Bay was the locus of the brown tidal algal blooms that occurred in 1985 and 1986 (Smayda, 1988, 1989; Nowicki and McKenna, 1990; Penniman *et al.*, 1991b:49).

A study jointly funded by the Narragansett Bay Project (NBP) and the U.S. Environmental Protection Agency (EPA) in 1986 found that the East Greenwich WWTF was a major source of BOD and suspended solids to Greenwich Cove, and because of circulation patterns, could also affect Greenwich Bay (Frithsen *et al.*, 1987;

Dettmann *et al.*, 1989; Nowicki and McKenna, 1990). This study was performed prior to an upgrade of the East Greenwich WWTF. However, population growth in East Greenwich has already exceeded projections for the year 2010, suggesting that the Town's wastewater facility will continue to be a significant source of nitrogen, phosphorus, and BOD to Greenwich Cove and Greenwich Bay (Penniman *et al.*, 1991b:49). Metcalf & Eddy, Inc., in a study commissioned by the NBP in 1990, assessed several options for upgrading the East Greenwich treatment facility, but concluded that further study was necessary to assess the impacts of any changes (Metcalf & Eddy, Inc., 1991c).

It also needs to be determined whether additional sewering is necessary to mitigate water quality problems associated with failed or failing OSDSs in the Greenwich Bay basin. A preliminary basin plan will be developed by the Rhode Island Department of Environmental Management (RIDEM), the Rhode Island Coastal Resources Management Council (CRMC), the NBP, and local governments pursuant to an interagency agreement executed in November 1990 to assess the situation and recommend the appropriate technological and land use controls (Penniman *et al.*, 1991b:49-50). The preliminary Greenwich Bay basin plan and the subsequent Greenwich Bay Special Area Management (SAM) Plan should use existing local comprehensive land use and facilities plans to help identify areas where sewering may be required in order to alleviate impacts from existing, sub-standard septic systems.

Existing Policies

WWTFs

In general, wastewater treatment facilities (WWTFs) do not have specific permit limits for nutrients. Primary and secondary WWTF effluents are regulated for BOD, suspended solids, and other conventional and toxic pollutants. In other words, conventional wastewater treatment is primarily concerned with reducing BOD and suspended solids in the final effluent, and not eutrophication of receiving waters due to excessive loadings of nutrients (Penniman *et al.*, 1991b:13, 27).

Septic Systems

Current OSDS regulations in Rhode Island affect septic system location, design, installation or alteration, and maintenance. Determination of site suitability includes such factors as location relative to wetlands, surface water bodies and drinking water supplies, slope, type of soil, percolation tests, maximum groundwater elevation, and occurrence of impervious formations. There are special regulations for sensitive areas, such as lateral setbacks of 150 feet within coastal erosion-prone areas and the Narrow River and coastal pond watersheds, and 200 feet in the Scituate Reservoir watershed (RIDOA, 1990a). However, there is no requirement within current regulations that percolation tests performed in determining subdivision delineations correspond with final location of OSDSs on individual lots (Penniman *et al.*, 1991b:52).

The CRMC has encouraged the use of alternative septic system designs in certain unsewered areas where nitrogen loadings from domestic waste would be a problem. The CRMC has required the installation of denitrifying RUCK systems in the salt pond region of southern Rhode Island, for example. The homeowner might also be required to install a standard OSDS as a back-up in the event of failure of the alternative system (Penniman *et al.*, 1991b:35).

To ensure routine inspection and maintenance of both conventional and alternative septic systems, as well as adequate septage disposal capacity, the State of Rhode Island passed enabling legislation in 1987 allowing municipalities to establish wastewater management districts (WWMDs) (RIDOA, 1987; Penniman *et al.*, 1991b:36). Although no WWMDs have been formed to date (1991), three towns—Hopkinton, Narragansett, and Jamestown—have begun developing WWMD ordinances (Penniman *et al.*, 1991b:54).

Analysis

Effective long-term management of nutrient loadings to surface waters is best approached from a watershed-level perspective. CRMC's SAM Plan process represents one effective vehicle for managing nutrient inputs via land use and density controls. There are, however, a number of approaches for controlling nutrient loadings on a watershed (or subwatershed) basis. (Penniman *et al.*, 1991b: 33-40) For example, the Buzzards Bay Project (1990) has established a subwatershed approach to control nitrogen loadings to nutrient-sensitive waterbodies by setting limits on OSDS density based upon modelled loadings that would achieve a "critical nutrient loading limit" designed to protect the receiving waters from eutrophication (Buzzards Bay Project, 1990; Monahan *et al.* 1991). OSDS density controls are also proposed as one of the "management practices" in the *Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters* (EPA, 1991a:4-40 to 4-41). Therefore, the state's Coastal Nonpoint Pollution Control Program (CNPCP), that will be developed jointly between CRMC and RIDEM as required by Section 6217 of the 1990 Amendments to the Coastal Zone Management Act or CZMA (EPA, 1991a; NOAA/EPA, 1991), may include enforceable watershed-based mechanisms to limit the cumulative impact of nitrogen loading to coastal waters from OSDS. [Note: A more detailed discussion of the CNPCP, required by Section 6217 of the 1990 Amendments to the CZMA, is presented in 04-01-07: Source Reduction: Nonpoint Sources.]

Another mechanism to control nutrient loads is through the establishment of total maximum daily loads (TMDL) and associated waste load allocations (WLA) (EPA, 1991a). For example, in cases where excessive nutrient loads cause eutrophication and/or loss of fish or wildlife habitat in spite of discharger compliance with technology-based requirements, water-quality based controls may be required in order to achieve desired uses (*e.g.*, Providence-Seekonk River). In such cases, the state must determine the amount of nutrients or BOD that the waterbody can assimilate and meet water quality standards (*e.g.*, dissolved oxygen). The amount of pollutant that the waterbody can assimilate is called the TMDL. Based upon the TMDL, permissible loads from both point and nonpoint sources are calculated. The TMDL is then allocated among point and nonpoint sources based upon WLA (for point sources) and load allocations or LA (for nonpoint sources).

The State of North Carolina has established a statutory definition of "nutrient-sensitive waters" (NSW) as "waters that are experiencing or are subject to excessive growth of microscopic or macroscopic vegetation .... [which will] ... substantially impair the use of the water for its best usage..." Designation as NSW requires the development and implementation of a nutrient management strategy. The North Carolina Environmental Management Commission designated the 5,400 square mile Tar-Pamlico River basin as nutrient-sensitive waters in September 1989. The implementation of the nutrient reduction/control strategy includes a "nutrient-trading" strategy between point source (*e.g.*, WWTFs) and nonpoint source (*e.g.*, farmers) dischargers of nitrogen and phosphorus. Interim nutrient reduction goals have been established prior to the development of a TMDL and water quality model for the Tar-Pamlico River estuary.

On the other hand, while taking a watershed-wide approach, care should be taken not to trivialize localized impacts, especially near major point sources and in subembayments where tidal flushing is limited. Assessments of loadings and their effects and the development of mitigation strategies must focus on areas of demonstrated impacts, or where future conditions such as population growth or land use changes are likely to degrade water quality (Penniman *et al.*, 1991b:7-8).

Water Quality Criteria vs. Waste Load Allocation Models

Water quality standards are based on the water quality criteria necessary to maintain a waterbody's designated uses (*e.g.*, fishing, swimming, or fish and wildlife habitat). However, as mentioned above, no nutrients

water quality criteria have been promulgated nationally that specifically protect aquatic organisms from the effects of eutrophication and other impacts of excessive nutrients (Penniman *et al.*, 1991b:13). In addition, at present, EPA can only establish nutrients loadings limits for dischargers if the need for nutrient removal has been demonstrated empirically by evidence of hypoxia, anoxia or other indicators of eutrophic conditions in the receiving water, *and* the basis for nutrient loadings reductions has been apportioned via a WLA.

A WLA is a mathematical model that relates pollutant loadings, *e.g.*, nutrient and BOD loadings, to the maintenance of minimum in-stream water quality criteria, *e.g.*, dissolved oxygen levels. The model is used to establish WWTF discharge limits for BOD and, if necessary, nutrients, in order to achieve the desired dissolved oxygen concentrations in the receiving water. The RIDEM has conducted a WLA for the Pawtuxet River, for example, and assigned more stringent effluent limits for BOD to the Cranston, Warwick, and West Warwick WWTFs (Penniman *et al.*, 1991b:4). However, the WLA approach does not account for ecological impacts of excess nutrient additions other than those related directly to dissolved oxygen concentrations. In addition, the WLA approach is reactive rather than proactive since it is only applied after evidence of a negative environmental impact already exists.

Protective aquatic life criteria should be developed for nutrients in order to enable federal, state and local regulatory agencies to govern future sources of nutrients to receiving waters before evidence of eutrophication occurs. These criteria should go beyond simply establishing threshold concentrations of nutrients in the water column since these concentrations may have little relationship to the existence of, or potential for, eutrophic conditions. For example, phytoplankton and seaweeds rapidly take up and recycle available nitrogen, leaving low nutrient concentrations in the water column itself but potentially resulting in nuisance algal blooms. Therefore, to accurately assess and limit the potential for eutrophication, it may be more appropriate to set nutrient loading limits rather than water column concentrations as standards (Buzzards Bay Project, 1990; Penniman *et al.*, 1991b:13).

Any chemical-specific criteria that would apply could be complemented by biological criteria. The EPA has issued guidance for states to develop biological criteria to incorporate into state water quality standards (EPA, 1990). These criteria may be numerical values (*e.g.*, indices of community structure), narrative descriptions of aquatic communities, or characteristics of unimpaired waters to be compared with other waterbodies (Penniman *et al.*, 1991b:44). By utilizing a biological or community descriptor, biological criteria can provide better detection of impairment resulting from unknown types or sources of pollutants or the synergistic effects of individual pollutants, in a similar fashion to whole effluent toxicity testing. Biological criteria should be particularly useful in detecting eutrophication and other nutrient-related impacts—that is, in addition to lowered dissolved oxygen—from point or nonpoint sources (Penniman *et al.*, 1991b:44).

Recommended Policies and Actions and *Estimated Cost of Implementation* are presented in the following pages.

RECOMMENDED POLICIES AND ACTIONS
SOURCE REDUCTION: NUTRIENTS

CODE	POLICY	AGENCIES	STATUS
I.	Point source loadings of nutrients to Narragansett Bay should be reduced where receiving water impacts from nutrients have been demonstrated. Increases in point source loadings of nutrients to Narragansett Bay should be minimized to prevent eutrophication and undesirable nutrient-related effects to Narragansett Bay and its tributaries.		
I.A.	The U.S. Environmental Protection Agency (EPA) should establish protective aquatic life water quality criteria and/or annual loading criteria for eutrophication and related impacts from nitrogen and phosphorus to fresh, estuarine, and marine receiving waters by January 1994. Any nutrient-related criteria should be more inclusive of ecosystem function than merely simple water column concentration of either phosphorus or nitrogen. 1. The EPA should provide guidance for the states to adopt biological criteria for the detection and regulation of nutrient (*i.e.*, nitrogen and phosphorus) loadings impacts upon fresh, marine, and estuarine receiving waters. The proposed biological criteria should be more sensitive to nutrient specific effects than, for example, simple benthic community composition. 2. Once established these criteria should be considered for incorporation by the State of Rhode Island and the Commonwealth of Massachusetts into their Coastal Nonpoint Source Programs developed pursuant to Section 6217(g) of the Coastal Zone Management Act Reauthorization Amendments of 1990 in order to assist in delineating "critical coastal areas", as defined in *Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance* (EPA, 1991a:1-20).	EPA, NOAA, RIDEM, CRMC, MADEP, MACZM	[See EPA/ ERL, Narragansett. "Preliminary Agreement," Section 715-05-06 re: development of nutrient criteria for marine waters.]
I.B.	The EPA should establish enforceable nutrient effluent limits for wastewater treatment facilities (WWTFs) based upon removal efficiencies achievable by best achievable technology (BAT) for secondary and tertiary wastewater; and should require WWTF influent and effluent monitoring of nitrogen and phosphorus.	EPA	

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RECOMMENDED POLICIES AND ACTIONS
SOURCE REDUCTION: NUTRIENTS

CODE	POLICY	AGENCIES	STATUS
I.C.	Based upon the results of the Narragansett Bay Project-sponsored *Dissolved Oxygen Model of the Providence-Seekonk River* (Dettmann *et al.*, 1992), the Rhode Island Department of Environmental Management (RIDEM) and EPA should prepare a waste load allocation (WLA) of nutrients for point source dischargers to the Providence-Seekonk River and require loadings reductions, if necessary, to achieve dissolved oxygen water quality standards.	RIDEM, EPA	NBP-sponsored Eutrophication Screening Model completed, June 1992. [See EPA/ERL, Narragansett, RIDEM "Preliminary Agreements," Section 715-05-06 re: Providence River WLA.]
I.D.	The EPA, the Massachusetts Department of Environmental Protection (MADEP), and RIDEM should conduct synoptic dry weather and wet weather water quality surveys of the Blackstone River in order to: 1. Help identify the relative importance of nutrient loadings from point source discharges, runoff, and sediment resuspension utilizing water quality modelling methodology. 2. Use that modelling to prepare a WLA of nutrients and biochemical oxygen demand (BOD) for point and nonpoint source dischargers to the Blackstone River system based upon any demonstrated violations of dissolved oxygen water quality criteria in the Blackstone or impacts to the Providence-Seekonk River.	EPA, RIDEM, MADEP	[See EPA Region I "Preliminary Agreement," Section 715-05-06 re: DO-BOD-nutrients modeling on the Blackstone River.]
I.E.	As part of the implementation of advanced waste treatment for Warwick, West Warwick, and Cranston WWTFs, RIDEM and the WWTFs shall conduct a monitoring program to verify that compliance with the final Rhode Island Pollutant Discharge Elimination System (RIPDES) effluent limits is sufficient to meet water quality standards for the Pawtuxet River. If these BOD limits are insufficient to meet water quality standards for dissolved oxygen, RIDEM should consider establishing nutrient effluent limits for these WWTFs.	RIDEM, Warwick WWTF, W.Warwick WWTF, Cranston WWTF	[See RIDEM "Preliminary Agreement," Section 715-05-06 re: Pawtuxet River monitoring.]

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RECOMMENDED POLICIES AND ACTIONS
SOURCE REDUCTION: NUTRIENTS

CODE	POLICY	AGENCIES	STATUS
I.F.	Greenwich Bay		
I.F.1.	In order to alleviate low dissolved oxygen concentrations in Greenwich Bay, the EPA, RIDEM, and the East Greenwich WWTF should conduct a WLA for point and nonpoint sources to Greenwich Bay when the RIPDES permit for the East Greenwich WWTF is renewed in 1993.	EPA, RIDEM, E. Greenwich WWTF	[See EPA Region I "Preliminary Agreement," Section 715-05-06.]
I.F.2. ✓	**The Rhode Island Coastal Resources Management Council (CRMC), the RIDEM, and other state and local planning and implementation authorities should develop a Special Area Management (SAM) Plan for the Greenwich Bay region. Data collected by the NBP and others, including an engineering review of wastewater management infrastructure in the basin and local comprehensive and facility siting plans should be used to the maximum extent possible in preparing the SAM Plan. The SAM Plan should address:** **a. Both major point and nonpoint sources of pollution to Greenwich Bay;** **b. The long-term need for sewering in the basin to alleviate nonpoint source pollution relating to septic systems;** **c. The needs for sewering related to existing and projected population growth;** **d. Long-term management of the Greenwich Bay shellfish resource; and** **e. Capital costs associated with implementation of the SAM Plan and sources of federal and state funding available for implementation.**	**CRMC, RIDEM**	**$150,000 may be available for preliminary basin plan pursuant to RIDEM-CRMC-NBP Interagency MOA. [See RIDEM "Preliminary Agreement," Section 715-05-06.]**

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RECOMMENDED POLICIES AND ACTIONS
SOURCE REDUCTION: NUTRIENTS

CODE	POLICY	AGENCIES	STATUS
II.	Land use activities along the shores of Narragansett Bay and all nutrient-sensitive tributary waters and wetlands within the Narragansett Bay basin should be required to provide for management of nutrient loadings to receiving waters.		
II.A.	The State of Rhode Island, the Commonwealth of Massachusetts, and local municipalities should adopt consistent policies in the Narragansett Bay watershed to control on-site sewage disposal system (OSDS) densities at the subwatershed level in order to minimize nitrogen loadings (*i.e.*, dissolved inorganic nitrogen) to marine and estuarine waters. The recommendation should be implemented in sequence as described below.		
II.A.1.	The RIDEM, CRMC, MADEP, and Massachusetts Coastal Zone Management (MACZM) should delineate all nutrient-sensitive waters (and associated subwatersheds) in the Narragansett Bay basin. Possible criteria to be used in delineating nutrient-sensitive waters include: 1) poorly flushed coastal embayments, 2) waterbodies subject to summer vertical stratification, 3) waterbodies with large watershed areas relative to the receiving waterbody area, 4) waterbodies experiencing water column or sediment hypoxia or anoxia, and/or 5) waterbodies experiencing excessive growth of microscopic or macroscopic vegetation, and/or fish kills.	RIDEM, CRMC, MADEP, MACZM	
II.A.2.	The RIDEM and MADEP, in conjunction with the Rhode Island Division of Planning (RIDOP), CRMC, MACZM, and local governments (as appropriate), should require minimum two acre zoning to control OSDS density in currently unplatted areas. Cluster development should be strongly encouraged to attain the nitrogen-loading equivalent of a two acre OSDS density for the number of units considered. In addition, RIDEM and MADEP, in conjunction with CRMC and MACZM, should develop design and performance standards for alternative OSDS technologies to be required for use in all subwatersheds of nutrient-sensitive waters in order to minimize the cumulative impact of nutrient inputs to the receiving waters. [*Note*: The prescriptive OSDS density controls and setback requirements are interim measures to be used until the site-specific density controls recommended in II.A.3 (below) are developed.]	RIDEM, MADEP, RIDOP, CRMC, MACZM, municipalities	See 04-01-05 Source Control: On-site Sewage Disposal Systems.

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RECOMMENDED POLICIES AND ACTIONS
SOURCE REDUCTION: NUTRIENTS

CODE	POLICY	AGENCIES	STATUS
II.A.3.	The EPA, RIDEM, MADEP, CRMC, and MACZM should evaluate the effectiveness of existing approaches to control OSDS density based upon nitrogen loading and provide funding to develop and test a model ordinance for the Narragansett Bay watershed. The model should use site-specific criteria (*e.g.*, soils, watershed and receiving water characteristics) to the greatest extent possible. [The model developed by the Buzzards Bay Project should be evaluated for application in the Narragansett Bay watershed.]	EPA, RIDEM, MADEP, CRMC, MACZM	[See EPA Region I "Preliminary Agreement," Section 715-05-06 re: workshops on nitrogen management.]
II.B.	The OSDS setback distance should be increased to a standard minimum distance in unplatted areas adjacent to critical resources, including identified nutrient-sensitive waterbodies. The OSDS setback distance on existing lots of record in nutrient-sensitive watersheds should be increased to a minimum of 75 feet up to the maximum possible distance. The Rhode Island OSDS (as ISDS) Regulations (RIDEM 1989f) should be revised to: 1. Ensure that water level verification and percolation tests be performed on a lot-by-lot basis coincident with the location of the individual OSDS systems after individual lots are delineated; and 2. Provide a procedure for an applicant to seek a variance from the setback requirements if evidence of no significant impact from additional nutrient loading to adjacent waterbodies can be demonstrated based on site-specific data.	EPA, RIDEM, MADEP, CRMC, MACZM	See 04-01-05 Source Control: On-site Sewage Disposal Systems
II.C.	Best management practices for nutrient control		
II.C.1.	The State of Rhode Island should adopt the *Rhode Island Soil Erosion and Sediment Control Handbook*(RIDEM, 1989e) and *Rhode Island Stormwater Design and Installation Standards Manual* when completed (Boyd, 1991) as required best management practices (BMP) within the Narragansett Bay watershed to the extent that these practices are at least as protective as the "management measures" presented in the final *Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters* (EPA, 1991a).	RIDEM, CRMC, Mass. counterparts	[See USDA SCS "Preliminary Agreement,", Section 715-05-06 re: efforts to establish soil erosion and sediment control regulations in Mass.]

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RECOMMENDED POLICIES AND ACTIONS
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CODE	POLICY	AGENCIES	STATUS
II.C.2.	In developing BMPs to control pollutants carried by surface water runoff, the "vegetated buffer strip delineation work group" [described in 04-02-02 Resource Protection: Protection of Critical Areas], should consider buffer strips or vegetated filter strips as BMPs based upon all the functions that buffer strips can perform. The "vegetated buffer delineation work group" should emphasize the maintenance of natural, undisturbed riparian areas, as defined in *Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters* (EPA, 1991a: 7-2 to 7-3), and should consider all available research results on buffer strip delineation.	RIDEM, CRMC	[See CRMC "Preliminary Agreement," Section 715-05-06.]
II.C.3.	The "vegetated buffer strip delineation work group" [described in 04-02-02 Resource Protection: Protection of Critical Areas] should consider establishing a prescriptive buffer area adjacent to nutrient-sensitive waters where the use of nitrogen and phosphorus-containing fertilizers would be prohibited. In addition, RIDEM, MADEP, MACZM, CRMC, U.S. Department of Agriculture Soil Conservation Service, and State Cooperative Extension Services should produce outreach information to inform the public of the impacts of excessive fertilizer use on aquatic systems, and to discourage fertilizer use near waterbodies and wetlands.	RIDEM, MADEP, MACZM, CRMC, USDA SCS, Cooperative Extensions	[See USDA SCS "Preliminary Agreement," Section 715-05-06 re: development of a state nutrient management program.]
II.D.	The State of Rhode Island and the Commonwealth of Massachusetts should legislatively require the establishment of wastewater management districts (WWMDs) by all municipalities having unsewered areas within the Narragansett Bay watershed by December 1995. Priority should be given to those municipalities bordering nutrient-sensitive estuarine receiving waters.	R.I., Mass.	[See RIDEM "Preliminary Agreement," Section 715-05-06.]
II.E.	The State of Rhode Island and the Commonwealth of Massachusetts should require certification of OSDS tank structural integrity (visually determined by certified septage pumper/hauler and included as part of pumpout receipt), frequency of historical pumping, date of most recent pumping, and history of leach field failure as part of required seller disclosure information.	R.I., Mass.	R.I. Assoc. of Realtors submitted draft "seller disclosure" legislation (HR 8891) in 1992 legislative session.

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RECOMMENDED POLICIES AND ACTIONS
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CODE	POLICY	AGENCIES	STATUS
II.F.	The State of Rhode Island should ban the retail sale and advertisement of acid and organic chemical solvents for use in septic systems. The Commonwealth of Massachusetts should ban the use, sale, and advertisement of such chemicals. The State of Rhode Island and the Commonwealth of Massachusetts should institute informational campaigns to inform the public of the risk of environmental damage from these products.	R.I., Mass.	
II.G.	The State of Rhode Island and the Commonwealth of Massachusetts should prohibit the sale of laundry detergents containing greater than 0.5 percent elemental phosphorus by weight and dishwashing detergents containing greater than 8.7 percent elemental phosphorus by weight. The RIDEM and MADEP should establish phosphate limits for other commercial detergents, including those used by car washes.	R.I., Mass.	
II.H.	The State of Rhode Island and the Commonwealth of Massachusetts should prohibit the installation of garbage disposal systems in residences and businesses served by OSDSs. RIDEM and MADEP should establish outreach information to inform the public of the relative impacts and waste contributions from residential garbage disposal systems in order to help reduce the use of existing garbage disposals.	R.I., Mass., RIDEM, MADEP	
II.I.	The Rhode Island Solid Waste Management Corporation, the Rhode Island Association of Sustainable Agriculture (RISA), RIDEM and Rhode Island municipalities should encourage efforts by WWTFs to compost sludge, septage, boater septage wastes and yard wastes.	R.I. SWMC, RISA, RIDEM, municipalities	

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RECOMMENDED POLICIES AND ACTIONS
SOURCE REDUCTION: NUTRIENTS

CODE	POLICY	AGENCIES	STATUS
III	The State of Rhode Island and the Commonwealth of Massachusetts should support programs to establish a greater understanding of the effects of and processes controlling nutrients in the Narragansett Bay watershed in order to support management of loadings and effects.		
III.A.	The EPA, the Commonwealth of Massachusetts, and the States of Rhode Island, New York, and Connecticut should establish joint monitoring stations in the Rhode Island Sound-Long Island Sound region to provide for baseline information on the oceanic input of nutrients to Buzzards Bay, Narragansett Bay, and Long Island Sound.	EPA, Mass., R.I., N.Y., Conn.	[See EPA Region I "Preliminary Agreement," Section 715-05-06.]
III.B.	The EPA, the National Oceanic and Atmospheric Administration (NOAA), the State of Rhode Island, and the Commonwealth of Massachusetts should support a permanent, comprehensive monitoring program to assess the impact of direct wet and dry atmospheric deposition of nutrients and toxics to the Narragansett Bay watershed.	EPA, NOAA, R.I., Mass.	[See EPA Region I "Preliminary Agreement," Section 715-05-06.]
III.C.	The State of Rhode Island and the Commonwealth of Massachusetts should increase monitoring and assessment of summer low dissolved oxygen concentrations in Mount Hope Bay and the Taunton River and, if necessary, establish and implement nutrient reduction strategies for the Mount Hope Bay watershed. The assessment of nutrient loads to Mount Hope Bay should include possible nitrogen and BOD contributions from the Brayton Point Power Plant cooling water effluent.	MADEP, RIDEM	[See RIDEM. "Preliminary Agreement," Section 715-05-06.]
III.D.	The State of Rhode Island should support a permanent Volunteer Monitoring Program Coordinator within RIDEM with the responsibility, in part, to provide technical support to citizen monitoring programs in Narragansett Bay embayments and tidal rivers in order to achieve more complete monitoring coverage of these areas.	RIDEM	[See RIDEM. "Preliminary Agreement," Section 715-05-06.; and Chapter 05-02-04 Long-term Monitoring.]

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Estimated Cost of Implementation—Source Reduction: Nutrients

Table 715-04(2) summarizes the estimated costs associated with the implementation of this chapter's recommendations. The major costs associated with Element I (Point Sources) are to complete a waste load allocation for nutrients in the Providence-Seekonk River ($150,000) and a water quality model of point and nonpoint sources to Greenwich Bay ($400,000). Major recommended actions that are costed elsewhere include synoptic wet/dry weather water quality surveys (04-03-02 Areas of Special Concern: Blackstone River), a SAM Plan for Greenwich Bay (04-02-02 Resource Protection: Protection of Critical Areas), and monitoring of the Pawtuxet River to verify compliance with NPDES/RIPDES effluent limits (04-01-01 Source Reduction: Toxics). Other costs relate to coordination with other agencies.

The major actions recommended under Element II (Land Use Strategies) are a requirement for the establishment of Wastewater Management Districts (costed under 04-01-03 Source Control: Water Management) and the development of a vegetated buffer guidance (costed under 04-02-02 Resource Protection: Protection of Critical Areas). Other minor costs include the adoption of standards and the creation of legislation prohibiting high phosphate detergents. A recommended requirement for two acre zoning to control OSDS density in the subwatersheds of nutrient-sensitive waters could potentially cause a loss of tax revenue to a municipality as well as having an impact on the profitability of land to landowners. The legislative cost associated with revision of zoning ordinances to Bay watershed municipalities is estimated at $117,500. Monitoring recommendations in Element III (Scientific Understanding) are costed under the Mount Hope Bay (04-03-01) and *CCMP* Governance (715-05-02) chapters.

RIDEM will be responsible for the cost of the major actions recommended in this chapter with some smaller personnel costs to CRMC, MADEP, and MACZM. There will also be coordination activities between these state agencies and federal agencies.

For further details regarding the *CCMP* cost estimation process and funding strategies, refer to the *Narragansett Bay CCMP Cost Estimation and Funding Report*(Apogee Research Inc./NBP, 1992).

Table 715-04(2)

ESTIMATED COST OF IMPLEMENTATION
SOURCE REDUCTION: NUTRIENTS

COST ESTIMATES BY ELEMENT

	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
I-Reduce Point Source Loads	0	150,000	0	0	0	400,000	25,000	0	0	0	25,000	550,000
II-Manage Land Use Activities	2,500	0	29,375	0	30,625	0	29,375	0	29,375	0	121,250	0
III-Effects and Processes	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	2,500	150,000	29,375	0	30,625	400,000	54,375	0	29,375	0	146,250	550,000
TOTAL BY YEAR		152,500		29,375		430,625		54,375		29,375		696,250

COST ESTIMATES BY AGENCY

	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
RIDEM	1,250	150,000	0	0	1,250	400,000	0	0	0	0	2,500	550,000
RI CRMC	0	0	0	0	0	0	12,500	0	0	0	12,500	0
MADEP	1,250	0	0	0	0	0	0	0	0	0	1,250	0
MACZM	0	0	0	0	0	0	12,500	0	0	0	12,500	0
Municipalities*	0	0	29,375	0	29,375	0	29,375	0	29,375	0	117,500	0
TOTALS	2,500	150,000	29,375	0	30,625	400,000	54,375	0	29,375	0	146,250	550,000
TOTAL BY YEAR		152,500		29,375		430,625		54,375		29,375		696,250

* Ultimate implementation costs will vary for each municipality depending on its particular environmental and institutional conditions. In addition, the estimated municipal implementation costs do not include ultimate program and capital costs that may result from completion of underlying planning activities, or costs that are expected to be completely recoverable from user fees.

04-01-03 Source Control: Water Management and Wastewater Treatment

Objective for Water Management and Wastewater Treatment

The State of Rhode Island should improve the water quality of Narragansett Bay and its tributaries through institutional changes in the organizations responsible for water supply and use, and wastewater treatment and discharge within the Narragansett Bay watershed. The institutional changes should be intended to produce direct water quality benefits or to result in economic or administrative efficiencies which can then be translated into water quality improvements.

Introduction

Water supply, water use, wastewater treatment, and wastewater discharge are fundamentally linked. In most cases, water supply to domestic, commercial, or industrial users is ultimately discharged through a municipal treatment system and discharged to receiving waters. However, the use of water, from supply to ultimate disposal, is typically managed according to the particular location, destination and/or use of the water in question. As a result, the institutional framework used to manage water is extremely complex.

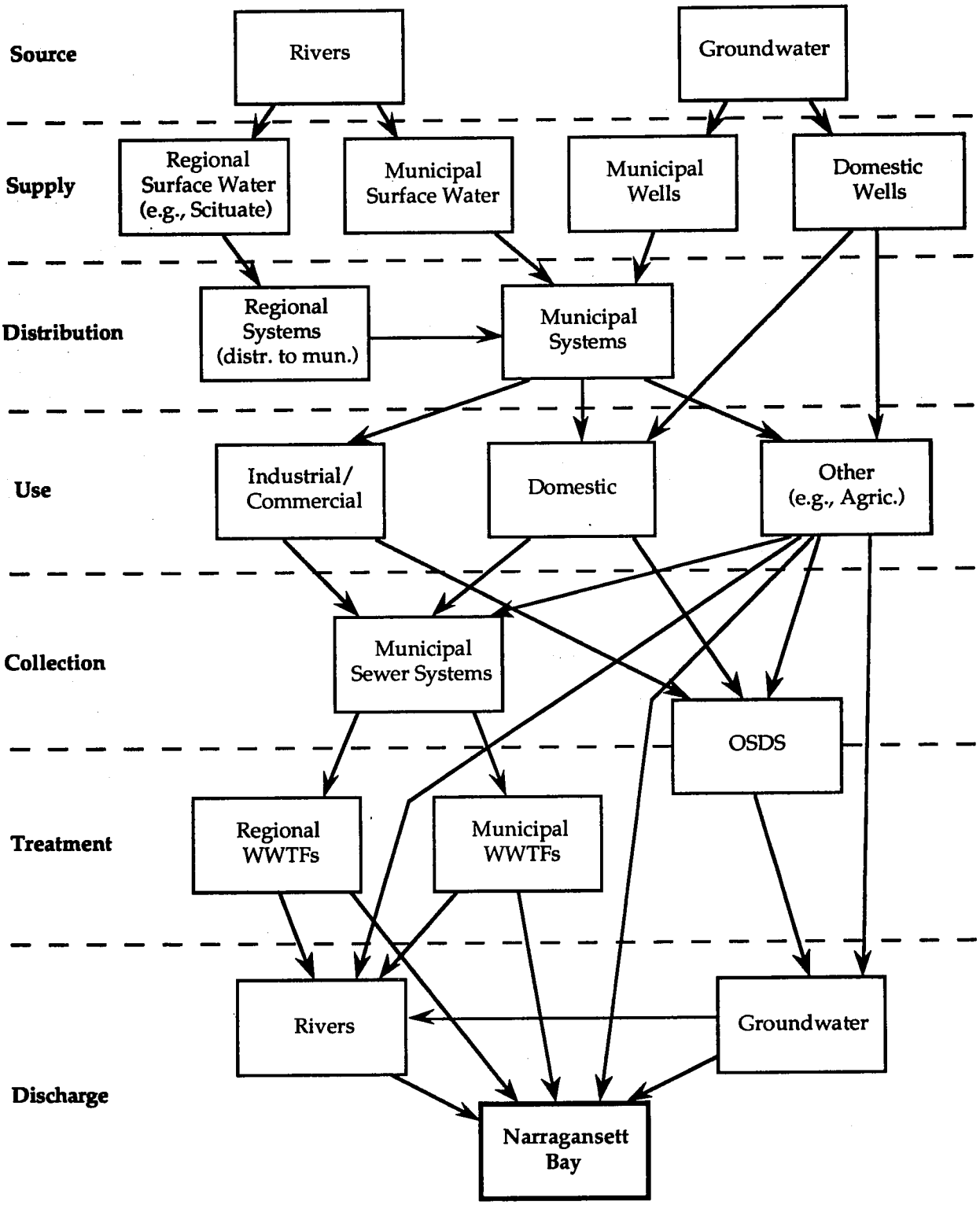
In populated areas, domestic, industrial, commercial, and agricultural water supplies are typically provided through publicly owned or commercial water suppliers, or by on-site wells. This water is then distributed to residential, commercial, and industrial users through municipal distribution systems. "Used" water is subsequently discharged through municipal sewer systems to publicly owned wastewater treatment facilities (WWTFs), or to on-site sewage disposal systems (OSDSs), for treatment and ultimate discharge to a receiving water — such as Narragansett Bay or one of its tributaries. Other water uses such as irrigation, power generation, and cooling may rely on direct withdrawals from surface waters or groundwater, and result in direct or indirect (runoff) discharge to a receiving surface water or groundwater, often without treatment. Figure 715-04(1) shows the many paths that water may take from its source to its ultimate discharge as wastewater (Zingarelli and Karp, 1991:1-2).

In Rhode Island alone, 30 major water suppliers provide the water supply of 90 percent of the state's residents. Many of the major suppliers are regulated by the Public Utilities Commission (PUC), although some of the major suppliers and most of the minor suppliers are not. Municipal sewage collection and conveyance systems are administered by each sewered community in the watershed for the primary purpose of protecting public health and safety and maintaining water quality. However, the municipalities also use sewer plans as a means to manage local growth and development (Zingarelli and Karp, 1991:1).

There are presently 33 WWTFs in the Narragansett Bay watershed, administered by 32 separate regional or municipal sewage treatment authorities in Rhode Island and Massachusetts. (As a result of the recent merger of the Narragansett Bay Commission and the Blackstone Valley District Commission, the Narragansett Bay Commission administers both the Field's Point and Bucklin Point WWTFs.) These sewer authorities have no control over the water supply systems or the OSDSs within their service area, nor do the water suppliers have any control over the treatment authorities.

In addition, local decisions about water supply and wastewater treatment have historically been regulated by different federal, state, and regional agencies, often with overlapping authority. In some cases, regulatory authority over water use, water quality, and wastewater quality is exercised by separate departments or divisions within those agencies (Zingarelli and Karp, 1991:1). Therefore, as described in the following sections, restructuring the institutional framework for managing water could be an important step in improving the water quality of Narragansett Bay and its tributaries (Zingarelli and Karp, 1991:3).

Figure 715-04(1). Path of Water from Source to Discharge



Statement of the Problem

The large number of water suppliers in Rhode Island has historically made statewide water supply planning a difficult task. In addition, the large number of federal, regional, state, and local authorities with responsibility for water supply and wastewater treatment in the Narragansett Bay basin has complicated the state's ability to manage water use and protect water quality. The effects of the existing, decentralized system of regulating water supply and wastewater treatment on water conservation and water quality are discussed below.

Billing Practices *vs.* Conservation

Water use rates used in the Narragansett Bay basin range from an annual flat charge to regular and timely usage-based billing. The price charged for water is often low relative to the true cost of providing the water and, in many cases, billing is infrequent and reflects declining block rates (*i.e.*, the price per gallon decreases as consumption increases). In addition, water meters are often nonexistent, nonfunctioning, or read only sporadically (Zingarelli and Karp, 1991:5). As a result, existing billing practices often create disincentives for individual consumers to conserve water or to invest in water conservation technology.

Similarly, there is little incentive for water supply or wastewater treatment authorities to invest in water conservation since their mandate has traditionally been limited to assuring adequate supplies or treatment. In addition, the ability of these authorities to reform the water rate structure is often limited by the absence of accurate metering at the point of water withdrawal and/or at the point of consumption, and, occasionally, by lack of jurisdiction over the metering system itself. In other cases, narrow interpretations of existing legal requirements have effectively blocked efforts to impose water rates that increase with increased water use (inclining rates) (Zingarelli and Karp, 1991:5).

Inconsistent Regulation of WWTFs

Individual wastewater treatment facilities within each state operate under unique physical and regulatory conditions. The physical operation of each facility depends upon when it was built, particularly the technologies available at the time it was built, and when major upgrades were undertaken. In addition, the local industrial and residential base determines the chemical characteristics of the wastewater influent to a WWTF, leading to differences in regulation (such as the establishment of a pretreatment program). Differences in local environmental conditions, such as the characteristics of the receiving water (marine or freshwater, dilution field, *etc.*), also lead to different treatment and effluent limits for each facility.

Since a WWTF permit is effective for five years, each WWTF is regulated according to which regulations apply at the time the facility's operating permit is issued. Therefore, different regulatory requirements can be imposed on neighboring WWTFs discharging to the same receiving water, at least temporarily, as new requirements are phased into effect (Zingarelli and Karp, 1991:7). Although there may in some cases be reasons for treating WWTFs individually, it is important to evaluate by a basinwide approach whether the regulatory requirements are achieving their intended result. However, as a result of the number of regulated WWTFs in the Bay basin, the federal and state regulatory agencies rarely make geographically comprehensive decisions about the cumulative impacts of WWTF discharges to regulated waterbodies. Regionalization of WWTFs could, therefore, be one approach to promote basinwide planning and basinwide regulation of pollutant sources to protect shared waters.

Existing Policies

In Massachusetts, water supply functions have been administered both by the Department of Environmental Management (MADEM) and by the Department of Environmental Protection (MADEP), and wastewater treatment functions primarily by the MADEP. In Rhode Island, a Water

Supply Management Division was established within the Rhode Island Department of Environmental Management (RIDEM) in 1991 by Executive Order. Wastewater treatment facilities are also regulated by the RIDEM. Municipal sewage collection systems are administered by each sewered community in the Narragansett Bay watershed, as mentioned above (Zingarelli and Karp, 1991:1).

Rhode Island's institutional structure for governing the supply and pricing of water is highly complex. Agencies with significant water use responsibilities in the State of Rhode Island include the State Water Resources Board, the Rhode Island Division of Planning (RIDOP), the Department of Health (RIDOH) Division of Water Supply, RIDEM's Divisions of Water Resources, Freshwater Wetlands, and Water Supply Management, and the Public Utilities Commission (PUC) (Zingarelli and Karp, 1991:4). Since water supply and wastewater treatment are managed as unrelated functions by both states, policies affecting water conservation and wastewater treatment are addressed separately, see below.

Water Conservation

Almost 90 percent of Rhode Island's residents rely on water supplied by 30 major water departments. The rates and operating practices of the largest of these 30 water providers are regulated by the PUC. The large number of water suppliers complicates regional planning and cooperation, as stated above, and is an impediment in itself to water conservation (Arthur D. Little, Inc., *et al.*, 1990). The need for water conservation and regional water supply planning have been identified in many recent activities, including the *Water Supply Analysis for the State of Rhode Island* prepared for the Rhode Island Water Resources Coordinating Council in 1990, the establishment of a Water Supply Management Division within RIDEM in 1991, and the draft *Water Supply Plan* completed by the RIDOP in 1992.

Legislation passed by the Rhode Island General Assembly in 1991, however, offers a significant opportunity to improve water conservation. The legislation, based on extensive work by the Narragansett Bay Project, other participants in the "Green Rhode Island" initiative, and the RIDOP, requires water suppliers to complete water supply management plans that consider both *demand management* and *system management* measures to promote water conservation. These might include fee and billing structures, retrofitting water-saving plumbing equipment, effective metering, leak repair and prevention, and public education programs. The law also establishes guidelines for setting fees, rates, and charges that are intended to improve water supply management (R.I.G.L. 46-15.4, as amended; Zingarelli and Karp, 1991:5-6).

WWTF Management

In the early years of the Clean Water Act, state and federal subsidies for WWTFs were provided through the Construction Grants program. This program and its successor, the State Revolving Fund (SRF), include specific federal eligibility requirements for participation in the program. The State of Rhode Island, in funding its SRF, contributed additional state money into the program and established the Clean Water Protection Finance Agency in order to be able to fund projects that might not be eligible under federal requirements. The investment of state funds indicates some public recognition of the *statewide* benefits of wastewater treatment. In addition, the eligibility requirements for SRF loans indicate an appreciation of those projects with the greatest statewide rather than local benefit (Zingarelli and Karp, 1991:8).

Before the Clean Water Act, however, there was a precedent in Rhode Island for regionalizing WWTFs. The Blackstone Valley District Commission (BVDC) was created by the General Assembly in 1947, when lawmakers concluded:

> Economy and efficiency dictate the desirability for an overall plan for dealing with the sewage and industrial wastes which originate in several municipalities and industries located in the Blackstone and

> Moshassuck Valleys... [T]he problem can best be solved by the creation of a state agency for the planning, construction, operation, and maintenance of appropriate facilities (R.I.G.L. 46-21-2).

The act creating the Narragansett Bay Commission (NBC) in 1980 echoed these sentiments, and added:

> [B]ecause of the scope and complexity of the work necessary to correct and minimize these pollution discharges and the scope of financing required, local municipalities in the Providence metropolitan area have been unable alone to cope properly and immediately with the magnitude of the pollution discharges (R.I.G.L. 46-25-2(c)).

In 1991, legislation was passed authorizing the merger of BVDC and NBC in early 1992. The merger statute noted that "economy, efficiency, and technological advances dictate the desirability of having one entity to formulate, coordinate, and regulate an overall plan to reduce the discharge of sewerage and industrial wastes..." (R.I.G.L. 46-25-2(g); Zingarelli and Karp, 1991:8) .

Even so, WWTFs in the Narragansett Bay watershed are, with few exceptions, still owned and operated by the communities in which they are located. The watershed contains 33 regionally or municipally owned WWTFs, operated by 32 separate entities, 15 in Rhode Island and 17 in Massachusetts. Facilities in both Rhode Island and Massachusetts are subject to National Pollutant Discharge Elimination System (NPDES) permit requirements. In Massachusetts, NPDES permits are issued and enforced by the U.S. Environmental Protection Agency (EPA). Concurrently, State discharge permits are issued by the Commonwealth of Massachusetts through MADEP. In Rhode Island, WWTFs must obtain Rhode Island Pollutant Discharge Elimination System (RIPDES) permits, based on the NPDES program but delegated by the EPA to RIDEM. In spite of similar permitting programs and EPA oversight in both Massachusetts and Rhode Island, WWTFs are typically *not* regulated in a consistent manner, either basinwide or statewide (Zingarelli and Karp, 1991:7). For example, the inconsistencies in discharge permit limits for toxic pollutants between WWTFs in Rhode Island and Massachusetts are described in 04-01-01 Source Reduction: Toxics.

Analysis

Water Conservation

The volume of water used for domestic, commercial, and industrial purposes has a direct effect on the water quality of the Bay and its tributary ground and surface waters. Water conservation measures may be necessary in some instances simply to assure adequate water supplies (Arthur D. Little, Inc. *et al.*, 1990). Water conservation efforts should also be pursued to help reduce wastewater load, particularly to OSDSs. The failure rate of OSDSs can be reduced in some cases by reducing the hydraulic load on the leach field, particularly in areas with saturated or poorly drained soils. In addition, reducing wastewater loads can extend the lifetime and lower the capital needs of publicly owned wastewater treatment facilities (WWTFs), if the system is nearing its treatment capacity. Water conservation may result in a less dilute influent load to the WWTF, which in some cases may make effective treatment more difficult to achieve (Zingarelli and Karp, 1991:4).

Rhode Island's recent enactment of water conservation legislation (R.I.G.L. 46-15.4, as amended) provides sufficient authority to the PUC and state management agencies to effectively implement water conservation measures. In support of that legislation, all water suppliers should be required to utilize all feasible and effective water conservation measures prior to developing new sources of water supply or abandoning existing sources. Active water conservation programs could be developed through fee and billing structures; retrofitting of water-saving plumbing equipment, including performance of water audits and installation of devices at cost or no direct cost to users; meter

installation, replacement, and reading; leak detection, repair, and prevention; and public education programs, including programs for municipal and state building officials (Zingarelli and Karp, 1991:6).

WWTF Consolidation

Consolidation of publicly owned wastewater treatment facilities may better protect the states' economic and environmental interests for several reasons. First, to the extent that WWTF improvements are financed and partially subsidized through the state-administered revolving loan funds, the public's investment could be better protected by preferentially financing projects based, in part, on their expected statewide benefit. Regional treatment authorities, with their focus on *regional* water quality and facility planning, would have a greater interest in providing benefits to the general public rather than to residents of a narrow geographic region. Basinwide pollution abatement and growth management alternatives would, therefore, be evaluated more objectively, and more consistently implemented (Zingarelli and Karp, 1991:8-9).

In evaluating possible consolidation or regionalization of WWTFs, environmental (*e.g.*, water quality improvements) and economic (*e.g.*, cost savings resulting from operational efficiencies) issues are most important. However, other issues, such as equity considerations in establishing a consistent user fee schedule, must also be considered (Metcalf & Eddy, Inc., 1991c).

- Environmental and Economic Benefits

The environmental and economic benefits to be achieved from consolidation of WWTFs are fundamentally linked. Establishment of a uniform system for managing geographically complex programs (*e.g.*, combined sewer overflow (CSO) abatement) can result in the development of solutions that provide the greatest environmental benefit at the least cost. Similarly, any economic efficiencies achieved from merging programs could result in direct cost savings that could be re-invested into further capital or program improvements. For example, efficiencies could be achieved through consolidation of the labor pool, establishment of a single billing and accounting system, centralization of laboratory, library, and training facilities, and standardization of maintenance programs, including bulk purchases of materials and chemicals (Zingarelli and Karp, 1991:11).

Administrative consolidation of wastewater treatment authorities into a regional or statewide utility could also facilitate the examination of structural solutions to local wastewater treatment and disposal problems. For example, three communities on the Pawtuxet River (West Warwick, Warwick, and Cranston) are each conducting a facility plan to evaluate alternatives for providing advanced wastewater treatment (AWT), under a consent agreement with RIDEM. Although each community is investigating regional AWT alternatives as part of its facility plan, and regional AWT could be implemented without consolidating the three treatment authorities, the facility planning process and any ultimately recommended regional solution would doubtlessly be facilitated through consolidation of the three WWTFs into a Pawtuxet River Treatment Authority. In addition, basinwide pollution abatement and growth management alternatives could most objectively be evaluated and consistently implemented by a regional Pawtuxet River Treatment Authority, rather than by individual communities, which may have a self-interest in recommending community-specific solutions (Zingarelli and Karp, 1991:9).[See "Other Issues" below.]

There are many additional examples of potential environmental advantages from consolidating WWTFs. Consolidated WWTFs may be better able to equalize the utilization of treatment capacity, rather than allowing some plants to operate periodically at or above their design capacity. This approach may also reduce or eliminate some of the WWTF bypasses and CSO discharges that currently occur, if base wastewater loads or storm flows can be transferred to plants with available capacity. Opportunities may also be present for regional solutions to the problem of sludge disposal, through methods such as compost-

ing, incineration, or pelletization (Zingarelli and Karp, 1991:10).

Administrative consolidation of treatment authorities may also directly lead to environmental benefits. An authority's management structure and other institutional constraints, such as a mismatch between its treatment requirements and financial capabilities, may result in its failure to comply with permit conditions (University of Rhode Island Intergovernmental Policy Analysis Program, 1990). Consolidation of authorities with severe financial constraints or ineffective management structures into those with financial capability and effective management could result in direct water quality improvements, or cost savings that could be reinvested into such improvements (Zingarelli and Karp, 1991:11).

Consolidation should also promote the standardization of several programs. In these cases, while direct environmental benefits may be difficult to document, more effective regulatory programs would result, thus producing indirect environmental benefits. Examples of programs that could be improved with standardization include the industrial pretreatment program and septage disposal programs (Zingarelli and Karp, 1991:12).

It is also likely that consolidation would result in a significantly reduced workload for facility staff. A reduction in the number of RIPDES/NPDES discharge permits — with an associated reduction in mailings, public hearings, discharge monitoring reports, *etc.*, — would be one instance where the workload of state and federal regulators would be reduced as well (Zingarelli and Karp, 1991:12).

• Equity Issues

User fees vary widely between existing authorities. This may be due to the different costs for providing treatment, in some cases at different treatment levels, from one authority to the next. On the other hand, some sewer authorities recover debt service and other costs through the general property tax rate rather than through user fees. As part of any consolidation, a consistent schedule to recover all operating and capital costs from user fees, varying strictly with the cost of treatment or other characteristics of the service subarea, would have to be established system wide. However, residents of those communities that currently have relatively low user fees because the cost of treatment is subsidized by property taxes might consider such a system inequitable, particularly if not accompanied by a corresponding decrease in property taxes (Zingarelli and Karp, 1991:12-13).

A related equity issue to be considered would be the issue of debt retirement. Communities have varying levels of outstanding debt service, related to the time when major construction was last undertaken (Metcalf & Eddy, Inc., 1991c). An equitable arrangement of retiring debt would have to be established so that those communities with low remaining outstanding debt would not be penalized (Zingarelli and Karp, 1991:13).

In Rhode Island, regulation of consolidated treatment authorities through the PUC may be an appropriate channel for resolution of such financial and equity issues. The PUC is charged with providing "fair regulation of public utilities and carriers in the interest of the public." (R.I.G.L. 39-1-1(b)) Although existing authority of the PUC over wastewater treatment authorities is currently limited to the NBC, expansion of PUC authority to other regional wastewater treatment authorities would likely prove the most effective means of resolving interjurisdictional issues regarding rate and debt equity (Zingarelli and Karp, 1991:13).

• Other Issues

One political impediment to consolidation may be a desire by communities to retain control of their WWTFs. Those communities with an effective management structure may be reluctant to relinquish control to a regional authority, as well as having to assume costs for improvement of the more poorly-run plants (Metcalf & Eddy, Inc., 1991c). Similarly, regional planning and siting for "undesirable" facilities (*e.g.*, sludge incinerators) may result in certain

member communities considering themselves to be unfairly treated.

Additionally, individual communities may consider control over lateral sewers an important tool in planning and management of growth. The issue of whether control of lateral sewers should be transferred to a regional authority should also be investigated as part of an analysis of the feasibility and desirability of WWTF consolidation (Zingarelli and Karp, 1991:12).

Recommended Policies and Actions and *Estimated Cost of Implementation* are presented in the following pages.

RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: WATER MANAGEMENT AND WASTEWATER TREATMENT

CODE	POLICY	AGENCIES	STATUS
I.	The State of Rhode Island should maximize conservation of its water supplies in order to minimize the volume of wastewater generated and ultimately discharged to Narragansett Bay and its tributaries.		
I.A.	The Rhode Island Department of Environmental Management (RIDEM) Division of Water Supply Management, the Rhode Island Department of Health (RIDOH) Division of Drinking Water Quality, the Rhode Island Department of Administration Division of Planning (RIDOP), the Division of Public Utilities, and the Public Utilities Commission (PUC) should actively enforce the requirements of the Water Supply Management Act of 1991 (R.I.G.L. 46-15.4, as amended by P.L. 1991, ch. 311).	RIDEM, RIDOH, RIDOP, PUC	[See RIDOP and RIDOH "Preliminary Agreements," Section 715-05-06.]
I.B.	These agencies should ensure that all water suppliers develop active water conservation programs through: 1. Fee and billing structures; 2. Retrofitting of water-saving plumbing equipment, including performance of water audits and installation of devices at cost or no direct cost to users; 3. Meter installation, testing, replacement, and reading for domestic, commercial, and industrial users; 4. Leak detection, repair, and prevention; 5. Public education programs, including programs for municipal and state building officials; and 6. Other feasible water conservation measures.	RIDEM, RIDOH, RIDOP, PUC	
I.C.	These agencies should evaluate whether consolidation of water supply authorities may be an appropriate measure to enhance water conservation efforts or to effect other water quality improvements, either directly or indirectly.	USGS, RIDEM, RIDOH, RIDOP, PUC	[See USGS and RIDEM "Preliminary Agreements," Section 715-05-06 re: development of a water use database to evaluate demand on water supplies, and effect on wastewater treatment.]
I.D.	All water suppliers should be required to utilize all feasible and effective water conservation measures, including those listed above, prior to developing new sources of water supply or abandoning existing sources. Water suppliers should utilize sources within their watershed prior to utilizing out-of-basin transfers for water supply.	RIDEM, RIDOH, RIDOP, PUC, Water Suppliers	

✓ – High Priority Action

RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: WATER MANAGEMENT AND WASTEWATER TREATMENT

CODE	POLICY	AGENCIES	STATUS
II.	The State of Rhode Island should maximize the economic and administrative efficiency of the State's wastewater treatment facilities (WWTFs) in order to more effectively protect Narragansett Bay and its tributaries from the effects of wastewater treatment and disposal.		
II.A.	The State of Rhode Island should establish a commission to evaluate the feasibility of consolidating its WWTFs. The commission should determine whether such consolidation, if feasible, should consist of: 1. Individual consolidation measures (*e.g.*, incorporation of the Smithfield and East Providence sewer districts into the Narragansett Bay Commission (NBC); merger of the West Warwick, Warwick, and Cranston sewer districts); or 2. Establishment of a few regional wastewater treatment authorities based on political subdivision boundaries (*e.g.*, by county), or based on watershed boundaries (*e.g.*, Upper Bay, West Bay, East Bay, coastal); or 3. Establishment of a statewide wastewater treatment authority by phasing individual consolidations to regional authorities and, eventually, to a single state authority.	State of R.I.	NBC-BVDC officially merged in January 1992. RIDEM is requiring Cranston, Warwick and W. Warwick to consider regional options for achieving advanced treatment requirements in the Pawtuxet River.
II.B.	The commission should also examine: 1. The feasibility of forming a combined authority (or authorities, if regional consolidation is recommended) to manage both wastewater treatment and water supply; and 2. The desirability of bringing regional treatment authorities under the regulation of the PUC.	State of R.I.	[See USGS "Preliminary Agreement," Section 715-05-06 re: development of a water use database to evaluate demand on water supplies, and effect on wastewater treatment.]

✓ – High Priority Action

RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: WATER MANAGEMENT AND WASTEWATER TREATMENT

CODE	POLICY	AGENCIES	STATUS
II.C.	The commission should consider the following issues in evaluating the aforementioned consolidation alternatives: 1. Environmental effects of WWTF consolidation, including: a. Feasibility of regional CSO abatement measures; b. Feasibility of regional treatment alternatives (*e.g.*, advanced wastewater treatment); c. Feasibility of regional pretreatment, sludge disposal, and effluent reuse programs; d. Probability of achieving improved wastewater treatment through effective management and financial capabilities; and e. Availability of additional funding for environmental improvements as a result of economic savings (see below). 2. Economic effects of WWTF consolidation, including: a. Personnel consolidation; b. Centralized billing and accounting system; c. Centralized laboratory, library, and training center; d. Pooling or bulk purchase of equipment and materials; and e. Uniformity of maintenance programs. 3. Other effects of WWTF consolidation, including: a. Standardization of programs; b. Community control of WWTFs and lateral sewers; c. User fee schedules and debt retirement; and d. Desirability of placing WWTFs under PUC authority.	State of R.I.	
II.D.	In addition, the commission: 1. Should recommend whether the following structural regionalization alternatives should be technically evaluated through the facility planning process: a. Consolidation of East Greenwich and Quonset Point WWTF discharges to a new deepwater outfall at Quonset Point; b. Consolidation of Narragansett Bay Commission Bucklin Point (formerly BVDC) and East Providence WWTF discharges to a single discharge at East Providence. 2. Should <u>not</u> consider a facility plan for a consolidated marine outfall off Point Judith unless new scientific information is developed on the potential water quality impacts of such a project on Narragansett Bay and Rhode Island Sound.	State of R.I.	

✓ – High Priority Action

Estimated Cost of Implementation - Source Control: Water Management and Wastewater Treatment

Table 715-04(3) summarizes the estimated costs associated with implementing the recommendations in this chapter. Element I (Water Conservation) requires State agencies to actively enforce the use of water conservation measures by the State's water suppliers prior to the development of new drinking water supply sources or the abandonment of existing sources. The costs involved ($100,000) are spread out evenly over the five-year planning period. Element II (WWTF Consolidation) recommends the creation of a commission to evaluate the feasibility of establishing a regional or statewide wastewater treatment authority. This would occur in 1994-95 and would conclude in the following year. Both Elements require coordination activities between the major State agencies (RIDEM, RIDOH, and RIDOP) and municipalities.

Although the NBP actively supported the action, the costs associated with consolidating the NBC and BVDC WWTFs have not been included because the merger became official prior to completion of the *CCMP*. Similarly, the costs associated with the upgrade of the Cranston, Warwick, and West Warwick WWTFs on the Pawtuxet River have not been included since the action was mandated by RIDEM independently of the *CCMP*. However, RIDEM's most recent estimate (June 1992) of the capital costs associated with the upgrade of the individual WWTFs is: Cranston, $30 million; Warwick, $25 million; and West Warwick, $20 million. Consistent with the recommendations in this chapter, a regional solution may be more cost-effective to the extent that these communities seek partial state financing from the Rhode Island Clean Water Protection Finance Agency (RICWPFA) or another state revenue source in order to complete the advanced treatment projects.

For further details regarding the *CCMP* cost estimation process and funding strategies, refer to the *Narragansett Bay CCMP Cost Estimation and Funding Report* (Apogee Research Inc./NBP, 1992).

Table 715-04(3)

ESTIMATED COST OF IMPLEMENTATION
SOURCE CONTROL: WATER MANAGEMENT AND WASTEWATER TREATMENT

COST ESTIMATES BY ELEMENT

	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
I-Water Conservation	20,000	0	20,000	0	20,000	0	20,000	0	20,000	0	100,000	0
II-WWTF Consolidation	0	0	0	0	26,250	0	25,000	0	0	0	51,250	0
TOTALS	20,000	0	20,000	0	46,250	0	45,000	0	20,000	0	151,250	0
TOTAL BY YEAR		20,000		20,000		46,250		45,000		20,000		151,250

COST ESTIMATES BY AGENCY

	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
RIDEM	5,000	0	5,000	0	11,250	0	10,000	0	5,000	0	36,250	0
RIDOH	5,000	0	5,000	0	5,000	0	5,000	0	5,000	0	25,000	0
RIDOP	5,000	0	5,000	0	10,000	0	10,000	0	5,000	0	35,000	0
RI PUC	5,000	0	5,000	0	5,000	0	5,000	0	5,000	0	25,000	0
RI Governor's Office	0	0	0	0	5,000	0	5,000	0	0	0	10,000	0
RI Municipalities*	0	0	0	0	5,000	0	5,000	0	0	0	10,000	0
WWTFs	0	0	0	0	5,000	0	5,000	0	0	0	10,000	0
TOTALS	20,000	0	20,000	0	46,250	0	45,000	0	20,000	0	151,250	0
TOTAL BY YEAR		20,000		20,000		46,250		45,000		20,000		151,250

* Ultimate implementation costs will vary for each municipality depending on its particular environmental and institutional conditions. In addition, the estimated municipal implementation costs do not include ultimate program and capital costs that may result from completion of underlying planning activities, or costs that are expected to be completely recoverable from user fees.

04-01-04 Source Control: Combined Sewer Overflows

Objective for the Abatement of Combined Sewer Overflows

Combined sewer overflows within the State of Rhode Island and the Commonwealth of Massachusetts shall be eliminated or brought into compliance by the year 2000 with technology-based requirements and applicable state water quality standards, in order to preserve and restore existing and historical uses wherever possible.

Introduction

In many older communities, wastewater and storm runoff is collected, conveyed, and discharged by a single system, the combined sewer. During periods of precipitation or snow melt, the combined flows of wastewater and runoff may exceed the carrying and treatment capacities of the conveyance system and the associated wastewater treatment facility (WWTF). At these times, hydraulic overload of the facility or flooding is prevented by combined sewer overflows (CSOs), which divert excess flows from the combined sewer directly to a receiving water (Zingarelli and Karp, 1990:i). A combined sewer system is described schematically in Figure 715-04(2).

Statement of the Problem

Combined sewer overflows and WWTF bypasses are the greatest source of fecal contamination to the receiving waters of Narragansett Bay (Zingarelli and Karp, 1990:9). Discharges from CSOs also release untreated, or partially treated, industrial process wastewater. In general, the flow of untreated sewage, industrial wastewater, and urban runoff from CSOs can contribute to violations in water quality criteria for turbidity, dissolved oxygen, bacteria, metals, and toxic organic pollutants. These discharges also may contribute to low oxygen conditions in some areas due to high levels of nutrients and solids loadings. While some CSO impacts, particularly those relating to turbidity or dissolved oxygen, tend to be localized around the outfall, others, such as fecal contamination, may be significantly more widespread (Zingarelli and Karp, 1990).

Discharges from CSOs and WWTF bypasses into Narragansett Bay's receiving waters have contributed to the permanent closure of 26,000 acres of shellfish harvesting areas in Mount Hope Bay and the Providence River, and, following precipitation events, result in the closure of an additional 10,672 acres in the upper bay (Zingarelli and Karp, 1990:8-9). Closures in conditional harvesting areas run for a minimum of seven days after the storm. These periods, added together over the course of a year, can represent a significant amount of time. In 1990, for example, CSO-related harvesting prohibitions in the conditional area spanned 281 days.

Leaks and hardware failure in combined sewers can cause discharges to receiving waters even in dry weather. Additionally, wherever the structural integrity of the drainage system is compromised, significant volumes of groundwater may be able to infiltrate. This can cause dry weather overflows and increased overflows during storms. Physical blockages of the regulating structures can also result in overflows in both dry and wet weather (Zingarelli and Karp, 1990:1).

More than a hundred CSOs and WWTF bypasses discharge directly into Narragansett Bay or its tributaries. Their locations are indicated in Figure 715-04(3). The annual discharge to the Bay from these facilities is estimated to be four billion gallons—compared to 73 billion gallons per year from the WWTFs themselves (Zingarelli and Karp, 1990:2).

Existing Policies

Combined sewer overflows are "point sources" (of water pollution) regulated through the National Pollutant Discharge Elimination System (NPDES). In Rhode Island, CSOs are subject to Rhode Island Pollutant Discharge Elimination System (RIPDES) permits. [See 04-01-01 Source Reduction: Toxics.] In Massachusetts, the U.S. Environmental Protection Agency

Figure 715-04(2): Schematic of CSO System.

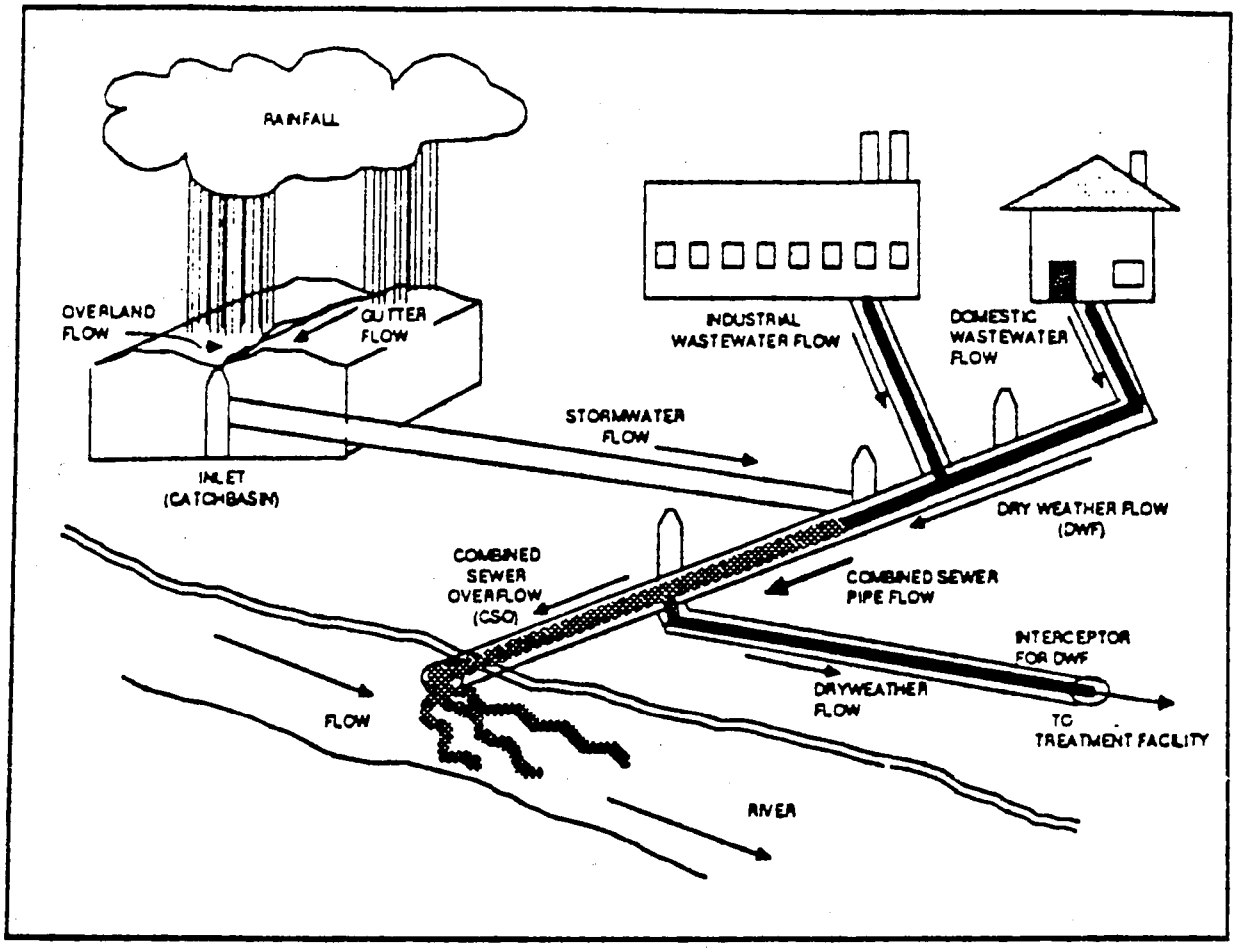
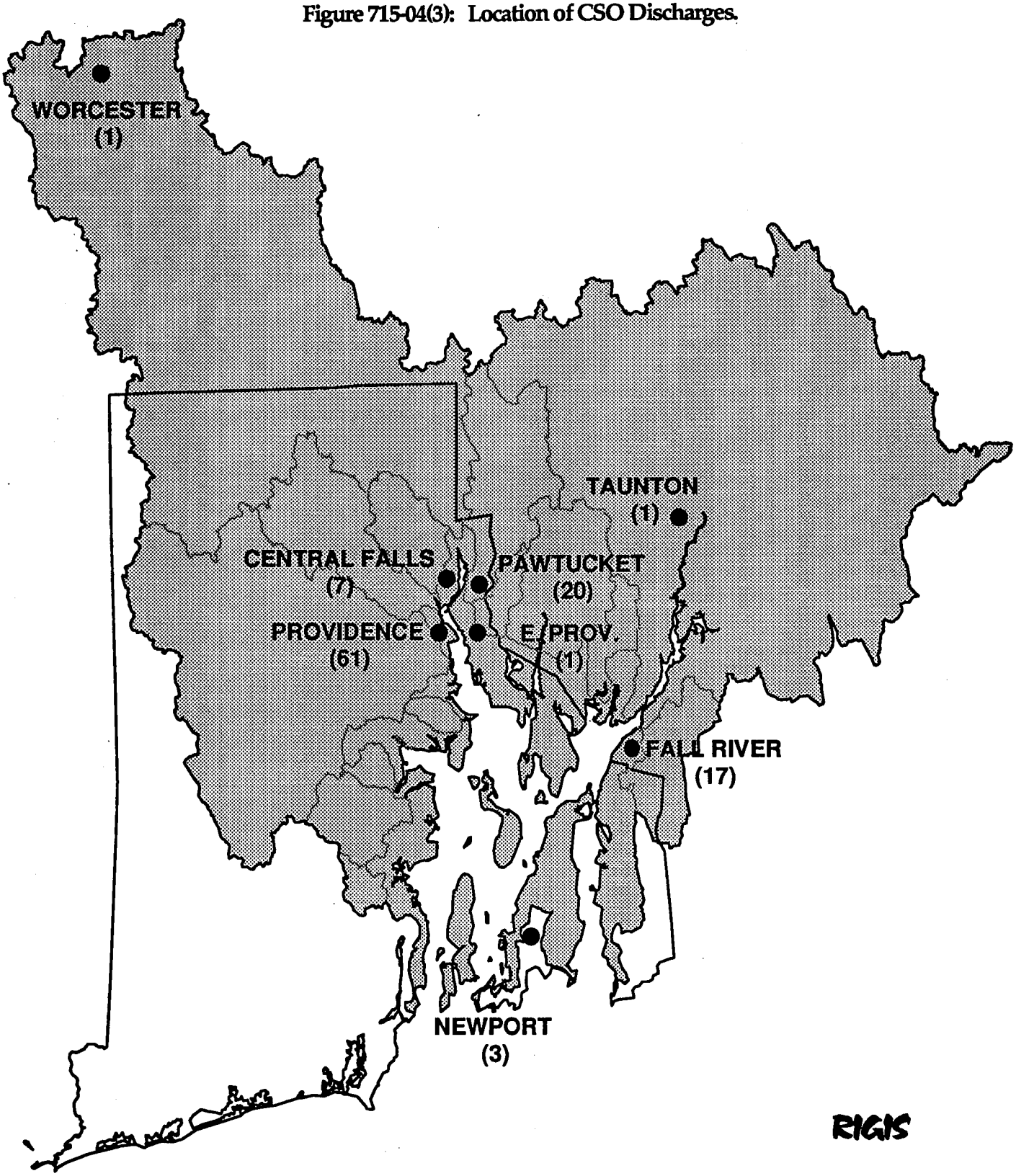


Figure 715-04(3): Location of CSO Discharges.



(EPA) Region I has retained this authority under National Pollutant Discharge Elimination System (NPDES).

The EPA formulated a *National Combined Sewer Overflow Control Strategy* in 1989. The *Strategy* is "designed to complement the control programs for sanitary sewers and separate storm sewers. [It] establishes a uniform, nationally-consistent approach to developing and issuing NPDES permits for CSOs...State-wide permitting strategies will be developed by the States or Regions to ensure implementation with this CSO strategy." (EPA, 1989a:1,3) As a minimum, the *Strategy* proposes that states and municipalities employ technology-based measures to meet the goals of the Clean Water Act. Included among these methods are regular maintenance, effective pretreatment programs, maximization of flow to WWTFs, a prohibition of dry weather overflows, and control of fecal, solid, and floatable materials in wet weather overflows. In addition, "the CWA under Section 301(b)(1)(C) also requires any additional permit limits that may be necessary to protect State water quality standards" (EPA, 1989a:6).

In response to EPA's *National Strategy,* the Rhode Island Department of Environmental Management (RIDEM) prepared a *Combined Sewer Overflow Policy* that was approved by the EPA in April 1990. This policy requires that each CSO discharge receive *equivalent primary treatment*—"the use of or combined uses of storage, screening, settling, or other technologies such that the treated effluent results in removal rates of 50% of the Total Suspended Solids (TSS) and 35% of the Biochemical Oxygen Demand (BOD) loadings[,] or 100% of all settleable solids, whichever is demonstrated to have the greatest water quality impact" (RIDEM/Division of Water Resources (DWR), 1990b:n.p.). All flows created by the hypothetical one-year, six-hour design storm, and storms occurring more frequently, are subject to the requirement of equivalent primary treatment (Zingarelli and Karp, 1990:4). If equivalent primary treatment cannot sufficiently abate water quality impacts from a particular CSO, RIDEM reserves the right to require more extensive treatment (RIDEM/DWR, 1990b).

As opposed to establishing specific removal rates for components of CSO discharges, Massachusetts' *Implementation Policy for the Abatement of Pollution from Combined Sewer Overflows* requires the outright elimination of impacts on receiving waters. Impact elimination is determined by the nondegradation of the receiving water's designated use. This use classification, assigned according to the Commonwealth's Water Quality Standards, must be maintained for storms up to the hypothetical three-month storm, a design storm of such intensity that it is expected to occur or to be exceeded once every three months. If overflows cannot be eliminated, relocated, or otherwise sufficiently mitigated, the receiving water may be assigned a "partial-use" subcategory to denote occasional short-term impairment of use (Commonwealth of Massachusetts, 1990a:n.p.; Zingarelli and Karp, 1990:5).

Analysis

State Policies

The policy approaches taken by state government in Rhode Island and Massachusetts with regard to the CSO problem are dissimilar, though both are sanctioned by the EPA. In Rhode Island, there is a specific technology-based requirement for abatement: effective primary treatment for storm events up to the one-year, six-hour design storm. In Massachusetts, the standard is maintenance of use categories in affected waterbodies, for events up to the three-month design storm. Massachusetts has no technology-based requirement *per se.*

Both CSO policies are very new, and to date there have not been any abatement projects constructed since their implementation that test either one. The EPA has left it up to the individual states to establish their own policies and procedures for maintaining water quality standards, and no major inequities have yet been reported due to the difference in approaches. However, it is possible that the fundamental difference in policies (*e.g.*, the different design storms) will result in fundamentally different abatement projects and water quality benefits in Rhode Island and Massachusetts. It is also quite possible that

the different policies eventually will cause problems in shared waters such as Mount Hope Bay. For example, planned abatement facilities for Fall River, which will be designed under Massachusetts' CSO policy, could be insufficient to meet Rhode Island's goals for its portion of Mount Hope Bay (Zingarelli and Karp, 1990:14).

Rhode Island's CSO policy allows a CSO authority to petition the RIDEM for relief from the requirement of effective primary treatment should "significant beneficial water quality improvements" be demonstrated using a cost-benefit analysis from incorporating a lesser level of treatment. No provisions are included in the policy, however, outlining the specific actions that the authority must undertake to petition for relief.

Abatement Strategies

There are three basic types of structural abatement measures. The first is separation of combined sewer flows into independent sanitary and storm flows, followed by full (usually secondary) treatment of sanitary flows. The second is storage of overflows in detention systems at centralized locations or at individual overflow points, and subsequent discharge to WWTFs when treatment capacity is available. The third is treatment of the overflows, also at either centralized or localized sites, by such measures as screening and sedimentation, coagulation-flocculation, or swirl concentration-vortex separation, plus disinfection (typically chlorination or chlorination/ dechlorination) (Zingarelli and Karp, 1990:10-11).

Non-structural measures, or "best management practices" (BMPs), may also be used, either as stand-alone strategies or in conjunction with structural measures to reduce the scale of structural improvements. Some basic BMPs are street sweeping, controlling erosion at construction sites, eliminating infiltration and inflow, flushing sewers to remove trapped solids, and increasing network storage (Zingarelli and Karp, 1990:10-11).

Progress on the Local Level

Local authorities in the Narragansett Bay watershed have completed several CSO abatement projects:

- The City of Worcester constructed a CSO facility that stores, screens, and (in summer months only) disinfects discharges, with engineered capabilities up to the five-year storm. The facility officially went on line on December 8, 1990, the effective date of its NPDES permit.

- Newport completed its CSO treatment and disinfection facility on Washington Street in March 1991, and renovated and modified a microstrainer facility on Wellington Street that had experienced operational problems.

- After implementing the first phase of its local abatement plan, Fall River is reported as having virtually eliminated illegal dry-weather discharges to the Quequechan River from the city's CSOs.

- The Narragansett Bay Commission (NBC) has constructed several improvements to its system to provide in-line storage and divert combined sewage flows to the Field's Point WWTF (Zingarelli and Karp, 1990:12).

Several more projects have been proposed and tentatively scheduled for completion within the next ten years:

- Fall River's storage and treatment follow-up is expected to be completed by the year 2000, at a cost of $122.4 million (Maguire Group, 1990).

- The NBC will conduct a program of repairs and renovations, storage and treatment facilities, and sewer separation, for its Field's

Point service area. The total cost is estimated at almost $200 million (Narragansett Bay Commission, 1991).

- The Blackstone Valley District Commission (BVDC) on behalf of the cities of Pawtucket and Central Falls began a CSO abatement study for the Blackstone and Seekonk Rivers in November 1990. The study, being completed by the NBC as a result of its merger with BVDC, has issued a draft report recommending CSO abatement facilities estimated to cost approximately $117 million (Beta Engineering and CH2M Hill, 1992).

Recommended Policies and Actions and *Estimated Cost of Implementation* are presented in the following pages.

RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: COMBINED SEWER OVERFLOWS

CODE	POLICY	AGENCIES	STATUS
I.	CSO Abatement Policies		
I.A.	The EPA should carefully review and monitor the implementation of state CSO policies to ensure that states are consistently and equitably moving toward compliance with water quality standards.	EPA	[See EPA. Region I "Preliminary Agreement," Section 715-05-06.]
I.A.1.	The EPA should review relevant federal and state CSO policies every three years, concurrent with the review of state water quality standards, with subsequent review as needed, to ensure that the policies, as applied, are adequate to ensure compliance with state water quality standards. The Narragansett Bay Project should convene a forum of representatives from the EPA, State of Rhode Island, and Commonwealth of Massachusetts to develop a written statement of agreement on the goals, interpretation, and implementation of these policies.	EPA, NBP, RIDEM, MADEP	
I.A.2.	Efforts should be taken to reconcile the water quality classifications of interstate waters, such as Mount Hope Bay and the Blackstone River.	EPA, RIDEM, MADEP	[See RIDEM "Preliminary Agreement," Section 715-05-06; 04-03-01 Areas of Special Concern: Mount Hope Bay; and 04-03-02 Blackstone River.]
I.A.3.	The EPA and the states should ensure that receiving water monitoring is conducted within a defined area of all CSO discharge zones, in order to assess the ultimate success of CSO abatement projects in achieving water quality standards.	EPA, RIDEM, MADEP	[See EPA Region I "Preliminary Agreement," Section 715-05-06.]

✓ - High Priority Action

RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: COMBINED SEWER OVERFLOWS

CODE	POLICY	AGENCIES	STATUS
I.A.4.	The EPA should carefully review NPDES/RIPDES permits issued to CSO dischargers, to ensure that: a. The permits are in compliance with all applicable CSO policies (federal, regional, and state). b. The permits are sufficiently stringent to attain designated uses of receiving waters. c. Appropriate state or local authorities monitor receiving waters to evaluate the success of CSO abatement in meeting water quality standards. Permits that affect interstate waters should be reviewed by both states to ensure consistency with water quality standards in both states. d. Particular attention should be paid to the water quality impacts of the Narragansett Bay Commission (NBC) Bucklin Point North Diversion Structure. EPA and RIDEM should review the NBC CSO abatement study to ensure that the projects recommended are consistent with the state CSO policy and, based on the data in that study, make CSO abatement at the North Diversion Structure a high priority (see Recommendation III.A.). An effluent (Recommendation I.E.) and receiving water quality (Recommendation I.A.3.) monitoring program should be established to determine if the level of CSO abatement provided by the project is sufficient to meet water quality standards. EPA, RIDEM, and NBC should subsequently review the results of the monitoring program to determine whether greater than primary treatment should be required for all flows from the North Diversion Structure to achieve the State's goals for CSO abatement.	EPA, RIDEM, NBC	See Recomm. I.A.3., I.E., III.A. EPA currently issues or reviews all NPDES and RIPDES permits issued to CSO dischargers.
I.B.	The RIDEM CSO policy should be revised, as quickly as possible, to incorporate a stronger water quality-based approach, in addition to the current technology-based approach, to CSO abatement, noting that: 1. Revisions to the RIDEM CSO policy should not be interpreted to delay CSO abatement projects undertaken by publicly owned wastewater treatment facilities (WWTFs) under current policy [See Recommendation I.C.]. 2. Water quality-based permits are predicated on water quality-based criteria that may now vary in neighboring states with shared waterbodies.	RIDEM	[See RIDEM "Preliminary Agreement," Section 715-05-06.]
I.C.	CSO abatement plans developed before the approval of revised state CSO policies should be subject to all requirements of those policies. Those WWTFs currently implementing CSO abatement plans based on current policies in "good faith" should continue to implement those plans.	EPA, RIDEM, MADEP, CSO authorities	[See EPA Region I "Preliminary Agreement," Section 715-05-06.]

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RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: COMBINED SEWER OVERFLOWS

CODE	POLICY	AGENCIES	STATUS
I.D.	A documented waiver process, open to public review, should be established for requesting a waiver from the RIDEM's technology-based CSO requirement of effective primary treatment for storms up to the one-year, six-hour design storm, noting that the specific requirements for a waiver can only be determined on a case-by-case basis.	RIDEM	
I.E.	A program of CSO discharge monitoring should be established, through NPDES/RIPDES discharge permits, that includes monitoring of selected outfalls. The respective states should cooperate with the implementing authority in developing the program. 1. A calibrated and verified model (*e.g.*, SWMM) of the combined sewer system in a given community should be utilized to determine the storm characteristics that would be likely to result in CSO discharge. Forecasted and observed weather data would be used to determine when such storms are likely to occur or are occurring. a. The above model would be used to identify "critical" CSO outfalls. b. The "critical" outfalls would be monitored for three to five storms of variable intensity per year to test the predictions of the model and performance of the CSO or CSO abatement facility. 2. A system would be established to monitor, on a rotating basis, "non-critical" outfalls. 3. Routine monitoring of all outfalls would be conducted to ensure the elimination of dry-weather discharges (which are illegal). 4. The results of this monitoring would be used to recalibrate the model, if necessary.	EPA, RIDEM, MADEP	[See EPA Region I and RIDEM "Preliminary Agreements," Section 715-05-06.]
I.F.	Authorities responsible for CSOs should be required to maximize CSO discharge flows under their jurisdiction to WWTFs, so as to take maximum advantage of the primary and secondary treatment capacity of the WWTF.	CSO authorities	

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RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: COMBINED SEWER OVERFLOWS

CODE	POLICY	AGENCIES	STATUS
I.G.	WWTFs should make maximum possible use of existing primary and secondary treatment capacity available for treatment of CSO flows. CSO flows, once brought into a WWTF for treatment, should be subject to requirements of the Clean Water Act (CWA). 1. In cases where secondary treatment capacity is limited, however, consideration should be made to allow flexibility in implementing CWA secondary treatment requirements for the combined flow, in order to allow for maximum use of existing capacity without harming the integrity of the WWTF structure or treatment processes. 2. Secondary capacity of WWTFs should not be increased exclusively for the purpose of treating all wet weather flows at the WWTF.	WWTFs	
II.	CSO Abatement Technologies		
II.A.	Proposed CSO abatement measures should be evaluated based on their ability to achieve the goal of meeting water quality standards and preserving and restoring historic uses, in addition to their compliance with existing state and federal requirements. Secondary benefits of alternative measures, such as providing the greatest possible treatment of the stormwater portion of combined flows, should also be considered.	EPA, RIDEM, MADEP, CSO authorities	
II.B.	The need for disinfection of CSO flows should be evaluated based upon the expected ability to meet the desired goal of preserving and restoring historic uses such as shellfish harvesting balanced against potential treatment or chlorine toxicity problems.	EPA, RIDEM, MADEP, CSO authorities	See 04-02-04 Resource Protection: Public Health

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RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: COMBINED SEWER OVERFLOWS

CODE	POLICY	AGENCIES	STATUS
III.	Financing and Implementation		
III.A. ✓	**The State of Rhode Island and Commonwealth of Massachusetts should develop statewide priority rankings to help determine how state funds should be spent on CSO abatement projects.** **1. The Rhode Island prioritization schedule should be jointly prepared by NBP and RIDEM staff.** **2. Massachusetts should develop a prioritization schedule which recognizes the importance of and places a high priority on CSO abatement measures for the portion of the Commonwealth within the Narragansett Bay watershed (*i.e.*, Fall River).** **3. These rankings should be used in conjunction with internal priorities established by individual communities and WWTFs.** **4. The rankings are not to prevent any currently planned and funded projects from proceeding.** **5. Factors to be considered in developing the prioritization schedule include pre- and post-abatement values of:** **a. Volume of CSO discharge.** **b. Pollutant loading of CSO discharge.** **c. Water quality impacts of CSO discharge, including probable impacts on existing and desired uses of receiving waters.** **d. Frequency of CSO discharge.** **e. Readiness to proceed with CSO abatement.** **f. Cost of and benefits from CSO abatement.**	**RIDEM, Narragansett Bay Planning Section, NBC, MADEP**	**CSO abatement is required under federal and state laws regulations, and/or policies. [See RIDEM "Preliminary Agreement," Section 715-05-06 re: development of a priority ranking system.]**
III.B.	All sources of funding should be considered for the financing of CSO abatement projects, including reauthorization of the Clean Water Act, federal and state grants, the State Revolving Fund, and local sources.	EPA, State of R.I., Comm. of Mass., municipalities	

✓ - **High Priority Action**

RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: COMBINED SEWER OVERFLOWS

CODE	POLICY	AGENCIES	STATUS
IV.	Sewer Connection Issues		
IV.A.	Sewer authorities with combined sewers should implement a policy that: 1. Allows "no net increase" of stormwater flows to combined sewers as a result of new construction. Potential stormwater increases should be mitigated by on-site measures (*e.g.*, detention basins). 2. Requires new sanitary connections to tie in to separate sanitary sewers whenever technically and economically feasible. 3. Encourages cross-jurisdictional sanitary connections to separate sanitary sewers whenever feasible and necessary to avoid connection to combined sewers. 4. Requires a two-for-one reduction in infiltration/inflow (I/I) for any new sanitary connections to the system. An I/I analysis should be performed prior to requiring the reductions to determine if I/I is a significant contributor to influent flows. The sewer authority would have the responsibility for ensuring the reduction, and the option of whether to pass the responsibility on to the developer. 5. A moratorium on new sanitary connections to combined sewers should <u>not</u> be considered, since such a policy would tend to direct development away from areas having existing infrastructure to areas requiring the construction of new infrastructure.	R.I. and Mass. sewer authorities	
IV.B.	Storm drains that discharge sanitary waste due to illegal connections, effectively operating as combined sewers, should <u>not</u> be regulated in the same manner as CSOs. Sanitary connections to storm drains are illegal and must be eliminated.	EPA, RIDEM, MADEP, municipalities	

✓ - **High Priority Action**

Estimated Cost of Implementation—
Source Control: Combined Sewer Overflows

Table 715-04(4) summarizes the estimated costs associated with implementing the recommendations in this chapter. Element I (Abatement Policies) contains recommendations that require agencies to review CSO policies, coordinate activities, and to monitor the implementation of such policies. The cost of monitoring CSO discharges is included under Long-Term Monitoring (05-02-04) and Source Reduction: Toxics (04-01-01). The substantial costs associated with large-scale CSO abatement projects are reflected in Element III (Finance and Implementation). The majority of these capital costs (approximately 73 percent) are for NBC projects; the remainder go toward CSO abatement projects planned for WWTFs in the Cities of Taunton and Fall River, Massachusetts. Element IV (Sewer Connection) displays the oversight costs that NBC will encounter in implementing policies regarding new connections to combined sewers. This section also recommends that municipalities eliminate illegal sanitary connections to stormdrain systems; this activity has potential for significant costs, however, these cannot be estimated due to the varying type, size, and location of these systems in the many Bay watershed municipalities.

CSO abatement costs will extend beyond the five-year planning period (post-1997 capital cost of $92.8 million) as will the repayment of bonds issued for CSO abatement purposes. NBC will have additional staffing needs over the project life to perform planning and oversight. There will also be minor coordination and review costs for RIDEM and MADEP.

For further details regarding the *CCMP* cost estimation process and funding strategies, refer to the *Narragansett Bay CCMP Cost Estimation and Funding Report* (Apogee Research Inc./NBP, 1992).

Table 715-04(4)

ESTIMATED COST OF IMPLEMENTATION
SOURCE CONTROL: COMBINED SEWER OVERFLOWS

COST ESTIMATES BY ELEMENT

	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
I-Abatement Policies	12,500	0	0	0	22,500	0	5,000	0	10,000	0	50,000	0
II-Abatement Technologies	5,000	0	0	0	0	0	0	0	0	0	5,000	0
III-Finance and Implement	35,000	15,090,000	10,000	19,672,000	10,000	103,481,000	10,000	116,462,000	10,000	86,222,250	75,000	340,927,250
IV-Sewer Connection Issues	50,000	0	50,000	0	50,000	0	50,000	0	50,000	0	250,000	0
TOTALS	102,500	15,090,000	60,000	19,672,000	82,500	103,481,000	65,000	116,462,000	70,000	86,222,250	380,000	340,927,250
TOTAL BY YEAR		15,192,500		19,732,000		103,563,500		116,527,000		86,292,250		341,307,250

COST ESTIMATES BY AGENCY

	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
RIDEM	22,500	0	5,000	0	22,500	0	10,000	0	15,000	0	75,000	0
MADEP	15,000	0	5,000	0	10,000	0	5,000	0	5,000	0	40,000	0
NBC	55,000	13,104,000	50,000	17,686,000	50,000	70,313,000	50,000	83,294,000	50,000	63,753,250	255,000	248,150,250
Fall River WWTF	5,000	1,956,000	0	1,956,000	0	31,835,000	0	31,835,000	0	21,135,000	5,000	88,717,000
Taunton WWTF	5,000	30,000	0	30,000	0	1,333,000	0	1,333,000	0	1,334,000	5,000	4,060,000
Municipalities*	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	102,500	15,090,000	60,000	19,672,000	82,500	103,481,000	65,000	116,462,000	70,000	86,222,250	380,000	340,927,250
TOTAL BY YEAR		15,192,500		19,732,000		103,563,500		116,527,000		86,292,250		341,307,250

* Ultimate implementation costs will vary for each municipality depending on its particular environmental and institutional conditions. In addition, the estimated municipal implementation costs do not include ultimate program and capital costs that may result from completion of underlying planning activities, or costs that are expected to be completely recoverable from user fees.

04-01-05 Source Control: On-Site Sewage Disposal Systems

Objective for Management of On-Site Sewage Disposal Systems

The State of Rhode Island, the Commonwealth of Massachusetts, and their municipal governments should undertake initiatives to mitigate and prevent contamination of Narragansett Bay and tributary waters from on-site sewage disposal system wastes in order to minimize public health risks, environmental degradation and impairment of water quality-dependent uses.

Introduction

On-site sewage disposal systems, or OSDS, are an important source of surface and groundwater contamination in the Narragansett Bay basin. Septic systems that are located in poorly drained soils, or which are poorly designed, constructed, or maintained can fail because the assimilative or "treatment" capacity of the soil is exceeded (Zingarelli and Karp, 1991:16; RIDOA, 1987). Similarly, OSDSs fail to provide effective treatment where the cumulative density of development causes hydraulic overload of OSDS leach fields, and where property owners have constructed (illegal) sub-surface drains from the leach field. However, properly designed and completely functional septic systems can also represent a source of viruses, nutrients, and toxic chemicals to receiving waters (Karp *et al.*, 1990:32-34 ; Penniman *et al.* 1991b:33-39; Zingarelli and Karp, 1991:16).

Statement of the Problem

Thirty-seven percent of Rhode Islanders depend upon OSDSs for treatment of domestic, household wastes, and 12 of Rhode Island's 39 cities and towns are completely unsewered, as are several communities in the Massachusetts portion of the Narragansett Bay watershed (RIDOA, 1989a). In addition, over 70 percent of the Narragansett Bay coastline is unsewered and served by OSDSs (Roman, 1990; Karp *et al.*, 1990:32). The potential for contamination of the Bay from OSDS runoff and leachate is exacerbated by increasing residential and commercial development in unsewered suburban and rural areas of the basin, and the conversion of seasonal homes with OSDSs—many installed prior to modern regulations—to year-round residences (Karp *et al.*, 1990:32-33). Closures of shellfish harvesting grounds in several Narragansett Bay embayments have been at least partially attributed to septic system failures (USDA SCS, 1990:9; RIDEM, 1990a; Karp *et al.*, 1990:33; Zingarelli and Karp, 1991:17).

Septic system location, design, age, maintenance, and use are critical considerations for individual septic systems. In general, OSDSs installed prior to Rhode Island's adoption of septic system regulations in 1969 tend to be the systems that fail. Routine maintenance such as pumping out the septic tank, checking the integrity of the tank and the leach field, conserving water, and avoiding disposal of household and commercial toxic and hazardous wastes would help to improve septic system performance, and extend the life of the leach field. However, individual property owners are often unaware of the need for routine maintenance until the system fails (USDA SCS, 1990).

The OSDS issue is further complicated by problems that stem from properly functioning septic systems. Depending upon soil type, water saturation, and other factors, viruses and dissolved chemical pollutants can migrate long distances down-gradient from properly functioning OSDSs and ultimately leach into surface or groundwaters (Karp *et al.*, 1990:33; Penniman *et al.*, 1991b:38). Therefore, residential and commercial OSDSs sited in aquifer recharge areas represent a potential threat to drinking water supplies, as well as to other surface and groundwater supplies. In addition, the cumulative environmental impact associated with the density of residential and commercial septic systems is not usually considered when new septic systems are approved. As a result, the current regulatory system, which focuses on failed septic systems, only addresses part of the problem.

Existing Policies

In Rhode Island, state agencies oversee the siting, design, construction, and regulation of OSDSs, although local governments have the authority to manage OSDS density and maintenance in their communities. Municipal boards of health exercise these responsibilities in Massachusetts. The federal government does not exercise regulatory jurisdiction over any aspect of OSDS design, siting or density. However, the U.S. Environmental Protection Agency (EPA) has issued draft technical guidance regarding OSDS design and performance standards, and siting criteria in support of the Clean Water Act Section 319 Nonpoint Source Pollution Control Program, and the Section 6217 Coastal Nonpoint Management Program (EPA, 1987a; EPA, 1991a; EPA-NOAA, 1991).

The Rhode Island Department of Environmental Management's (RIDEM) OSDS regulations require new and replaced OSDSs to be installed at least three feet above the seasonal high water table, or five feet above impervious formations, and require a minimum setback of 50 feet from surface waters. However, RIDEM requires a 150-foot setback and a four-foot separation distance from groundwater in the Salt Pond region, and a 200-foot setback in the Scituate Reservoir watershed in order to protect these identified critical areas (RIDEM, 1989b). The Rhode Island Coastal Resources Management Council (CRMC) can require up to 180-foot setbacks between septic systems and surface waters in erosion-prone areas (Karp *et al.*, 1990:33).

Rhode Island has also recognized that existing OSDSs need to be managed to assure proper treatment and disposal of septic system wastes. Pursuant to legislation passed in 1987, Rhode Island cities and towns have broad authority to establish "wastewater management districts" (WWMD) to assure that residential and commercial septic systems are routinely inspected and properly maintained. In addition, RIDEM presently requires publicly-owned wastewater treatment facilities (WWTF) to accept septage generated within their service areas for treatment (Zingarelli and Karp, 1991:18).

Two financial assistance programs have been available in Rhode Island to help property owners repair or replace failed septic systems: the $5-million Sewer and Water Supply Failure Fund and the Rhode Island Aqua Fund. However, the Sewer and Water Supply Failure funds were completely expended in 1990, and Aqua Fund bond funds are not available to assist individual property owners.

In summary, state agencies oversee the siting, design, construction, and regulation of septic systems in Rhode Island, although local governments have the authority to manage septic system density and septage disposal issues in their communities. Municipal boards of health exercise these responsibilities in Massachusetts.

Analysis

As of 1991, over 1,200 acres of Rhode Island's salt ponds, tidal rivers and coastal embayments were permanently or seasonally closed to shellfish harvesting due, in part, to runoff and leachate from septic systems, illegal sewer connections to storm drains, and illegal boater discharges (RIDEM, 1990a; Zingarelli and Karp, 1991:17). Some of these areas also show signs of nutrient enrichment, including increased frequency of algal blooms and low dissolved oxygen concentrations. In addition, shoreline surveys of coastal embayments indicate that some property owners have installed (illegal) subsurface drains in the OSDS leach fields resulting in the direct discharge of septic wastes to receiving waters (Zingarelli and Karp, 1991:17).

An OSDS Task Force convened by RIDEM in 1985 recommended increasing the minimum separation distance from the bottom of the OSDS to the seasonal high water table to four feet, at least in critical resource areas and areas with excessively permeable soils. The Task Force also suggested greater horizontal buffer distances between septic systems and critical surface water and groundwater resources to allow for some additional

incidental treatment in the event of a septic system failure.

However, the recommendations of the Task Force were not completely adopted by the RIDEM and may not be sufficient in any case to protect the public from exposure to bacterial or viral pathogens, or to protect living marine resources from other dissolved pollutants in domestic waste (Penniman *et al.*, 1991b:22-24). For example, based on an EPA septic system siting model that evaluated pollutant transport (EPA, 1987a), Roman (1990) concluded that even if the groundwater separation distance were increased to ten feet or 30 feet, fecal contamination would still be considered "probable" because of the poorly drained soils typical of Rhode Island's coastal zone.

Violations, Remediation, and Enforcement

The Rhode Island Division of Planning (RIDOP) estimates that the overall septic system failure rate is between three and five percent, based upon the number of violations reported to the Rhode Island Department of Health (RIDOH) that are subsequently acted upon by RIDEM because the property owner failed to correct the problem. The scope of the problem may be substantially underestimated, however, since property owners are likely to have failed or failing systems pumped out for aesthetic and sanitary reasons before state regulators intervene. In addition, the results of a property owner survey in the Town of Narragansett suggested that the septic system failure rate could be as high as ten to 15 percent in some communities (Zingarelli and Karp, 1991:17). [Note: In 1989, for example, RIDEM issued 2,462 Letters of Warning and 103 Notices of Violation, and the Rhode Island Aqua Fund Council received applications for grant funding from seven communities representing over 2,000 households with failed or failing septic systems (Karp *et al.*, 1990:33).]

In Massachusetts, where responsibility for OSDS installation resides with each municipality, the adequacy of inspection and enforcement is reported to be uneven from community to community (USDA SCS, 1990:3). Regulation of existing septic systems is also erratic in Rhode Island where OSDS inspection and enforcement depends entirely on RIDEM's ability to investigate reported septic system failures. Although Rhode Island cities and towns have had broad authority to establish WWMDs to manage septic systems since 1987, no districts have been established as of 1992. Reasons cited by municipal officials include lack of guaranteed septage disposal options, lack of start-up capital, and political unwillingness to assess user fees to support the districts (Zingarelli and Karp, 1991:19). Efforts to establish a WWMD in the Town of Narragansett in 1991 were tabled because of public opposition to user fees and concerns about granting access to septic system inspectors.

Sewering Unsewered Areas

Sewering represents a necessary solution in some densely developed areas where chronically failing OSDS contribute to surface or groundwater contamination, or limitations on water quality-dependent uses. However, sewering, without appropriate land use controls, can result in more intensive development, increase impervious surfaces (roads, driveways, roofs, sidewalks, *etc.*,) and compound runoff problems. Many planners and regulators, therefore, view sewering as a last resort, acceptable only in extreme cases where the carrying capacity of the soil has been exceeded due to overdevelopment, and where no reasonable alternative or group of alternatives would work.

Routine OSDS inspection and maintenance, water conservation, replacement of failed and failing septic systems, and the use of denitrifying or other advanced treatment technologies, including artificial wetlands and solar aquatic greenhouses represent some alternatives to sewering. In addition, new technologies are emerging with respect to septage treatment. For example, the Massachusetts Department of Environmental Protection (MADEP) issued regulatory approvals to a solar aquatics-type septage treatment facility in Harwich, MA in 1992. [See 04-01-03 Source Control: Water Management and Wastewater Treatment for a brief description of the experimental solar

aquatics wastewater treatment facility at Narragansett Bay Commission Field's Point in Providence.]

Recommended Policies and Actions and *Estimated Cost of Implementation* are presented in the following pages.

RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: ON-SITE SEWAGE DISPOSAL SYSTEMS

CODE	POLICY	AGENCIES	STATUS
I.	The State of Rhode Island and the Commonwealth of Massachusetts should adopt consistent policies and regulations in the Narragansett Bay watershed to regulate the location, design, construction, and use of on-site sewage disposal systems (OSDS) in order to minimize OSDS-derived pollutant loadings to Narragansett Bay and its tributary waters.		
I.A. ✓	**The Rhode Island Department of Environmental Management (RIDEM), subject to interagency review, shall review the adequacy of existing minimum standards in the *Rules and Regulations Establishing Minimum Standards Relating to Location, Design, Construction, and Maintenance of Individual Sewage Disposal Systems* (1989b) with respect to setbacks from drinking water supplies and identified critical resources, minimum separation distances from groundwater, and OSDS design and performance standards, *and:***	**RIDEM, CRMC, MADEP, MACZM**	**[See RIDEM and CRMC "Preliminary Agreements," Section 715-05-06 re: revision of ISDS regulations.] Mass. expects to release draft Title V regulations for public review in fall 1992.**
I.A.1.	The OSDS setback from identified critical resources, including nutrient-sensitive waterbodies, should be increased to a prescribed minimum distance in order to reduce groundwater transport of OSDS-derived fecal contaminants, dissolved nutrients, and toxic pollutants. [*Note*: Prescriptive OSDS setback distances are recommended as an *interim* measure until criteria and standards for site-specific OSDS density controls are established. See 04-01-02 Source Reduction: Nutrients for a description of approaches used to establish site-specific OSDS density controls; and 04-02-02 Resource Protection: Protection of Critical Areas for discussion of critical resource areas.] In order to implement this recommendation:	RIDEM, MADEP, MACZM	

✓ - High Priority Action

RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: ON-SITE SEWAGE DISPOSAL SYSTEMS

CODE	POLICY	AGENCIES	STATUS
I.A.1.a.	The OSDS setback distance should be increased to at least 200 feet in unplatted areas adjacent to critical resources, including nutrient-sensitive waterbodies, unless evidence of no significant water quality or use impairment from additional OSDS loadings to adjacent surface or groundwaters can be demonstrated. [Note: In establishing a prescriptive minimum setback distance, RIDEM should review the effectiveness of the 150 foot setback and four foot groundwater separation distance in the coastal pond area. RIDEM should also review existing information regarding groundwater transport of *bacteria* (Roman, 1990; Weiskel and Heufelder, 1989; EPA, 1987a); *viruses* (Roman, 1990; Reneau *et al.* 1989; EPA, 1987a); *nitrogen* (Valiella and Costa, 1988; Groffman *et al.*, 1991); and *toxic pollutants* (Groffman *et al.*, 1991) in evaluating the need for more protective OSDS setback requirements.]	RIDEM, MADEP, MACZM	
I.A.1.b.	The OSDS setback distance should be increased to a minimum of seventy-five feet, up to the maximum possible distance, for existing lots of record.	RIDEM, MADEP, MACZM	
I.A.1.c.	Cluster development should be strongly encouraged in order to obtain appropriately protective OSDS setbacks from critical resources. Unit density limits should include the area of the setback to the extent possible.	RIDEM, MADEP, MACZM	
I.A.2.	The OSDS requirements of minimum depths to ground water should consider factors to account for flooding and sea level rise over the life of the septic system on lots located in Flood Hazard Areas. [See 04-02-02 Resource Protection: Protection of Critical Areas for further recommendations concerning planning for sea level rise.]	RIDEM, MADEP, MACZM	
I.A.3.	The OSDS regulations should be revised to ensure that water level verification and percolation tests are performed on a lot-by-lot basis, coincident with the location of the individual septic systems after the lots are delineated.	RIDEM, MADEP, MACZM	

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RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: ON-SITE SEWAGE DISPOSAL SYSTEMS

CODE	POLICY	AGENCIES	STATUS
I.A.4.	The OSDS regulations should be revised to include applicability criteria, design and performance standards, and effluent limits for a range of alternative OSDS technologies that may be allowed for use in areas: a. Where dimensions or characteristics of the site preclude the use of conventional on-site sewage disposal systems. b. Identified as "critical resource protection areas," including drinking water supply watersheds, watersheds of nutrient-sensitive waters, and waters where water quality problems already exist (*e.g.*, bacteriological and nutrient-related problems such as shellfishing restrictions, persistent hypoxia, algal blooms, *etc.*). The OSDS regulations, as revised, should explicitly recognize that some "critical resource protection areas" are undevelopable with presently available technologies, and that sewering may be the appropriate technology of last resort in some completely developed areas with water quality problems and/or limitations on water quality-dependent uses attributable to OSDSs. c. Presently platted or developed in ≤ 1/2 acre lot sizes. d. Zoned for ≤ 1/2 acre lots close to "critical resource protection areas," where site characteristics indicate that water quality, ecological, or use impairments of the "critical resource protection area" could occur. e. Where there is evidence of existing water quality, habitat, or use impairments related to septic systems.	RIDEM, MADEP, MACZM	

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RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: ON-SITE SEWAGE DISPOSAL SYSTEMS

CODE	POLICY	AGENCIES	STATUS
I.A.4.f.	Where characteristics of the site indicate that water quality, ecological, or use impairments of ground or surface waters related to septic system use could occur. [RIDEM should refer to the EPA *Design Manual for Onsite Sewage Disposal Systems* (in prep., 1992); guidance developed for the Coastal Zone Management Section 6217 Coastal Nonpoint Pollution Control Program (CNPCP), including *Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters* (EPA, 1991a) and the Rhode Island Land Management Project's *Management Measures for Onsite Sewage Disposal Systems in Coastal Areas* (draft, Myers, 1991); OSDS regulations from other jurisdictions, including Massachusetts' Title 5 requirements (310 CMR 15), as amended; and recommendations in other chapters of the Narragansett Bay *CCMP* in order to develop specific pollutant loading targets and effluent limits, applicability criteria, and design and performance standards for alternative OSDS technologies.]	RIDEM, MADEP, MACZM	
I.A.5.	The RIDEM and Massachusetts counterparts should consider establishing a special approval for experimental OSDSs in order to encourage the development of more effective OSDS technologies, and develop baseline data on the performance of new technologies. The experimental OSDS permit should be linked to groundwater monitoring requirements, and posting of a performance bond. [In developing the requirements for experimental permits RIDEM and the Massachusetts Department of Environmental Protection (MADEP) should review the Virginia Department of Health's (draft) *Alternative Discharging Sewage Treatment System Regulations for Individual Single Family Dwellings* (1992).]	RIDEM, MADEP, MACZM	
I.A.6.	The OSDS regulations should be revised, as necessary, to identify innovative septage treatment and disposal options such as incineration, "solar aquatics" treatment, composting, and land application, and the revised regulations should be cross-referenced to the RIDEM's *Rules and Regulations Pertaining to the Treatment, Disposal, Utilization and Transportation of Wastewater Treatment Facility Sludge* (1991).	RIDEM, MADEP, MACZM	

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RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: ON-SITE SEWAGE DISPOSAL SYSTEMS

CODE	POLICY	AGENCIES	STATUS
I.B.	The RIDEM and MADEP, in conjunction with the Rhode Island Division of Planning (RIDOP), the Rhode Island Coastal Resources Management Council (CRMC), Massachusetts Coastal Zone Management (MACZM), and local governments (as appropriate), should require minimum two-acre zoning and cluster development in currently unplatted areas adjacent to critical resources, including nutrient-sensitive waters, in order to control OSDS density and reduce OSDS-generated pollutant loads. Alternatively, these agencies should require the use of approved OSDS treatment technology adequate to provide wastewater treatment equivalent to two acre OSDS density, unless evidence of no significant water quality or use impairment from additional OSDS loadings can be demonstrated. [*Note*: The prescriptive OSDS density controls are recommended as an interim measure until criteria and standards for site-specific OSDS density controls are established. See 04-01-02 Source Reduction: Nutrients for a description of approaches used to establish site-specific OSDS density controls.]	RIDEM, RIDOP, CRMC, Mass. counterparts, municipalities	
I.C.	The RIDOP should revise the *Handbook on the Local Comprehensive Plan* (1989b) as necessary, to require revised local comprehensive plans to include: 1. An evaluation of the distribution and performance of OSDSs in the community with respect to existing and projected cumulative impacts on water quality; and 2. Recommendations regarding appropriate land use policies to regulate OSDS densities, sewering, and wastewater treatment facility (WWTF) upgrades to protect surface and groundwater quality.	RIDOP	
I.D.	The State of Rhode Island and the Commonwealth of Massachusetts should require owners of residences and other facilities with OSDSs to keep the following records of system maintenance, to be made available to prospective buyers, realtors, and banks before ownership of the land can be transferred. The required seller disclosure information should include the following information: 1. Installation date and type of OSDS. 2. Certification of OSDS tank structural integrity (visually determined by certified septage pumper/hauler and included as part of pump-out receipt). 3. Frequency of historical pumping, date of most recent pumping, and history of leach field failure.	R.I., Mass.	R.I. Association of Realtors submitted draft legislation in 1992 session requiring use of "seller disclosure" statement, including status of septic systems.

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RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: ON-SITE SEWAGE DISPOSAL SYSTEMS

CODE	POLICY	AGENCIES	STATUS
I.E.	The State of Rhode Island should ban the retail sale and advertisement of acid and organic chemical solvents for use in septic systems. The Commonwealth of Massachusetts should ban the use, sale, and advertisement of such chemicals. The State and Commonwealth should also initiate informational campaigns to inform the public of the risk of environmental damage from these products.	R.I., Mass.	
I.F.	The State of Rhode Island and Commonwealth of Massachusetts should prohibit the installation of garbage disposal systems in residences and businesses served by OSDSs in order to reduce nutrient loadings to the septic system. In addition, the State and the Commonwealth should consider requiring the use of grease traps on commercial and residential properties served by OSDSs in order to improve OSDS performance, and increase the lifetime of the leach field.	R.I., Mass., Building Code Commissions	
I.G.	The RIDEM and the Rhode Island Department of Health (RIDOH) should negotiate an interagency Memorandum of Agreement transferring responsibility for OSDS inspections to RIDEM.	RIDEM, RIDOH	Completed September 1990. RIDOH retains jurisdiction to inspect food establishments.
I.H. ✓	**The State of Rhode Island and the Commonwealth of Massachusetts should develop educational programs for municipal officials and the general public that describe the environmental and financial risks of failing to address OSDS density and maintenance.**	**RIDEM, RIDOP, CRMC, Mass. counterparts**	

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RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: ON-SITE SEWAGE DISPOSAL SYSTEMS

CODE	POLICY	AGENCIES	STATUS
II.	By 1995, all properties served by OSDSs in unsewered areas of Rhode Island and the Narragansett Bay basin should be included within a wastewater management district (WWMD) that provides for routine inspection and maintenance of septic systems and adequate treatment and disposal of septic system wastes.		
II.A.✓	**In order to assure that all properties in the Narragansett Bay basin served by OSDSs are routinely inspected and maintained, the RIDEM and RIDOP should prepare draft legislation for submittal in 1993 that amends R.I.G.L. 45-24.5-1 *et seq.* to require each Rhode Island municipality to establish, or to associate with, an established WWMD by no later than January 1995.** **1. WWMDs established pursuant to Chapter 24.5, as amended, should be administered by regional and municipal WWTFs, other utilities, or municipal governments.** **2. Each WWMD should provide for routine inspection and maintenance of all OSDSs within the WWMD, and adequate treatment of all septic system waste generated within the WWMD.** **3. Comparable legislation should be adopted by the Commonwealth of Massachusetts for application, at least, in the Massachusetts portion of the Narragansett Bay basin.**	**RIDEM, RIDOP, CRMC, WWMDs, Mass. counterparts, municipalities**	**No WWMDs have been established in R.I. as of June 1992. Legislation drafted by NBP in 1991 was not submitted. [See RIDEM "Preliminary Agreement," Section 715-05-06 re: agreement to actively promote establishment of WWMDs.**
II.B.	In order to assure that WWMDs effectively and consistently carry out the responsibilities of the District with respect to septage management, the State of Rhode Island and Commonwealth of Massachusetts should establish appropriate enabling authority and administrative and regulatory controls. To implement this recommendation:		

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RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: ON-SITE SEWAGE DISPOSAL SYSTEMS

CODE	POLICY	AGENCIES	STATUS
II.B.1.	The WWMDs established pursuant to Chapter 24.5, as amended, should be empowered to exercise the following additional "powers and duties" pursuant to Section 4 of R.I.G.L. 45-24.5 [Subsections (a) through (j) of R.I.G.L. 45-24.5-4 as presently written, should continue to be exercised by WWMDs administered by local governments, WWTFs or other utilities.]: a. Require more effective wastewater treatment using septic system technologies approved in RIDEM's *Rules and Regulations Establishing Minimum Standards Relating to Location, Design, Construction, and Maintenance of Individual Sewage Disposal Systems* (1989b), as amended, in areas delineated by the municipality as "critical resource protection areas." b. Establish mandatory water conservation requirements for all property owners served by on-site septic systems within the WWMD. c. Establish and enforce prohibitions on the discharge of regulated toxic chemicals to septic systems covered by the WWMD. d. Establish and enforce standards governing the quality of septage eligible for treatment and disposal at the WWTF. e. Establish and enforce mandatory disclosure and reporting requirements regarding septic system maintenance and performance for all property owners served by the WWMD. f. Certify to RIDEM that WWTF treatment and disposal capacity exists to handle septic system wastes generated by any new or expanded septic system approved by RIDEM within the WWMD's service area. g. Advise RIDEM and appropriate municipal officials whether remedial or enforcement action is necessary based on documented septic system failure, the presence of illegal subsurface drains, or evidence of surface or groundwater contamination related to direct or indirect discharges from septic systems within the WWMD. h. Evaluate the cumulative public health and environmental impacts associated with existing and proposed septic systems within the WWMD's service area. i. Assure that property owners perform required repair or replacement of failed or failing OSDSs by enforcement of a lien on the property in question. j. Establish user fees adequate to assure complete cost recovery for all expenses related to operation of the WWMD, including administration of the WWMD, inspection and maintenance of OSDSs, septage treatment and disposal, compliance and environmental monitoring related to OSDS performance, enforcement, and maintenance of a revolving loan fund for repair/replacement of failed septic systems.	RIDEM, RIDOP, Mass. counter-parts	

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RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: ON-SITE SEWAGE DISPOSAL SYSTEMS

CODE	POLICY	AGENCIES	STATUS
II.B.2.	The WWMDs established pursuant to Chapter 24.5, as amended, should be required to exercise the following additional "duties" pursuant to a new section of R.I.G.L. 45-24.5 that explicitly requires all WWMDs to: a. Maintain records of septic system inspection, maintenance, pumping frequency, installation, repair, and replacement in a standardized format that is available for periodic review by RIDEM. b. Notify RIDEM regarding the location of failed or failing on-site sewage disposal system(s) within the WWMD's jurisdiction. c. Notify RIDEM regarding the location of ground or surface waters contaminated directly or indirectly by on-site septage disposal systems within the WWMD. d. Notify RIDEM regarding "critical resource protection areas" delineated by the municipality within the WWMD's jurisdiction that require more effective wastewater treatment, using septic system technologies approved in RIDEM's *Rules and Regulations Establishing Minimum Standards Relating to Location, Design, Construction, and Maintenance of Individual Sewage Disposal Systems* (1989b), as amended.	RIDEM, RIDOP, WWMDs, Mass. counterparts, municipalities	
II.B.3.	The RIDOP shall: a. Review and approve all WWMD ordinances and plans developed pursuant to R.I.G.L. 45-24.5-1 *et seq.* based upon technical guidance developed by RIDOP, RIDEM, and CRMC. [The model ordinance developed by the RIDOP ("*Scituate Reservoir Management Plan: Waste Water Management Districts...A Starting Point*". Report #62, 1987) should be referenced in Section 4 of R.I.G.L. 45-24.5, as amended.] b. Recommend the creation of regional WWMDs using the boundaries proposed in Rhode Island's '208' Areawide Water Quality Plan if the RIDEM determines that completely unsewered municipalities in Rhode Island have not been included within a WWMD by 1995.	RIDOP	

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RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: ON-SITE SEWAGE DISPOSAL SYSTEMS

CODE	POLICY	AGENCIES	STATUS
II.C.	In order to provide for adequate treatment and disposal of all septic system wastes generated within the Narragansett Bay basin, the following measures should be taken:		
II.C.1.	A new section should be added to R.I.G.L. 45-24.5 that explicitly requires every municipal WWTF in the State of Rhode Island to provide for adequate treatment and disposal of all septic system wastes generated within the municipality by January 1995. [This recommendation should apply to every WWTF in the State of Rhode Island that is subject to Rhode Island Discharge Elimination System (RIPDES) permitting requirements and eligible to receive federal or state funds.]	RIDEM, RIDOP, Mass counterparts	RIDEM currently requires WWTFs to accept septage generated within their service areas.
II.C.2.	A new section should be added to R.I.G.L. 45-24.5 that explicitly requires regional WWTFs such as the Narragansett Bay Commission (NBC) and the Port Authority facility at Quonset Point to reserve septage treatment and disposal capacity after 1995 for municipalities within the regional WWTF's existing service area; completely unsewered municipalities that are not served by a regional or municipal WWTF; and municipalities that can demonstrate that municipally-generated septage cannot be treated at other WWTFs because of limitations on treatment capacity. a. This requirement shall not be interpreted to relieve other WWTFs or municipalities from the obligation to establish WWMDs as required under R.I.G.L. 45-24.5, as amended. b. In addition, regional and state-operated WWTFs subject to this section, as amended, shall not be required to modify or waive existing criteria governing the acceptance of septage for treatment and disposal, or the rate structure applied to other users of the WWTF in order to satisfy the requirements of the Section, as amended. [The requirement to reserve septage treatment capacity may be waived by the Director of RIDEM if the Department finds that the reserved capacity is unnecessary.]	RIDEM, RIDOP, WWTFs	Port Authority septage receiving facility (17,000 gpd) should go on line in 1992. NBC Field's Pt. facility stopped accepting septage in 1992 because of odor complaints. NBC plans to design septage receiving facility at Field's Pt. within two years. NBC Bucklin Pt. currently accepts septage generated within its service area.

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RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: ON-SITE SEWAGE DISPOSAL SYSTEMS

CODE	POLICY	AGENCIES	STATUS
II.C.3.	The RIDEM and the MADEP shall determine what daily volume of septage each WWTF can accept for treatment and disposal without violating its National Pollutant Discharge Elimination System (NPDES)/RIPDES effluent limits; and require every WWTF to adopt numerical septage discharge limits governing the acceptance of septage for treatment and disposal. In addition, the U.S. Environmental Protection Agency (EPA), RIDEM, MADEP and local industrial pretreatment programs shall: a. Evaluate all commercial enterprises that generate septage within the Narragansett Bay watershed for inclusion in industrial pretreatment programs by December 1995. [See 04-01-01 Source Reduction: Toxics for further discussion of the proposed expansion of the pretreatment program.] b. Establish enforceable pretreatment standards for toxic metals and organic chemicals in septage and enforce existing state prohibitions on the discharge of non-domestic waste to OSDSs. c. Develop technical guidance to govern the promulgation of standards and, to the maximum extent practicable, ensure that consistent standards regarding septage quality are adopted and enforced statewide. [These agencies should review chemical criteria developed by the NBC to determine whether septage is acceptable for disposal.] d. Cooperate in developing regional septage disposal options.	EPA, RIDEM, WWTFs, Industrial Pretreatment Programs, municipalities, Mass. counterparts	
II.D.	In order to assure that failed on-site sewage disposal systems are repaired or replaced and that WWMDs are established and financially able to effectively carry out the responsibilities of the District with respect to septage management:	EPA, RIDEM, RICWPFA (SRF), R.I. Aqua Fund, WWTFs, Mass. counterparts	
II.D.1.	The State of Rhode Island should re-authorize the "Sewer and Water Supply Failure Fund" as a revolving loan fund to allow continued repair and replacement of failed individual OSDSs. Loans should be conditioned on the existence of local WWMDs.	State of R.I.	

✓ - **High Priority Action**

RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: ON-SITE SEWAGE DISPOSAL SYSTEMS

CODE	POLICY	AGENCIES	STATUS
II.D.2.	The EPA, Rhode Island Clean Water Protection Finance Agency (RICWPFA), Rhode Island Aqua Fund Council and Massachusetts State Revolving Fund Authority (SRF) should provide economic incentives for municipalities to establish WWMDs prior to the 1995 deadline and for municipalities and regional WWTFs to establish regional WWMDs. Such incentives might take the form of reduced interest rates on SRF loans to municipalities or regional WWTFs that: a. have established WWMDs prior to the 1995 deadline; b. have expanded the jurisdiction of the WWMD to include other municipalities; and/or c. are accepting septage from municipalities outside the WWMD.	RIDEM, RICWPFA (SRF), R.I. Aqua Fund, Mass. counterparts	
II.D.3.	Municipal WWMDs should establish user fees sufficient to cover all costs associated with administering and operating the WWMD. a. The municipality may consider establishing an "avoidable surcharge" system whereby a portion of the user fee is waived upon the property owner providing proof of OSDS inspection on an annual basis, and proof that the OSDS has been pumped according to a pre-established schedule. b. The user fee or surcharge should be sufficient to cover the Town's costs in providing substituted inspection and pumping services, encourage voluntary compliance with OSDS maintenance requirements, and all administrative and operating costs of the WWMD.	Municipalities, WWMDs	

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RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: ON-SITE SEWAGE DISPOSAL SYSTEMS

CODE	POLICY	AGENCIES	STATUS
III.	The State of Rhode Island and the Commonwealth of Massachusetts should encourage the use of water conservation and alternative wastewater treatment technologies before extending public sewers in order to avoid increased development in critical or sensitive areas that cannot accommodate additional growth. In order to implement this recommendation, A. The State of Rhode Island and the Commonwealth of Massachusetts should recommend sewering in sensitive areas of the Narragansett Bay watershed *if and only if* the area is "built-out" in terms of pollutant loading or existing zoning, *and* after all reasonable alternatives are explored, including, but not limited to mandatory water conservation and the use of alternative on-site wastewater treatment technologies, such as composting toilets, engineered wetlands or solar aquatic facilities. B. The RIDEM, CRMC, RIDOP, their Massachusetts counterparts, and all local permitting authorities should increase their efforts to educate the public about the need and procedures for maintaining OSDSs. C. The EPA, RIDEM, CRMC, and their Massachusetts counterparts should explore the permitted use of alternative wastewater and septage treatment technologies, such as passive solar aquatic "greenhouses." These agencies should carefully consider whether the proposed alternative technologies have been proven effective and whether the use of these technologies will promote increased development in critical or sensitive areas where the pollutant carrying capacity of the land is exceeded.	EPA, RIDEM, RIDOP, CRMC, Mass. counterparts	[See RIDOP and RIDOH "Preliminary Agreements," Section 715-05-06 re: enforcement of water conservation provisions of R.I.G.L. 46-15.4. MADEP issued regulatory approvals to solar aquatics septage treatment facility in Harwich, Mass. in June 1992.

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Estimated Cost of Implementation—Source Control:On-Site Sewage Disposal Systems

Table 715-04(5) summarizes the estimated costs associated with implementing the recommendations in this chapter. The major cost in Element I (Policies and Regulations) is the recommended evaluation of the effectiveness of existing OSDS density controls based upon nitrogen loading ($127,500). Activities included in this are the development of nutrient and runoff loading models and providing training to state and local officials. The delineation of nutrient-sensitive waters is costed under 04-02-02 Resource Protection: Protection of Critical Areas. There are lesser costs associated with the revision of regulations, interagency coordination, and legislative costs.

Element II (Wastewater Management Districts) contains the largest cost in this table, a $5,000,000 reauthorization of the Rhode Island Sewer and Water Supply Failure Fund. There are also costs pertaining to review of WWMD ordinances, agency guidance, and legislative actions. The major costs associated with Element II are for municipalities to establish WWMDs, although all administrative and operating costs are expected to be recovered from user fees. The establishment of WWMDs would create an additional annual cost for OSDS owners which would be offset by the fact that WWMD fees include the cost of septic system pumping (average pumping cost is $100). An indication of the cost of implementing a WWMD appears in an application to the Rhode Island Aqua Fund by the Town of Narragansett (June 1991). The Town requested funding in the amount of $143,140 for staff costs, public education, mapping and inventory of OSDSs, seed money for a revolving loan fund ($75,000), consultant services, and office supplies and equipment. An additional $14,160 would be derived from a first year user charge of approximately $2.80 per OSDS owner (based on 5,075 systems townwide). Total first year costs are estimated to be $157,300. In the second year, an average annual fee of $50.58 would be initiated and charged to each OSDS owner. The $256,000 derived from this annual charge would fully fund the operation of the WWMD. Also included in this section is a recommendation that the state provide economic incentives to WWTFs to establish WWMDs; the cost of providing these incentives cannot be estimated until specific incentives are selected.

The personnel costs for the recommendations in this chapter are distributed mainly between RIDEM and MADEP, with lesser legislative costs going to the Rhode Island and Massachusetts Legislatures and local governments. For further details regarding the *CCMP* cost estimation process and funding strategies, refer to the *Narragansett Bay CCMP Cost Estimation and Funding Report* (Apogee Research Inc./NBP, 1992).

Table 715-04(5)

ESTIMATED COST OF IMPLEMENTATION
SOURCE CONTROL: ON-SITE SEWAGE DISPOSAL SYSTEMS

COST ESTIMATES BY ELEMENT	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
I-Policies and Regulations	67,500	0	0	0	50,000	0	50,000	0	57,500	0	225,000	0
II-Wastewater Mgt. Districts	66,250	5,000,000	0	0	75,000	0	30,000	0	30,000	0	201,250	5,000,000
III-Alternative Technologies	5,000	0	5,000	0	5,000	0	5,000	0	5,000	0	25,000	0
TOTALS	138,750	5,000,000	5,000	0	130,000	0	85,000	0	92,500	0	451,250	5,000,000
TOTAL BY YEAR		5,138,750		5,000		130,000		85,000		92,500		5,451,250

COST ESTIMATES BY AGENCY	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
RIDEM	66,250	5,000,000	0	0	30,000	0	25,000	0	25,000	0	146,250	5,000,000
RI CRMC	0	0	0	0	30,000	0	25,000	0	25,000	0	80,000	0
RIDOP	1,250	0	0	0	30,000	0	5,000	0	5,000	0	41,250	0
RI Legisature	12,500	0	0	0	12,500	0	0	0	0	0	25,000	0
MADEP	43,750	0	5,000	0	10,000	0	5,000	0	5,000	0	68,750	0
MACZM	0	0	0	0	5,000	0	25,000	0	25,000	0	55,000	0
MA Legislature	15,000	0	0	0	12,500	0	0	0	0	0	27,500	0
Municipalities*	0	0	0	0	0	0	0	0	7,500	0	7,500	0
TOTALS	138,750	5,000,000	5,000	0	130,000	0	85,000	0	92,500	0	451,250	5,000,000
TOTAL BY YEAR		5,138,750		5,000		130,000		85,000		92,500		5,451,250

* Ultimate implementation costs will vary for each municipality depending on its particular environmental and institutional conditions. In addition, the estimated municipal implementation costs do not include ultimate program and capital costs that may result from completion of underlying planning activities, or costs that are expected to be completely recoverable from user fees.

04-01-06 Source Control: Boater Discharges

Objective for the Management of Boater Discharges

The State of Rhode Island and the Commonwealth of Massachusetts should reduce or eliminate the discharge of untreated and partially treated sewage from vessels operating in Narragansett Bay in order to assist in meeting the states' water quality goals, and to restore and protect water quality-dependent uses of the Bay.

Introduction

Boating is a desirable water-dependent use of the Bay for commercial, recreational and economic reasons. However, boaters operating within Narragansett Bay potentially represent a seasonally and locally significant public health risk related to the improper treatment and disposal of boater-generated sewage. The magnitude of the problem is related to the location of boat anchorages with respect to bathing and shellfish harvesting areas, boat density, and the lack of publicly available toilet and pump-out facilities (Karp and Penniman, 1991:1). In addition, it should be noted that boater discharges of floatables (trash, sewage solids), solvents (marine paints, antifreeze, cleaning agents), and petroleum derivatives (gasoline, oil, grease) also contribute to water quality and habitat degradation. Recognizing the importance of boating and related marine activities, the goal of abating boater discharges is to protect public health, prevent water quality and habitat degradation, and restore and protect water quality-dependent uses of the Bay.

Statement of the Problem

There were over 160 private marinas, yacht clubs, boat yards, town docks, and launching ramps operating in Narragansett Bay, including Mount Hope Bay, in summer of 1988 according to *Boating Almanac* estimates. These facilities provided in excess of 15,000 berths, slips, and moorings for recreational and commercial vessels, not including storage on land. The actual level of boating activity in Narragansett Bay is, however, much higher than reported slip capacity. Over 32,500 boats were registered with the Rhode Island Department of Environmental Management (RIDEM) Division of Boating Safety in 1991 compared to 29,900 in 1990; 28,500 in 1989; and 29,000 in 1988. In excess of 28,000 additional boats—including vessels documented by the U.S. Coast Guard (18,000), visitors (6,000), boats registered in Massachusetts and operating in Bay waters (number unknown), and vessels not required to register (4,000)—are also estimated to have used Rhode Island waters in 1988 (Roman, 1990; Karp and Penniman, 1991:i).

Land-based toilet and pump-out facilities for boaters are scarce in Narragansett Bay relative to the current level of boating activity. Based on the U.S. Environmental Protection Agency's (EPA) recommended formula of one pump-out station per 300 boats with marine sanitation devices (MSD) in "transient" harbors, and one pump-out station per 600 boats with MSDs in "parking lot" harbors for the use of both resident and transient boaters, approximately 30 pump-out facilities should be in service in Narragansett Bay based on 1988-1992 boat registration statistics. However, only five marine pump-out facilities were available in Narragansett Bay waters in 1990 and 1991 although eight stations are expected to be in operation in Narragansett Bay by June 1992. In addition, several coastal communities, including Warwick and Cranston, are planning to install municipal pump-out facilities as part of their *Harbor Management Plans*. Furthermore, as of summer, 1988, only 27 percent of the marinas, yacht clubs, and boat launching facilities throughout the Bay were reported to have shoreside toilet facilities. As a result, vessel discharges to the Bay can be inferred from the scarcity of suitable disposal options.

Boater wastes can be a significant public health problem if untreated or partially treated sewage discharges occur in poorly flushed or shallow waters in the vicinity of shellfish harvesting areas and bathing beaches (Karp and Penniman, 1991:3). For example, the RIDEM has closed approximately 115 acres in the coves surrounding Greenwich Bay, in part because of the ob-

served exceedance of fecal coliform concentrations in waters adjacent to marinas (Karp and Penniman, 1991:1). Boater discharges of sanitary wastes, however, represent only one source of fecal contamination to coastal waters. Other sources of contamination in suburban areas of the Bay include runoff and leachate from on-site sewage disposal systems (OSDS), illegal subsurface drains from OSDS leach fields, and illegal sewer connections to stormdrains. In urban areas such as the Providence River basin, vessel discharges are relatively insignificant compared to municipal wastewater treatment facility (WWTF) and combined sewer discharges.

Existing Policies

Section 312 of the federal Clean Water Act governs vessel discharges to all navigable waters of the United States, including Narragansett Bay. Under Section 312, untreated wastes from vessels with installed toilets must either be discharged beyond the three-mile limit or transferred to land for proper treatment and disposal. Direct discharge to state waters is permitted if and only if the waste is properly treated (macerated and disinfected) on-board with a Type 1 or Type 2 MSD. Section 312, as amended in 1987, authorizes the U.S. Coast Guard—and the states to enforce discharge prohibitions with respect to all vessels with installed heads. Both Rhode Island and Massachusetts re-negotiated their existing "statements of understanding" with the U.S. Coast Guard in March 1991 to begin implementing their authority to enforce federal MSD standards for vessels operating in State and Commonwealth waters.

The RIDEM is separately authorized to enforce prohibitions on the unpermitted disposal of pollutants, including untreated or partially treated sewage, to Rhode Island's surface waters (R.I.G.L. 46-12-5). In addition, RIDEM is required to investigate the sanitary quality of shellfishing waters (R.I.G.L. 20-8.1-3), and to determine whether the waters are "polluted" based on direct fecal coliform measurements or "evidence that significant volumes of fresh raw sewage or inadequately purified sewage may reach the area intermittently" (R.I.G.L. 20-8.1-4) (Karp and Penniman, 1991:1). Acting on existing legislative authority and the states' expanded authority to enforce Section 312, the Rhode Island General Assembly enacted R.I.G.L. 46-12-39, "Discharge of Sewage from Boats," in 1991 to enable the RIDEM to enforce federal MSD standards in Rhode Island waters, including Narragansett Bay, and enforce vessel sewage discharge prohibitions in "no-discharge areas" designated by EPA.

Several mechanisms also exist to enable the states to regulate the shore-based operations of marine facilities. The Rhode Island Coastal Resources Management Council (CRMC) encourages coastal communities to include provisions for marina pump-out facilities in their local *Harbor Management Plans*. In addition, the CRMC specifically prohibits the construction or expansion of marinas in Type 1 waters, the construction of new marinas in Type 2 waters, and the placement of new moorings areas in Type 1 waters. The CRMC does allow new mooring areas and expansions of existing mooring areas in Type 2 waters and allows for the continued operation of marinas in Type 2 waters (CRMC, 1983:23-24). Similarly, the RIDEM prohibits expansion of marinas and mooring fields in Class SA waters because these waters are deemed suitable for bathing and contact recreation, shellfish harvesting for direct human consumption, and fish and wildlife habitat (RIDEM/DWR, 1984:10). The Massachusetts Department of Environmental Protection (MADEP) Division of Wetlands and Waterways Regulation can require marine sewage pump-out stations to be installed as a licensing condition at new boating facilities, and at existing facilities that propose to expand by ten or more berths above existing capacity.

The Clean Water Act Section 401 water quality certification process represents another means for state agencies to comment on a marine facility's plans to control boater-generated sewage, as well as runoff and leachate from boatyard, parking, fueling and dredging operations. CRMC, for example, requires applicants to obtain a Section 401 water quality certification from RIDEM as a

prerequisite to licensing new or expanded marine facilities, and permitting dredging operations. Finally, the 1990 amendments to the federal Coastal Zone Management Act (CZMA) require states' coastal management and nonpoint source management programs to prepare Coastal Nonpoint Pollution Control Plans in coordination with existing Clean Water Act nonpoint source programs and policies established under Sections 208, 303, 319 and 320 [See 04-01-07 Source Reduction: Nonpoint Sources for further discussion of Section 6217 Coastal Nonpoint Pollution Control Plans]. The Section 6217 Coastal Nonpoint Pollution Control Plans are expected to provide the states with a powerful regulatory tool for reviewing all aspects of marine facility operations in order to better protect marine receiving waters. The EPA issued draft guidance on management measures to be used under CZMA Section 6217 in May 1991; the states' coastal management and nonpoint source management programs are expected to begin preparing Coastal Nonpoint Pollution Control Plans in 1992.

Analysis

The effectiveness of the initiatives described above may be compromised by existing boat density and use, the limited availability of marina pump-out facilities, and the increasing demand for recreational boating on Narragansett Bay (Karp and Penniman, 1991:3). The rate of compliance with federal MSD requirements for treatment of sanitary waste has been estimated by EPA to be as low as ten percent (Karp and Penniman, 1991:15). However, the federal and state governments' ability to enforce compliance with equipment requirements or prohibitions on boater disposal of untreated sewage is severely limited by the logistics of inspecting individual boats.

The relative significance of boater discharges into the Bay is also difficult to determine, except in coves and embayments where no other anthropogenic sources of fecal contamination exist (*e.g.*, Potters Cove, Prudence Island). In developed harbors and marinas, for example, boaters represent only one of several possible sources of fecal contamination. Other potential sources include runoff and leachate from failed and failing septic systems, illegal subsurface drains from OSDS leach fields, and storm drains conveying human and animal waste. In major urban areas such as the Providence River, WWTFs, and combined sewer overflows (CSO) represent the major source of fecal contaminants.

Boater discharges are not easily quantified because boats are mobile, boat use and occupancy rates are variable, and discharges are likely to be surreptitious and sporadic. However, an indirect estimation procedure comparing inputs of fecal waste from boats to the entire Bay with other sources indicated that boater discharges would be closely comparable to the estimated daily inputs of fecal coliform bacteria from the Blackstone and Taunton Rivers (Karp and Penniman, 1991:3). Furthermore, measured levels of fecal coliforms from the Great Salt Pond on Block Island show summer increases exceeding 200 coliforms/100 ml water during periods when large numbers of boats are present (Committee for the Great Salt Pond, 1992:1). [Note that concentrations exceeding 15 coliforms/100 ml are considered unsafe for shellfishing, and that concentrations exceeding 50 coliforms/100 ml are considered unsafe for swimming.] The present level of boating activity and the scarcity of waste disposal options in Narragansett Bay suggests that boater discharges can be a locally significant source of fecal contaminants and pathogens in poorly flushed or shallow waters, and are of particular concern near shellfishing and swimming areas (Karp and Penniman, 1991:3).

In 1990-1991 two groups of government and trade organization representatives, meeting respectively under the auspices of the Rhode Island Marine Advisory Service's Boat Sewage Management Task Force and the Narragansett Bay Project's (NBP) Boater Waste Round Tables, recommended that sewage pump-out facilities be strategically located around Narragansett Bay to provide recreational and commercial boaters easy access. Factors that have been identified as significant in determining the appropriate ratio of boats per pump-out facility include EPA's recommended formula for determin-

ing pump-out density, the number and length of vessels requiring pump-out services, geographic location of the facility, public notice of pump-out locations, accessibility to boaters, ease of use, and cost per pump-out (Karp and Penniman, 1991:7).

Sanitary wastes collected at marinas still require treatment prior to disposal whether the wastes are handled as septage or discharged directly to a WWTF. Marinas must treat the waste on-site in an OSDS, hold the waste on-site and have it periodically pumped by a septage hauler for transport to a WWTF, or directly tie-in to a nearby WWTF (Karp and Penniman, 1991:10).

On-site treatment of boater waste presents problems related to soil type (permeability), depth to water table, seawater intrusion and exchange, and chemical and physical characteristics of the waste that interfere with microbial decomposition [See 04-01-05, Source Control: On-site Sewage Disposal Systems] . On-site holding tanks in the coastal zone are subject to primary problems associated with corrosion and maintenance, and secondary problems related to ultimate disposal at WWTFs. Historically, municipal wastewater treatment facilities were reluctant to accept boat septage out of concern that the concentration of chemical additives used in boat waste (*e.g.*, formalin, chlorine, and hyperchlorous acid) may be toxic to the biological treatment process, or that metals contained in dyes may increase metals loadings to the plant. Several industrial pretreatment program administrators have noted, however, that the additives commonly used to preserve and deodorize boat wastes are quickly broken down when mixed and diluted with normal sanitary wastestreams, and that "benign" disinfection and deodorizing agents are commercially available (Karp and Penniman, 1991:10). In addition, RIDEM officials indicate that Rhode Island WWTFs are currently accepting boat-generated sewage (J. Migliore, RIDEM, personal communication).

Direct marina tie-ins to local WWTFs would, however, eliminate several of the problems described above since treatment would not occur on-site, and the size of the on-site holding tank could, therefore, be reduced or eliminated. In addition, boater wastes would be continuously discharged to the WWTF at low volumes which would alleviate concerns about possible toxicity associated with chemically-treated boater wastes and septage. WWTF treatment capacity is not an issue since the volume of sanitary waste expected to be generated by boaters per day, according to Rhode Island Division of Planning (RIDOP) estimates, represents less than 0.1 percent of the design capacity of Rhode Island WWTFs (Raytheon, 1978).

In summary, boating represents a desirable water-dependent use of the Bay for commercial, recreational and economic reasons. However, boaters and related shore-based activities also represent a potential seasonal, and locally significant, source of fecal contaminants and other nonpoint source pollutants to the Bay. Most importantly, vessel-related sewage discharges are relatively easy and inexpensive to eliminate if appropriate and convenient disposal options are made available to boaters. Therefore, recognizing the importance of boating and related marine activities to the region, the goal of abating boater discharges is to protect public health, prevent water quality and habitat degradation, and restore and protect water quality-dependent uses of the Bay.

Recommended Policies and Actions and *Estimated Cost of Implementation* are presented in the following pages.

RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: BOATER DISCHARGES

CODE	POLICY	AGENCIES	STATUS
I.	The State of Rhode Island and the Commonwealth of Massachusetts should reduce or eliminate boat sewage discharges in order to assist in meeting the states' water quality goals, and to restore and protect water quality-dependent uses of the Bay.		
I.A.1.	The State of Rhode Island should undertake the following administrative actions to identify areas of Narragansett Bay that should be protected from vessel discharges: The Rhode Island Department of Environmental Management (RIDEM) and Rhode Island Coastal Resources Management Council (CRMC) should continue or resume discussions on reconciling RIDEM water quality classifications, CRMC water use classifications, and state regulations regarding uses of tidal waters.	RIDEM, CRMC	[See RIDEM "Preliminary Agreement," Section 715-05-06.]
I.A.2. ✓	**The RIDEM Divisions of Water Resources, Fish and Wildlife, and Planning and Development (Natural Heritage Program), and the CRMC should prepare and update maps of critical marine resource areas on a biennial basis.** **a. These maps should indicate the location of high quality (Class SA; Type 1, Type 2) waters; critical or significant tidal and subtidal habitats; shellfish harvesting areas that are of significant or outstanding commercial or recreational value; threatened or endangered marine flora and fauna; bathing beaches; marine waters where state water quality criteria are currently exceeded; areas targeted for restoration projects; and areas where restrictions on marine expansion, placement of mooring fields and/or boater discharges should apply.** **b. The maps should be based on existing information, including information compiled by the NBP-funded *Habitat Inventory* (French *et al.*, 1992). The maps should be used with the Coastal Resources Management Plan, Special Area Management (SAM) Plans, local *Harbor Management Plans*, and relevant RIDEM regulations to assess an area's potential to be designated a "special or protected" area or a "no discharge area."**	**RIDEM, CRMC, Mass. counterparts**	**See 715-04-02, Protection of Critical Areas Rec. I.B.**

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CODE	POLICY	AGENCIES	STATUS
I.B.	The State of Rhode Island and the Commonwealth of Massachusetts should undertake the following actions to establish additional marina pump-out facilities around Narragansett Bay:		
I.B.1. ✓	**Develop and implement a Bay-wide pump-out facility plan in order to assure convenient boater access to pump-out facilities.** **a. Consistent with U.S. Environmental Protection Agency (EPA) guidelines for designating "no discharge areas", the RIDEM and CRMC should work toward establishing one pump-out station per 300 boats with marine sanitation devices (MSDs) in "transient" harbors, and one pump-out station per 600 boats with MSDs in "parking lot" harbors for the use of both resident and transient boaters. This approach should be adopted for all of Narragansett Bay, including portions of Mount Hope Bay and the Taunton River located within Massachusetts, and should be coordinated to the greatest extent possible with marine pump-out facility plans in approved local Harbor Management Plans.** **b. Regional land-based waste disposal facilities, or mobile pump-out vessels in association with fixed land-based facilities, should be encouraged. These facilities should be directly connected to municipal sewers wherever possible.** **c. Pump-out facilities should be located at or near central service areas such as fuel docks wherever possible in order to provide convenient boater access and increase the probability of use by boaters.** **d. Waste disposal facilities funded with public monies should be available to all users and should have controlled fees for a designated period of time.** **e. Dump stations for "porta-potties" should be provided for boaters.**	**RIDEM, CRMC, Mass. counterparts**	**Five pump-out stations were operating in Narragansett Bay in 1991. Three more are expected in 1992. [See RIDEM and CRMC "Preliminary Agreements," Section 715-05-06 re: siting marina pump-outs.]**
I.B.2.	Establish and maintain publicly available shore-based toilet and/or pump-out facilities at heavily used state parks with boat facilities.	RIDEM, Mass. counterpart	

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RECOMMENDED POLICIES AND ACTIONS
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CODE	POLICY	AGENCIES	STATUS
I.B.3.	Coastal communities with municipal marine facilities should establish and maintain publicly available shore-based toilet and/or pump-out facilities.	Municipalities	Jamestown and Warren, R.I. will have municipal pump-outs operating by 1992. The Warwick, Cranston, and Block Island Harbor Mgt. Plans propose municipal facilities.
I.B.4.	All private facilities that service or accommodate boats with MSDs or port-a-potties should provide convenient and affordable shore-based toilet facilities and waste disposal facilities. However, the states should phase in requirements for sewage pump-out stations at private marine facilities, including mooring fields, over a three to five year period in order to: a. Evaluate the performance of existing pump-out facilities, including boater acceptance and compliance. b. Establish procedures for the treatment and disposal of boater wastes. c. Enable the operators of public and private facilities to secure low-cost financing from funding sources such as the Rhode Island Aqua Fund and the State Revolving Funds.	RIDEM, CRMC, Private marine facilities	
I.C.	The State of Rhode Island and the Commonwealth of Massachusetts should undertake the following actions to assure proper collection, treatment and disposal of boater wastes:		
I.C.1.	The RIDEM and the CRMC should continue or resume discussions on developing a written policy for regulating construction of marinas, docks, mooring fields and boater discharges. The agencies will formulate a mutually agreeable method to address the cumulative impacts of marinas, docks, and mooring fields, using an areal or other basis.	RIDEM, CRMC	[See CRMC "Preliminary Agreement," Section 715-05-06 re: implementation and enforcement of state dock and marina policy.]

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RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: BOATER DISCHARGES

CODE	POLICY	AGENCIES	STATUS
I.C.2.	The RIDEM and CRMC should continue to restrict marina expansion and the development of mooring fields in all marine waters that are: a. Classified as SA or Type 1 or, as appropriate, Type 2 in order to assure that boating activity does not cause water quality degradation. [*Note*: RIDEM and CRMC permit mooring fields established in Class SA and Type 1 waters before 1988 to remain, although they are not allowed to expand.] b. Where existing access to shellfish harvesting areas, finfishing areas, and bathing beaches may be jeopardized by potential increases in boat sewage discharges. c. Where water quality standards are already exceeded *unless* the applicant can demonstrate that the proposed activity will not result in further water quality degradation. d. Included within the boundaries of marine sanctuaries such as the Narragansett Bay National Estuarine Research Reserve (NB-NERR). e. Identified as important breeding, spawning, nursery or foraging habitats for commercially, recreationally or ecologically important plants and animals. f. Identified as shellfish harvesting areas that are of significant or outstanding commercial or recreational value. [However, RIDEM should *not* issue Rhode Island Pollutant Discharge Elimination System (RIPDES) discharge permits to marinas at this time because of the difficulty in defining the land and water area that would be subject to permit limitations at each facility.]	RIDEM, CRMC, Mass. counterparts	[See CRMC "Preliminary Agreement," Section 715-05-06 re: restriction of marina expansion in vicinity of critical marine habitats.]

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CODE	POLICY	AGENCIES	STATUS
I.C.3.	The U.S. Army Corps of Engineers (USACOE), RIDEM, CRMC, and their Massachusetts counterparts should require developers of marina facilities to submit complete plans for the collection, treatment and disposal of boater wastes as part of the application for a permit to expand or develop new facilities. a. The size of on-site holding tanks for boater wastes should be based on the projected volume of boater waste that could be generated within a two week period assuming all boaters served by the facility use the pump-out and waste disposal services provided by the facility. In order to allow "down-sizing" of holding tanks where physical site restrictions exist, the RIDEM should require more frequent pump-outs and establish a mandatory holding tank maintenance schedule as a condition of permitting. b. In lieu of facility-specific information regarding the number of vessels, occupancy rate and frequency of use, dimensional requirements for holding tanks should be based on calculations of waste generated per boat per three day period presented in the *Marina Task Study* (Raytheon, 1978).	ACOE, RIDEM, CRMC, Mass. counterparts	
I.C.4.	Marinas and other marine facilities that are presently served by on-site septic systems should be required to tie-in to municipal wastewater treatment facilities (WWTF) when existing or planned sewer lines are located nearby. In addition, a. State-approved municipal *Harbor Management Plans* should contain a policy encouraging vessels that are continuously occupied for more than two days (*i.e.*, "live-aboards") to dock at marinas with direct tie-ins to municipal sewers, shore-based toilet facilities or sewage pump-out facilities. b. The CRMC in cooperation with the RIDEM, the RIMTA, the International Marina Institute (IMI), and other trade organizations, should assess the number and location of "live-aboards" and houseboats using Narragansett Bay facilities in order to evaluate the magnitude of the problem.	Municipalities, private marine facilities, CRMC, RIDEM, RIMTA, IMI	See "New England Coastal Marine Pumpout Survey" (IMI, 1992) re: marina waste disposal.

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CODE	POLICY	AGENCIES	STATUS
I.C.5.	To the fullest extent allowed by law, RIDEM and MADEP shall require WWTFs to accept septage generated within the WWTF's municipal service area as a condition of the WWTF's RIPDES/NPDES permit. In addition, to the fullest extent allowed by law, state grants and subsidized loans awarded to WWTFs shall be conditioned upon the WWTF's acceptance of septage generated within the WWTF's municipal service area, unless RIDEM or MADEP, as appropriate, has waived the septage disposal requirement. [See 04-01-05 Source Control: On-site Sewage Disposal Systems.] a. The RIDEM should require municipal WWTFs that are *not* presently accepting boater waste from boating facilities within their jurisdiction or service area to include provisions for direct marina tie-ins and treatment of boat septage as a mandatory part of the facility planning process. b. The RIDEM, with input from the CRMC and the Rhode Island Septage Management Task Force, should continue to work with WWTFs that do accept vessel wastes to encourage them to accept boater wastes from sources outside their jurisdiction or service area. c. Within the limits of their regulatory jurisdiction, the EPA, the RIDEM, the Massachusetts Department of Environmental Protection (MADEP), and local WWTF industrial pretreatment coordinators should develop criteria for chemical treatment and WWTF handling of boat wastes. d. To the extent permitted by law, the EPA, the RIDEM and Massachusetts counterparts should work with the Rhode Island Sea Grant Marine Advisory Service to generate a list of chemicals currently used to treat (disinfect, deodorize) boater wastes that should be phased out of use by 1994.	EPA, RIDEM, CRMC, R.I. Septage Mgt. Task Force, Mass. counterparts, WWTFs, URI Sea Grant	[See RIDEM "Preliminary Agreement," Section 715-05-06.]
I.C.6.	The RIDEM, CRMC and the Rhode Island Septage Management Task Force should include boater septage in their considerations of a statewide policy for septage treatment and disposal, including the establishment of regional wastewater management districts (WWMDs). Municipal *Harbor Management Plans* should include marinas in WWMDs as districts are developed. Requirements for marinas to be incorporated into WWMDs, as appropriate, should be included in the technical guidance for the establishment of WWMDs.	RIDEM, CRMC, R.I. Septage Task Force, municipalities	

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RECOMMENDED POLICIES AND ACTIONS
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CODE	POLICY	AGENCIES	STATUS
I.D.	The State of Rhode Island and the Commonwealth of Massachusetts should undertake the following actions to educate boaters about the proper treatment and disposal of boater wastes:		
I.D.1. ✓	**The RIDEM Division of Enforcement, Office of Boating Safety should institute a boater education program regarding proper boater waste disposal. This program should:** **a. Provide information on how to install, operate and maintain a MSD.** **b. Promote the use of MSDs and pump-out stations.** **c. Describe applicable federal and state laws regarding disposal of boat waste, including federal and state penalties for illegal disposal.** **d. Identify designated "no discharge areas" and areas where waste disposal is prohibited in order to protect shellfishing waters or bathing beaches.** **e. Identify the locations of operational pump-out stations, including harbors served by mobile pump-out vessels. The RIDEM Division of Enforcement's Office of Boating Safety or Parks and Recreation should produce a map of Narragansett Bay and adjacent waters that clearly indicates the location of available pump-out stations. The map should:** **i. Include or reference the general schedule of operating hours of pump-out facilities, and the fee schedule for pump-out services.** **ii. Describe the draft requirements of vessels that may be excluded because of insufficient water depth adjacent to pump-out facilities.** **iii. Include fees, if any.**	**RIDEM, Mass. counterpart**	**[See RIDEM "Preliminary Agreement," Section 715-05-06.]**
I.D.2.	General public educational programs should be performed in conjunction with the University of Rhode Island's Narragansett Bay Classroom, public schools, Rhode Island Marine Trade Association (RIMTA), trade shows, and harbormasters to the maximum extent possible.	RIDEM, RIMTA, URI	
I.D.3	Boater education materials, including EPA's *Environmental Guide for Mariners*, should be distributed with boat registration forms; through Boater Safety courses offered by U.S. Coast Guard through the U.S. Coast Guard Auxiliary and the RIDEM Division of Enforcement, Office of Boating Safety (and its Massachusetts counterpart), and by relevant marine trades organizations.	USGS, RIDEM, Mass. counterpart	RIDEM distributed EPA's "Guide" at various boat shows in 1992.

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I.D.4.	EPA Region I, RIDEM and appropriate Massachusetts authorities should work together to develop and display a sign that clearly indicates the availability of pump-out facilities. The sign should be immediately recognizable and visible from the water.	EPA, RIDEM, Mass. counterpart	EPA Region I has developed a sign for use in Narragansett Bay in 1992.
I.D.5.	Within the limit of their jurisdiction, the federal and state agencies, RIMTA and other trade organizations should promote and/or require the use of environmentally-safe holding tank additives that will not interfere with OSDS or WWTF performance.	EPA, RIDEM, MADEP, RIMTA, IMI, URI	
I.E.	The State of Rhode Island and the Commonwealth of Massachusetts should undertake the following regulatory actions to regulate boaters with respect to treatment and disposal of boater wastes:		
I.E.1.	The State of Rhode Island and the Commonwealth of Massachusetts should encourage the U.S. Congress to amend the Clean Water Act to require the installation of Type III MSDs with holding tanks, or portable toilets, on all commercial and recreational vessels that are designed with overnight accommodations or are greater than 25 feet in total length and are registered to operate in state waters.	RIDEM, Mass. counterpart, RIMTA, IMI	
I.E.2.	Rhode Island and Massachusetts should promulgate regulations pursuant to existing state authority over pollutant discharges to surface waters that would: a. License some full service maintenance or repair boating facilities as official vessel inspection stations. b. Require all vessels required to have MSDs to be inspected at the time of registration for the presence of properly installed and functioning MSD equipment. [In Rhode Island, this program should be administered by the RIDEM Division of Enforcement, Office of Boating Safety.]	RIDEM, Mass. counterpart	

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RECOMMENDED POLICIES AND ACTIONS
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CODE	POLICY	AGENCIES	STATUS
I.F.	The State of Rhode Island and the Commonwealth of Massachusetts should undertake or continue the following actions to enforce requirements regarding the treatment and disposal of boater wastes:		
I.F.1. ✓	**The RIDEM and the CRMC should continue to work with and encourage marinas to require boaters to obey all rules and regulations relating to boater discharge and to report and, if necessary, expel all violators of these rules. [For example, the RIDEM should consider requiring marine facilities operators to certify that facility users have agreed in writing to comply with all federal, state and local rules and regulations pertaining to the discharge of sewage from boats and that failure to comply may result in termination of any contract or agreement to use the facilities.]**	**RIDEM, CRMC, Mass. counterpart**	
I.F.2. ✓	**The RIDEM, CRMC, U.S. Coast Guard and EPA Region I should continue to implement the *Interagency Memorandum of Agreement* and modify the *Agreement* as necessary to provide for: a. Increased and consistent U.S. Coast Guard enforcement of MSD equipment requirements during routine inspections of all commercial and recreational vessels operating in state waters. b. Delegation of authority to state and local governments for enforcement of MSD and boater waste disposal requirements. RIDEM and local harbormasters should actively enforce boater discharge regulations enacted as R.I.G.L. 46-12-39 *et seq.*.**	**EPA, USCG, RIDEM, CRMC, Mass. counterparts, harbor masters**	**CWA, as amended, and Interagency MOA provide for delegating of enforcement authority. R.I.G.L. 46-12-39 passed in 1991.**
I.F.3.	The U.S. Coast Guard, in consultation with the EPA, should review and enforce federal MSD manufacturing, installation and maintenance requirements. [For example, the U.S. Coast Guard should require operators of vessels with Type I and II MSDs to comply with federal and applicable state laws regarding operation, maintenance and required retrofits of MSD equipment. In addition, the Coast Guard Auxiliary should be requested to include inspection for the presence of an approved and operational MSD on-board as a condition of issuing courtesy inspection stickers.]	USCG, EPA	

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SOURCE CONTROL: BOATER DISCHARGES

CODE	POLICY	AGENCIES	STATUS
I.F.4.	Based on agreements reached with the U.S. Coast Guard and to the extent allowed under Section 312 of the Clean Water Act, necessary state and local enabling legislation and regulations should be drafted that describe requirements for MSD installation and use, discharge limitations, disposal, treatment and enforcement. [NOTE: The Rhode Island General Assembly passed a bill titled "An Act Relating to Marine Discharge of Sewage" during the 1991 legislative session. The statute a) prohibits boat discharges of sewage in the waters of the state unless treated with a Type I or Type II MSD in "proper working condition"; b) prohibits boat discharges of sewage in any area declared to be a no-discharge area; c) authorizes RIDEM, harbormasters, assistant harbormasters, and police officers to enforce the provisions of the Act; and d) establishes penalties for violations of the provisions of the Act (R.I.G.L. 46-12-39).]	RIDEM, Mass. counterpart, municipalities	
I.F.5.	The RIDEM and its Massachusetts counterpart should establish penalties for violation of sewage discharge regulations. For example, penalties could include fines, payable by mail; and/or loss of state boat registration privileges; or loss of permission to operate in state waters for out-of-state boaters.	RIDEM, Mass. counterpart	
I.F.6.	Municipal *Harbor Management Plans* should include plans for increasing and enforcing the use of available marina pump-outs. For example, a. Municipalities should establish fines for boaters who discharge untreated sewage (or solid waste) in local waters. b. Docking privileges should be conditional on use of available pump-out facilities. c. Municipalities should be encouraged to appoint full-time harbormasters and harbormasters should be delegated full inspection and enforcement powers in conjunction with RIDEM and the U.S. Coast Guard as part of the *Interagency Memorandum of Agreement* and R.I.G.L. 46-12-39.	RIDEM, CRMC, Municipalities	Seven of twenty-one draft Harbor Management Plans submitted for CRMC, RIDEM review; seven approved by CRMC, two approved by RIDEM as of June 1992.

✓ - **High Priority Action**

RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: BOATER DISCHARGES

CODE	POLICY	AGENCIES	STATUS
I.F.7.	Owners and operators of public and private marinas, yacht clubs, *etc.*, should enforce the use of pump-out facilities by their customers by: a. Providing mobile pump-out vessels in combination with shore-based facilities to increase convenience of the service, ensure a higher rate of boater compliance, and increase boater awareness of equipment and discharge requirements. b. Contractually linking docking privileges with proper disposal of boat wastes. For example, harbormasters and marina operators should consider requiring valve seals on vessels with overboard discharge fittings and/or using dye tablets to monitor for improper overboard discharges. c. Including the cost of pump-outs in the docking fee and/or offering coupons, rebates or other incentives to promote the use of pump-out facilities.	Municipalities, private marine facilities	
I.G.	The State of Rhode Island and the Commonwealth of Massachusetts should undertake the following actions to assist in financing the treatment and disposal of boater wastes: 1. Rhode Island and Massachusetts should investigate the possibility of increasing the pass-through of federal and state funds available from boat registration fees to coastal communities in order to support local enforcement of equipment and discharge requirements. 2. Rhode Island should investigate the possible use of the State Revolving Fund to provide low-interest loans to public and private operators of marine facilities for the construction of marine pump-out facilities.	RIDEM, RICWPFA, Mass. counterparts	

✓ - High Priority Action

RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: BOATER DISCHARGES

CODE	POLICY	AGENCIES	STATUS
II.	The State of Rhode Island and the Commonwealth of Massachusetts should petition the EPA to designate all or part of Narragansett Bay as a "no discharge area" for vessel discharges.		
II.A.	By 1995, the State of Rhode Island and the Commonwealth of Massachusetts should petition the EPA pursuant to 40 CFR §140.4 to designate all or part of Narragansett Bay as a "no discharge area" in order to abate vessel-related sources of fecal contaminants and to better protect water quality, critical marine habitats, important living resources, and existing and future water quality-dependent uses of Narragansett Bay. Pursuant to 40 CFR §140, the petition must include: 1) a certification that the protection and enhancement of the waters described in the petition requires greater environmental protection than that provided by the applicable federal standard; 2) a map showing the location of commercial and recreational pump-out facilities; 3) a description of the location of pump-out facilities within waters designated for no-discharge; 4) the general schedule of operating hours of the pump-out facilities; 5) the draft requirements on vessels that may be excluded because of insufficient water depth adjacent to the facility; 6) information indicating that treatment of wastes from such pump-out facilities is in conformance with federal law; and 7) information on vessel population and vessel usage of the subject waters. [In addition, EPA Region I, which reviews "no discharge area" petitions in the New England region, encourages petitioners to include: 1) information on the percentage of boats with Type 3 MSDs, if possible; and 2) identification of aquatic recreational areas, aquatic sanctuaries, identifiable fish spawning or nursery areas and areas of intensive boating activity.]	RIDEM, CRMC, Mass. counterparts, municipalities, EPA	[See EPA Region I and RIDEM "Preliminary Agreements," Section 715-05-06.] RIDEM will petition EPA for "no discharge area" status for Jamestown and Block Island as high priorities in 1992 or 1993

✓ - High Priority Action

RECOMMENDED POLICIES AND ACTIONS
SOURCE CONTROL: BOATER DISCHARGES

CODE	POLICY	AGENCIES	STATUS
II.B. ✓	**In its petition, the State of Rhode Island and the Commonwealth of Massachusetts should specifically identify certain regions of Narragansett Bay such as the Narragansett Bay National Estuarine Research Reserve (NB-NERR) (seaward to the 18 meter isobath), Greenwich Bay, Dutch Island Harbor, Wickford Harbor, Newport Harbor, Great Salt Pond, and the coastal ponds as appropriate for "no discharge" status.**	**RIDEM, CRMC, municipalities, EPA**	**[See RIDEM "Preliminary Agreement," Section 715-05-06 re: Great Salt Pond.]**
II.C.	In its certification to EPA that the protection and enhancement of the waters described in the petition require greater environmental protection than the applicable federal standard, the State of Rhode Island and the Commonwealth of Massachusetts should emphasize their value as marine sanctuaries; shellfish management areas; historic and scenic waterfronts; and should supply evidence that boat sewage discharges may be contributing to water quality degradation and/or limitations on historic or existing water quality-dependent uses.	RIDEM, CRMC, Mass. counterparts, municipalities, EPA	

✓ - High Priority Action

Estimated Cost of Implementation—Source Control: Boater Discharges

Table 715-04(6) summarizes the estimated costs associated with implementing the recommendations in this chapter. Most of the recommended actions are to be implemented in 1992-93. Initial activities include reconciling state water quality and water use policies, instituting and enforcing boater discharge regulations, and developing criteria for the treatment and disposal of boater wastes. (The issue of industrial pretreatment standards for boater wastes is partially costed under 04-01-01 Source Reduction: Toxics). RIDEM and CRMC will require funding for additional staff, legislative costs, and minor capital investment. MADEP and MACZM will incur costs for agency coordination and public education.

Element IB (Establish Pump-outs) includes a major capital cost for the construction of marina pump-out stations. Based on a survey of Rhode Island and Massachusetts marinas (public and private), the average cost of installing a pump-out facility was $11,500; this varies with proximity to sewer lines, desired capacity, and staffing needs. Boaters could be charged a pump-out fee to partially subsidize the operation of pump-out facilities. Two hundred ninety-five marinas in New England responded to a boating use survey conducted in 1991; according to this survey, the average regional cost per pump-out was $4.00, although the range was between $50.00 and $0.00 per pump-out (IMI, 1992:37). Lower fees will, however, provide an incentive for boaters to use the service.

State costs represent construction of marine pump-outs in State parks with major boating facilities, and could be partially subsidized with pump-out fees. The cost of installing marine pump-out facilities in municipal harbors could be partially subsidized by State Revolving Fund (SRF) loans to municipalities. The Rhode Island SRF (Clean Water Protection Finance Agency) could also potentially provide loans to private marina operations if the loans were funneled through the municipal government. Municipal and private pump-out facilities could be operated on a cost-recovery basis via pump-out fees. Private operators could also include the cost as part of the seasonal docking fee, with or without a redeemable coupon for each pump-out.

Element IC (Collection and Treatment) contains a recommendation that marinas presently served by OSDSs be required to hook up to municipal WWTFs, if possible. Marina owners would be responsible for the cost of installing a sewer line, and for annual sewer use charges. Sewer expenses could be recovered through increased docking fees. Element ID (Public Education) includes annual costs to RIDEM for developing and distributing educational materials to the boating public. Element IE (Regulatory Actions) recommends that all recreational and commercial vessels greater than 25 feet, designed with overnight accommodations, be required to install Type III marine sanitation devices (MSDs). Enforcement of this requirement will represent a cost to boaters that are not already in compliance. This section also recommends that some boat yards become state vessel inspection stations; additional staff time and equipment could be covered by inspection fees.

For further details regarding the *CCMP* cost estimation process and funding strategies, refer to the *Narragansett Bay CCMP Cost Estimation and Funding Report* (Apogee Research Inc./NBP, 1992).

Table 715-04(6)

ESTIMATED COST OF IMPLEMENTATION
SOURCE CONTROL: BOATER DISCHARGES

COST ESTIMATES BY ELEMENT

	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
IA-Administrative Actions	10,000	0	0	0	0	0	0	0	0	0	10,000	0
IB-Establish Pump-Outs	20,000	101,250	0	0	0	0	0	0	0	0	20,000	101,250
IC-Collection and Treatment	87,500	0	0	0	25,000	0	0	0	0	0	112,500	0
ID-Public Education	17,500	6,000	10,000	6,000	10,000	6,180	10,000	6,000	10,000	6,000	57,500	30,180
IE-Regulatory Actions	25,000	0	0	0	10,000	0	10,000	0	10,000	0	55,000	0
IF-Enforcement Actions	27,500	0	0	0	12,500	0	0	0	0	0	40,000	0
IG-Financing Treatment	22,500	0	0	0	0	0	0	0	0	0	22,500	0
II-"No Discharge" Zone	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	210,000	107,250	10,000	6,000	57,500	6,180	20,000	6,000	20,000	6,000	317,500	131,430
TOTAL BY YEAR		317,250		16,000		63,680		26,000		26,000		448,930

COST ESTIMATES BY AGENCY

	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
RIDEM	108,750	39,750	5,000	6,000	22,500	6,090	10,000	6,000	10,000	6,000	156,250	63,840
RI CRMC	27,500	0	0	0	25,000	0	0	0	0	0	52,500	0
RI CWPFA	5,000	0	0	0	0	0	0	0	0	0	5,000	0
URI	5,000	0	0	0	0	0	0	0	0	0	5,000	0
MADEP	48,750	0	5,000	0	10,000	90	10,000	0	10,000	0	83,750	90
MACZM	5,000	0	0	0	0	0	0	0	0	0	5,000	0
Municipalities*	0	67,500	0	0	0	0	0	0	0	0	0	67,500
WWTFs	10,000	0	0	0	0	0	0	0	0	0	10,000	0
TOTALS	210,000	107,250	10,000	6,000	57,500	6,180	20,000	6,000	20,000	6,000	317,500	131,430
TOTAL BY YEAR		317,250		16,000		63,680		26,000		26,000		448,930

* Ultimate implementation costs will vary for each municipality depending on its particular environmental and institutional conditions. In addition, the estimated municipal implementation costs do not include ultimate program and capital costs that may result from completion of underlying planning activities, or costs that are expected to be completely recoverable from user fees.

04-01-07 Source Reduction: Nonpoint Sources

Objective for the Reduction of Nonpoint Source Inputs

The State of Rhode Island and the Commonwealth of Massachusetts should reduce loadings of nonpoint source pollutants to Narragansett Bay.

Introduction

Nonpoint source pollution results from rain, snowmelt and groundwater transporting pollutants from many diffuse sources on the land surface. Some of the resulting pollutant load is entrained, decomposed or biologically assimilated. However, some of these pollutants are transported via surface runoff or percolation into the groundwater, and are subsequently deposited into streams, rivers, ponds, lakes, drinking water supply reservoirs, wetlands, and coastal waters (Boyd, 1991; EPA, 1991a). Although nonpoint source pollutants are continuously generated, they are differentiated from fixed, point sources by their sporadic and spatially variable nature.

Urban, residential, agricultural, commercial, and industrial activities contribute to nonpoint source pollution. As a result, nonpoint source pollutants discharged or released anywhere within the Narragansett Bay watershed have the potential of finding their way into the Bay via stormwater runoff or groundwater seepage. The potential for nonpoint source pollution increases as a function of the type, distribution and intensity of land use. The gradual increase of impervious or paved surfaces and the alteration of natural drainage patterns also results in increased volumes, peak discharges, and velocities of runoff (Stuart, 1991:1).

The quantity and quality of stormwater runoff reaching a waterbody is influenced by the size of the land area draining to the waterbody (*i.e.*, the basin or watershed), the use and management of that area, the slope of the land, and the physical characteristics of the path runoff follows as it flows through the drainage area. In general, as a drainage area becomes urbanized, the rate of flow (peak discharge) and volume of runoff increases significantly. Increased human activity results in more pollutant sources, and increased runoff volume and velocity (due to smoother surfaces) (Stuart, 1991:7). It should be noted, however, that wetlands provide an important function in the landscape by improving water quality, reducing sedimentation and storing stormwater runoff. Many water quality impairments are exacerbated by activities that interrupt the natural hydrological, physical, and biological processes of wetlands.

Statement of the Problem

The U.S. Department of Agriculture Soil Conservation Service (USDA SCS) has identified urban and residential runoff, runoff and leachate from failing septic systems, and sediment erosion from construction and agricultural sites as significant nonpoint sources of pollution within the watershed of Narragansett Bay (USDA SCS, 1990:2). Runoff from impervious surfaces (such as highways, roads, parking lots, and driveways) can carry sediment, metals, organic chemicals, and nutrients. Runoff from agricultural lands, livestock operations, sewage sludge landfills, lawns, and failed or failing septic systems can also carry fecal contaminants in addition to nutrients, sediments, and toxic substances, *e.g.*, pesticides (Stuart, 1992:3; Karp *et al.*, 1990:41). While forests are a major land type within the Bay watershed, less than one per cent, or 3,000 acres, of timber is commercially harvested each year. As a result, timber harvesting or *silviculture* appears to be an insignificant contributor of nonpoint source pollution to the Bay, noting that clear-cutting for urban development does result in nutrient releases and soil erosion (USDA SCS, 1990:2).

Figure 715-04(4) shows the potential pollutants associated with several land covers commonly found in the Narragansett Bay watershed. The land covers are listed in order of the volume of runoff likely to be generated given the same amount of rain on the same soil type, with the lowest runoff volume first.

Figure 715-04(4): Land Cover *vs.* Associated Potential Pollutants.

Low Runoff		
"Natural" areas (wood, brush, unmanaged areas)		Nutrients
Managed grass (lawns, golf courses, hay, pasture, orchards)		Nutrients, pesticides
Cultivated land		Nutrients, pesticides, sediment
Construction sites Roads, parking lots	↓	Sediment, nutrients Petroleum products, salts, metals, sediment
High Runoff		

[*Note:* Addition of animal or human waste to any of these land covers adds pathogens and nutrients to the list of potential pollutants.]

One hundred and sixty four (164) surface water segments within the Narragansett Bay watershed were assessed by Rhode Island and Massachusetts as part of the 1988 *Nonpoint Source Assessments* in conjunction with development of the state Section 319 *Nonpoint Source Management Plans*. Surface runoff was identified as a major nonpoint source pollution transport mechanism in 70 percent of the waterbodies in Rhode Island with nonpoint source pollution problems. Failed on-site sewage disposal system (OSDS) and groundwater contamination were implicated in 49 percent of Rhode Island waterbodies with nonpoint source pollution problems. In Massachusetts, the reported figures were 43 percent for surface runoff and 20 percent for septic systems (USDA SCS, 1990:9).

Nutrients and/or eutrophication were identified as a nonpoint source pollution problem in 74 of the 164 assessed surface water segments in the Bay watershed. Agricultural runoff was a contributing source in 15 of the 74 segments; urban and residential runoff was identified as a contributing nonpoint source in 59. Solids and silt were identified as a problem in 61 of the 164 segments, noting that USDA SCS estimates that between 100,000 and 150,000 tons of sediment enters water bodies in the Bay watershed each year from urban development, construction sites, road runoff and cultivated fields. Nonpoint sources of metals were identified in 29 of the 164 segments; oils and greases in eight; and pesticides in two (Stuart, 1992: 7-11; RIDEM, 1988a; MADEQE, 1989).

In addition, nonpoint sources of fecal contamination have been implicated in the closure of approximately 17,000 acres of potential shellfish-harvesting waters in the Bay (RIDEM, 1990a). Nonpoint sources of fecal waste include runoff or leachate from failed septic systems, livestock operations, other animal waste, and illegal connections of sanitary drains to storm sewers. [*Note*: Storm drains, like combined sewers, are considered to be point sources under the federal CWA and the CZMA. However, storm drains are addressed in this chapter because the type of pollutants, frequency of discharge and appropriate source reduction measures are comparable to problems and solutions for stormwater runoff.]

Effective management of nonpoint source pollution is both technically and institutionally complicated. Potential pollutant sources—such as direct discharges of storm drains, poorly designed, installed or main-

tained septic systems, exposed soil in areas susceptible to erosion, and areas where fertilizers and pesticides are applied—are temporally variable, geographically scattered, and dependent on local physiographic site conditions. As a result, it is often difficult to quantitatively measure the pollutant loads related to a particular source, or to evaluate the relative importance of multiple sources. In addition, land use activities that alter the structure or natural hydrologic regime of wetland and riparian areas can create or exacerbate nonpoint source pollution problems. Similarly, the intensity of land use, *e.g.*, density of septic systems or area of impervious surface, often dictates the magnitude of nonpoint source pollution problems.

The pervasiveness of the nonpoint source problem also complicates management options. Federal, state, and local governments may lead the way by defining control methods, promoting educational efforts, conducting investigations, and providing enforcement activity where necessary. However, success in abating existing pollution sources and preventing new sources will require efforts by the development community, businesses, and individuals, as well as the government. Moreover, because human activities throughout the drainage area affect Bay water quality and habitat, the drainage area needs to be managed *as a whole* in order to effectively reduce incremental, cumulative impacts (Stuart, 1991:7).

Existing Policies

Federal Initiatives for Nonpoint Source Management

The U.S. Environmental Protection Agency (EPA) and the U.S. USDA have historically had primary responsibility for addressing nonpoint source pollution issues pursuant to the federal CWA, the Farm Bill and the Federal Insecticide, Fungicide, and Rodenticide Act. However, recent initiatives under the CZMA of 1990 and the Intermodal Surface Transportation Efficiency Act of 1991 have vested major nonpoint source management responsibilities in the National Oceanic and Atmospheric Administration's (NOAA) Coastal Zone Management Program and the Federal Highway Administration (FHWA). The major federal programs are briefly described below.

EPA-Administered Programs

The EPA administers nonpoint source planning and regulatory programs under the federal CWA. Section 319 of the federal Water Quality Act of 1987 established the Nonpoint Source Pollution Management Program and required each state to prepare an *Assessment of Sources* and a *Nonpoint Source Management Plan*. Both the Rhode Island and Massachusetts *Assessments* found stormwater runoff to be a significant source of pollutants within the Narragansett Bay watershed. The states' *Nonpoint Source Assessments* were updated in 1990, and the *Nonpoint Source Management Plans* are currently undergoing revision (Stuart, 1991:5). The EPA also administers Section 208 (Areawide Waste Treatment Management) and Section 320 (National Estuary Program) of the federal CWA which require participating states to address nonpoint pollution sources in state basin plans and *Comprehensive Conservation and Management Plans*.

The Water Quality Act (1987) also required the EPA to regulate certain stormwater discharges under the National Pollutant Discharge Elimination System (NPDES). Under the regulations finalized in November 1990, and later amended, industrial stormwater dischargers are required to apply for NPDES permits by October 1, 1992. Municipalities with separate storm sewer systems serving populations of 100,000 or more must also apply, and must develop a program for monitoring and reducing pollutants in the stormwater system by 1993. Worcester, Massachusetts, is the only city in the Narragansett Bay watershed affected by this requirement at the present time. The City of Providence has been exempted from this NPDES requirement because most of the city is served by combined sewers that are regulated under the combined sewer overflow abatement program (Stuart, 1991:18). However, Providence will use a grant from

the Rhode Island Aqua Fund to prepare an inventory of municipally-owned storm sewers, and will follow EPA guidance for detecting illegal upstream inputs.

USDA-Administered Programs

Technical assistance is available through three agencies of the U.S. Department of Agriculture (USDA): the Soil Conservation Service (SCS), the Cooperative Extension Service (CES) and the U.S. Forest Service. Each program relies on the states for delivery of their services to at least some extent. The SCS works with farmers on soil erosion, water quality and water conservation problems by helping them to plan management systems, and designing and inspecting best management practices. SCS is federally-funded, but works under the direction of local Conservation Districts, as established by state law.

The CES, administered through the states' land grant universities, relies on federal, state and local funding. Through research and technology transfer, CES provides land-users with practical technical assistance regarding the selection and care of animals, crop production, pest management (including pesticide applicator training), soil testing for fertilizer needs, and marketing. CES has expanded its programs to provide homeowners with gardening, lawn care and household management assistance as well. Assistance is provided through a local Extension Board.

The Forest Service depends completely on state forestry programs which are partially funded by the U.S. Forest Service. The Massachusetts Department of Environmental Protection (MADEP) Division of Forest and Parks and the Rhode Island Department of Environmental Management (RIDEM) Division of Forest Environment Services provide forest managers with evaluation of timber quality and productivity, preparation of forest management plans, marketing advice, evaluation and control of forest insect and disease problems, a harvesting and sawmill improvement program, certification of nursery stock (insect and disease free) and the sale of tree seedlings at cost.

Federal financial assistance is available to farmers and forest managers for the installation of soil and water conservation practices and woodland management practices, the purchase and operation of farms, crop insurance, and for controlling the price of some agricultural products. USDA's Farmers Home Administration (FmHA) provides low-interest loans for farm ownership, farm operating expenses and soil and water conservation practices. The USDA Agricultural Stabilization and Conservation Service (ASCS) administers most price-support programs, and shares the cost of installing certain soil and water conservation practices and woodland management practices.

The ASCS in Rhode Island has designated the Narragansett Bay watershed as a Special Project Area under the USDA Water Quality Initiative, which reserves funds for conservation practices within the watershed. SCS can also provide cost-sharing for conservation practices under its Watershed Protection Program. Under the USDA Water Quality Initiative, CES and SCS are combining efforts within specified geographic areas to work more closely with farmers in protecting water quality. The Pawcatuck River (R.I.) and Buzzard's Bay (MA) "Hydrologic Units" are two nearby areas that were selected for this special emphasis. Selection of areas and plan preparation are coordinated with the states' 319 Nonpoint Source Management and National Estuary Programs.

NOAA- Administered Programs

Section 6217 of the CZMA Reauthorization Amendments of 1990 represents another important federal nonpoint source initiative (Stuart, 1991:6). Section 6217 requires states to establish Coastal Nonpoint Pollution Control Programs (CNPCP) to "develop and implement management measures for nonpoint source pollution to restore and protect coastal waters..." (EPA, 1991a). As of May 1991, EPA and NOAA have jointly issued two draft documents that provide guidance for

states to develop CNPCPs: *Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters* (EPA, 1991a) and *Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance* (NOAA/EPA, 1991).

State CNPCPs must "provide for the implementation, at a minimum, of management measures in conformity with the guidance published under subsection (g) to protect coastal waters generally" (EPA, 1991a:1-5). In addition CNPCPs must:

> "(1) Identify land uses which, individually or cumulatively, may cause or contribute significantly to a degradation of (a) coastal waters where there is a failure to attain or maintain applicable water quality standards or protect designated uses, or (b) coastal waters that are threatened by reasonably foreseeable increases in pollution loadings from new or expanding sources;
>
> "(2) Identify critical coastal areas adjacent to coastal waters identified under the preceding paragraph;
>
> "(3) Implement additional management measures applicable to land uses and areas identified under paragraphs (1) and (2) above that are necessary to achieve and maintain applicable water quality standards and protect designated uses;
>
> "(4) Provide technical assistance to local governments and the public to implement management measures;
>
> "(5) Provide opportunities for public participation in all aspects of the program;
>
> "(6) Establish mechanisms to improve coordination among State and local agencies and officials responsible for land use programs and permitting, water quality permitting and enforcement, habitat protection, and public health and safety; and
>
> "(7) Propose to modify State coastal boundaries as necessary to implement NOAA recommendations under Section 6217(e), which are based on findings that inland boundaries must be modified to more effectively manage land and water uses to protect coastal waters" (EPA, 1991a:1-5 to 1-6).

Specific management measures are also proposed for several major sources of nonpoint pollution, including: (1) agricultural runoff; (2) urban runoff (including developed and developing areas); (3) silvicultural (forestry) runoff; (4) marinas and recreational boating; and (5) hydromodification, dams and levees, and shoreline erosion (EPA, 1991a: 1-9). The CNPCP will not include management measures for point source of pollutants regulated under the CWA (*e.g.*, combined sewer overflows, wastewater treatment facilities, storm drains, and boats).

CNPCPs are intended to "serve as an update and expansion of existing nonpoint source management programs and are to be coordinated closely with the existing coastal zone management programs", and "the state coastal zone and water quality agencies are to have co-equal roles" in developing the CNPCP (EPA, 1991a:1-5). Section 6217 also requires the CNPCP "to be coordinated with existing CWA programs under sections 208, 303, 319, and 320", as well as to establish coordination mechanisms with other agencies and officials responsible for various aspects of nonpoint source pollution control (NOAA/EPA, 1991:vii). The requirements for the state CNPCP described in draft NOAA and EPA guidance (EPA, 1991a; NOAA/EPA, 1991) mandate that the plan be well coordinated with CWA section 320 programs (*i.e.*, Comprehensive Conservation and Management Plans produced by National Estuary Projects). Thus, the development of the Rhode Island CNPCP under Section 6217 of the 1990 Reauthorization of the CZMA should use the Narragansett Bay *Comprehensive Conservation and Management Plan* (*CCMP*) and other relevant nonpoint source policies, plans and regulations to the greatest

extent possible. Conversely, implementation of relevant sections of the Narragansett Bay *CCMP* should be structured so as to be compatible with final guidance for CNPCPs.

Most significantly, state CNPCPs must contain "enforceable policies and mechanisms to implement the applicable requirements of the coastal nonpoint programs" as defined under Section 316 of the CZMA. Each state's CNPCP must be approved by both NOAA and EPA and will be implemented through changes to the state's nonpoint source pollution program (Section 319 of the CWA) and coastal zone management program (Section 306 of the CZMA) (NOAA/EPA, 1991: v). Failure to implement a CNPCP may result in loss of portions of federal funds allocated by NOAA and EPA to state CZMA Section 306 and CWA Section 319 programs.

State Initiatives for Nonpoint Pollution Management

Rhode Island and Massachusetts have both established state nonpoint source management programs pursuant to Section 319 of the federal Clean Water Act. Rhode Island's Nonpoint Source Management Program, which is administered through RIDEM's Office of Environmental Coordination, devoted the early years of the program to preparing the *Nonpoint Source Assessment* and the *Nonpoint Source Management Plan*. Subsequent state efforts included the preparation of technical guidance and model ordinances, and coordinating nonpoint source planning efforts with regulatory programs. Both states established external advisory committees to assist in the preparation of the nonpoint source management plans. Rhode Island established a 19-member Water Quality Advisory Committee in 1988 to assist in the development of the State Clean Water Strategy, including the *Nonpoint Source Management Plan*. The Committee included representatives from RIDEM's regulatory divisions, the Rhode Island Division of Planning (RIDOP), the Rhode Island Coastal Resources Management Council (CRMC), USDA SCS, the University of Rhode Island (URI), environmental advocacy groups, local government, and the Narragansett Bay Project (NBP). This Committee has not met, however, since the publication of the *Nonpoint Source Management Plan* (Stuart, 1991:5). The Commonwealth of Massachusetts established a 50-member advisory committee under the direction of the MADEP, and a nine-member Steering Committee chaired by Massachusetts Coastal Zone Management (MACZM) to advise MADEP on the development of the state's *Nonpoint Source Management Plan* (Stuart, 1991:5).

The Rhode Island *Nonpoint Source Management Plan* established a system for ranking the state's waters based on their condition, use and need for remedial action. The *Nonpoint Source Assessment* (RIDEM, 1990c) evaluated the state's waters to determine whether they were impaired (*i.e.*, not attaining their designated use according to the *Water Quality Regulations for Water Pollution Control*, RIDEM 1988b) or threatened (*i.e.*, in full support of designated uses, but subject to impairment by pollutants occurring in the watershed). The *Nonpoint Source Management Plan* then established established criteria for prioritizing assessed waterbodies for protection or restoration efforts based on their drinking water supply, bathing and recreation, habitat, and fish and wildlife value, recognizing that human use and habitat function are equally valuable protected uses (Stuart, 1991:4). The ranked list is used to prioritize state efforts to restore impaired waterbodies and protect threatened waters. The Massachusetts *Nonpoint Source Management Plan*, on the other hand, does not currently have a documented priority-setting process (Stuart, 1991:4).

Rhode Island's Nonpoint Source Management Program also developed some of the technical guidance and regulatory framework needed to begin to address nonpoint source issues, and worked with the NBP-sponsored Land Management Project to provide technical assistance to cities and towns in preparing their local comprehensive land use plans. The *Rhode Island Soil Erosion and Sediment Control Handbook* (RIDEM, 1989e) was revised to serve as a design manual for best management practices (BMPs), and Rhode Island erosion and sediment control enabling legislation was

revised to reflect the needs of local officials. RIDEM's efforts in 1991 focussed on developing performance standards for stormwater control BMPs as the basis for regulatory permits (*e.g.*, the RIDEM freshwater wetlands program). Regulations, applicability criteria, and performance standards are presently in draft form (Stuart, 1991: 6,17). In addition, the CRMC has agreed to base its stormwater regulations on the standards developed by RIDEM, thus making the Council's regulations consistent with RIDEM's. Stormwater management is required, for example, in certain Special Area Management (SAM) Plans, and new development proposals requiring CRMC permits must maintain the present quantity and quality of stormwater leaving the site (Stuart, 1991:6, 17).

Apart from the nonpoint source planning initiative established under Section 319, the states regulate other aspects of the nonpoint source pollution problem through their agricultural, pesticide, groundwater, wetlands and on-site sewage disposal regulatory programs. Both states also work with USDA Conservation Districts and Cooperative Extension Service to provide technical assistance, including site plan review, to municipalities and individual property owners. In addition, the Narragansett Bay Project-sponsored Land Management Project (LMP), which operated in conjunction with Rhode Island's Nonpoint Source Management Program between 1988 and 1992, played a key coordinating function among the agencies and organizations responsible for nonpoint source management. The LMP developed outreach materials and guidance documents, compiled model ordinances from other jurisdictions, and actively assisted cities and towns throughout the watershed in evaluating regulatory controls and structural BMPs for nonpoint source pollution control.

Analysis

Coordination of Nonpoint Source Management Programs

Perhaps the greatest impediment to implementation of an effective nonpoint source management strategy is the difficulty of coordinating the activities of the numerous agencies and organizations involved. Both Rhode Island and Massachusetts should maintain permanent state nonpoint source advisory committees with participation by federal, state and local resource management agencies, environmental advocacy groups, academia, and other interest groups. RIDEM and CRMC should consider developing an umbrella organization that builds on the advisory committees organized by Save the Bay and USDA SCS. The Environmental Data Centers at URI and MACZM, which supply statewide computer mapping and data analysis through their respective Geographic Information Systems (GIS), should also become important mechanisms for sharing information to assess potential nonpoint source pollutant contributions from changes in land use (Stuart, 1991:4). In addition, the statewide CNPCP that will be developed jointly between CRMC and RIDEM, as required by Section 6217 of the 1990 Amendments to the CZMA, will require enhanced coordination between relevant federal, state, and local agencies if it is to receive approval from the EPA and NOAA. Without such federal approval, both RIDEM's Section 319 Program and CRMC's Section 306 funding will be penalized.

Nonpoint Source Pollution Assessments and Planning

Section 319 of the CWA encourages states to update their *Nonpoint Source Assessments* as part of the state *Clean Water Strategy* and the *State of the State's Waters* reports required under Section 305(b) of the Act. In general, *Nonpoint Source Assessments* provide a great deal of information, and should be regarded as a major reference for implementing agencies and organizations. However, of the 200 waterbody segments making up the Narragansett Bay watershed, 39 along the Blackstone and Taunton Rivers in Massachusetts have not been evaluated. Since implementing agencies are expected to focus their efforts on priority waterbodies based on criteria and data reported in the *Nonpoint Source Assessments*, it is imperative to evaluate all waterbody segments, including wetlands.

Both Rhode Island and Massachusetts should use information gathered by citizen monitoring programs to supplement the state *Nonpoint Source Assessments*, particularly where the states do not have other recent sources of data (Stuart, 1991:15-16). A number of citizen-based water quality monitoring programs are already underway in the Narragansett Bay watershed. In addition, the Narragansett Bay Project established a Citizens Monitoring Coordinator position in 1990 to help coordinate the various Rhode Island programs, provide a liaison between the volunteer groups and RIDEM, and establish standardized sampling, analytical and reporting procedures (Stuart, 1991:16). The position, which is administered by RIDEM's Division of Water Resources, should be made permanent and Massachusetts should establish a similar position.

As noted above, the Massachusetts *Nonpoint Source Management Plan* does not have a documented priority-setting process to target waterbodies for protection and restoration. Although a substantial effort may be required to develop a joint nonpoint source priority ranking system, it would represent an invaluable step for directing basinwide efforts toward "protecting the best and fixing the worst" interstate waterbodies. The state Nonpoint Source Advisory Committees could be used to establish common goals and criteria for prioritizing implementation efforts in the Narragansett Bay basin. In addition, federal and state nonpoint source control implementation efforts in both states should be directed toward protecting and restoring the highest priority waterbodies in order to focus available funding and reduce unnecessary duplication of effort. Recognizing that nonpoint source controls should be the highest priority for some waterbodies, Rhode Island and Massachusetts should also develop a method for reconciling the nonpoint source priority list with the 305(b) point source and 303(d) waterbody priority lists in order to assure that available water pollution control funds are used effectively.

Regulation of Nonpoint Pollution Sources

Although RIDEM is scheduled to release draft stormwater control regulations by October 1992, the logistics and staff requirements involved with issuing and enforcing NPDES permits for each municipal and industrial stormwater discharge are significant and probably impossible to meet at the present time (Stuart, 1991:18). The EPA has issued draft guidance to assist state and local officials in detecting illegal sewer connections to storm drains. Technical guidance for communities seeking to abate and eliminate stormwater discharges is available through the state's *Nonpoint Source Management Plan* and the *Recommendations of the Stormwater Management and Erosion Control Committee Regarding the Development and Implementation of Technical Guidelines for Stormwater Management* (RIDEM, 1988a). The management measures identified as part of the proposed CNPCP to control nonpoint source pollution from urban sources (EPA, 1991a:4-1 to 4-47) will also help to reduce loadings to urban storm drains. The state and local governments should also consider using shoreline survey data collected by citizens' monitoring programs to identify illegal dry weather storm drain discharges. However, additional guidance is needed from EPA regarding appropriate stormwater discharge survey, prioritization and abatement strategies. [See 04-01-02 Source Reduction: Nutrients, and 04-01-05 Source Control: On-Site Sewage Disposal Systems for a discussion of groundwater contamination issues related to septic systems and fertilizer use.]

On the local level, several Rhode Island municipalities have adopted stormwater and nonpoint source-related management ordinances, and some communities have incorporated water quality or flooding considerations in their subdivision regulations. For example, Middletown requires no increase in peak discharge from the two and 25-year storms, and Smithfield includes a nutrient loading determination in the required environmental studies for a subdivision proposal. In addition, as of early 1992, 14 of 39 Rhode Island municipalities had adopted Soil Erosion and Sediment Control ordinances. However, none of the municipal or state programs presently address cumulative water quality impacts, nor are there compre-

hensive programs for mitigating them. Moreover, most cities and towns are not technically or financially equipped to deal with these issues in an aggressive manner (Myers, 1988; Stuart, 1991:7-8). Local comprehensive plans approved by the RIDOP pursuant to Rhode Island's Comprehensive Planning and Land Use Regulation Act (R.I.G.L.45-22.2-1 *et seq.*) will, however, provide the basis for new zoning ordinances and other growth management controls that reflect projected patterns of development and potential sources.

The federal and state agencies also clearly need to provide more effective guidance regarding applicability criteria, and design and performance standards for nonpoint source control best management practices (BMPs). The need for design and performance standards is especially critical when addressing residential or "urban" nonpoint source issues, because concern for nonpoint source pollution in that area is relatively new. The stormwater management standards and applicability criteria developed by RIDEM for its Section 319 *Nonpoint Source Management Plan* should be adopted by all the state nonpoint source control authorities, including the MADEP, Massachusetts Department of Food and Agriculture (MAFA), RIDEM's Divisions of Agriculture and Water Resources, the state coastal zone management agencies (*i.e.*, MACZM and CRMC) and Departments of Transportation, Cooperative Extension Service, Conservation Districts, and USDA SCS (Stuart, 1991:6). To the greatest extent practicable, these agencies should consider BMPs and performance standards recommended in the final Section 6217 CNPCP guidance under development by EPA and NOAA.

Finally, as noted previously, the states maintain a variety of technical assistance programs that address various nonpoint source pollution control issues. The USDA and its affiliated state programs should review the components of an Integrated Pest Management System to reduce the use of pesticides. Selection of pesticides based on water quality impacts, and more effective regulation of pesticide applicators should also be considered (Stuart, 1991:25). In addition, since roads and other paved surfaces can have a significant impact on stormwater quantity and quality, it is of special importance to ensure that control measures are adequately installed and maintained. Most state and local road construction inspectors are not specialists in nonpoint source management, and may not be able to give these measures the attention they deserve. This may be an area where use could be made of the Conservation Districts' site plan review and inspection programs (Stuart, 1991:21). Rhode Island Conservation Districts could also assist the CRMC in the review and inspection of stormwater management systems in sites within SAM Plan jurisdiction, and could assist RIDEM's Division of Freshwater Wetlands when stormwater management regulations are adopted. Similarly, the Environmental Review Teams available through the Rhode Island Resource Conservation and Development (RC&D) Council should be expanded to have a watershed-based perspective in order to assist municipalities in assessing the cumulative impact of development proposals. Massachusetts' Conservation Districts and RC&D Councils could play a similar role for Massachusetts municipalities in the Bay watershed (Stuart, 1991:23).

Recommended Policies and Actions and *Estimated Cost of Implementation* are presented in the following pages.

RECOMMENDED POLICIES AND ACTIONS
SOURCE REDUCTION: NONPOINT SOURCES

CODE	POLICY	AGENCIES	STATUS
I.	The State of Rhode Island and the Commonwealth of Massachusetts should develop and implement consistent nonpoint source guidance, standards, and practices for application throughout the Narragansett Bay Watershed, in order to control nonpoint source pollution problems in a consistent manner and reduce duplication of efforts. Guidance developed for the states' Coastal Nonpoint Pollution Control Programs (CNPCP) under Section 6217 of the 1990 Reauthorization of the Coastal Zone Management Act (CZMA) should be considered in revising existing guidance and standards.		
I.A.	Rhode Island and Massachusetts, with assistance from the U.S. Environmental Protection Agency (EPA), should adopt a consistent set of criteria for selecting priority waterbodies, including wetlands, in the Narragansett Bay watershed on which to focus efforts. The criteria used in Rhode Island Department of Environmental Management's (RIDEM) *Nonpoint Source Management Plan* to rank waterbodies for protection or restoration based on the status, use and ecological values of the waterbody are recommended. [Note: Wetlands are included as "waters of the State of Rhode Island" pursuant to R.I.G.L. 46-12-5. Therefore, unless specifically noted, all references to "waters" or "waterbodies" of the State include wetlands.] 1. The environmental management and coastal zone management agencies of Rhode Island and Massachusetts should focus future nonpoint source planning and implementation on those waterbodies identified as high priority for protection and restoration. The states' CNPCPs should use information and ranking criteria developed by state *Nonpoint Source Assessments* and other related information (*e.g.*, Narragansett Bay *Comprehensive Conservation and Management Plan)* to the greatest extent possible. 2. The states' nonpoint source priority waterbody list should be reconciled with the states' 305(b) point source, and 303(d) waterbody priority lists to the maximum extent possible in order to assure that available implementation funds are used effectively. 3. If further delineation of priority watersheds is needed for agency-specific programs, the agency should consult with the Rhode Island Environmental Data Center (EDC) in determining appropriate delineation criteria and any methods available to match waterbodies with their program requirements.	EPA, USDA SCS, RIDEM, CRMC, Mass. counterparts	

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RECOMMENDED POLICIES AND ACTIONS
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CODE	POLICY	AGENCIES	STATUS
I.B. ✓	The Rhode Island and Massachusetts (Section 319 and Coastal) Nonpoint Source Coordinators should jointly maintain/reinstate a state Nonpoint Source Management Committee, to guide the nonpoint source control planning process, and to assist in developing new initiatives and the technical guidance needed for implementation. Coordination between the Rhode Island and Massachusetts Committees should be ensured. 1. Development of the new Section 6217 CNPCP, and update of the Section 319 *Nonpoint Source Management Plan* shall be coordinated within each state. EPA and the National Oceanographic and Atmospheric Administration (NOAA) shall make every effort to develop consistent policies and guidance regarding the control of nonpoint source pollution. The guidance developed for the CNPCP (EPA, 1991a) should be used to update the state's Section 319 *Nonpoint Source Management Plans* to the greatest extent practicable. 2. Design standards, applicability criteria, and performance standards for nonpoint source management systems and best management practices (BMPs) should be consistent throughout the Narragansett Bay Watershed to the greatest extent possible. The Rhode Island and Massachusetts Nonpoint Source Management Committees should agree on appropriate standards and should use existing CNPCP guidance (EPA, 1991a) to the greatest extent practicable. The State of Rhode Island should endorse the Rhode Island *Nonpoint Source Management Plan* and the *Recommendations of the Stormwater Management and Erosion Control Committee Regarding the Development and Implementation of Technical Guidelines for Stormwater Management* (1988a) for reducing stormwater pollutants.	RIDEM, CRMC, MADEP, MACZM, RIDOT, MA EOTC	[See RIDEM "Preliminary Agreement," Section 715-05-06 re: agreement to establish and jointly chair the Nonpoint Source Management Committee with CRMC. See USDA SCS and RIDOP "Preliminary Agreements," Section 715-05-06 re: agreement to participation on Nonpoint Source Management Committee.]

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RECOMMENDED POLICIES AND ACTIONS
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CODE	POLICY	AGENCIES	STATUS
I.C.	Rhode Island and Massachusetts should adopt a policy of stormwater management on a watershed basis and should use Section 6217 CNPCP guidance (EPA, 1991a) when available. State and Coastal Nonpoint Source Coordinators will be responsible for overseeing the development and implementation of regional nonpoint source/stormwater management plans for priority waterbodies, including wetlands. This oversight authority shall be delegated to municipalities or to other agencies that demonstrate the ability to implement these plans. The plans will be developed and implemented under the guidance of an advisory committee.	RIDEM, CRMC, MADEP, MACZM	
I.C.1.	Stormwater planning requirements and criteria should be adopted by the Nonpoint Source Coordinators, the Rhode Island Division of Planning (RIDOP), and the Massachusetts Regional Planning Agencies, for use in preparing stormwater management plans for priority waterbodies. The planning guidance should a) include an assessment of existing nonpoint source pollutant loading models; b) identify appropriate BMPs to reduce or pretreat stormwater sources; c) include or cross-reference design and performance standards and maintenance requirements for identified BMPs; and d) describe possible institutional and financial arrangements for long-term operation and maintenance of stormwater management BMPs. [Guidance available from the states' Clean Water Act (CWA) Section 319 Nonpoint Source Programs, CZMA Section 6217 CNPCP, and the U.S. Department of Agriculture Soil Conservation Service (USDA SCS) should be reviewed and used to the maximum extent possible. The proposed stormwater management planning guidance should contain provisions that are at least as protective as those presented in the final CNPCP guidance (scheduled to be released in 1992).]	RIDEM, CRMC, RIDOP, MADEP, MACZM	[See USDA SCS "Preliminary Agreement," Section 715-05-06 re: technical assistance to R.I. and Mass. regarding stormwater regulations. See CRMC "Preliminary Agreement," re: implementation of RIDEM-CRMC stormwater policies.]
I.C.2.	All nonpoint source policies developed by state and coastal zone nonpoint source programs shall be incorporated into *all* nonpoint source programs within Massachusetts and Rhode Island, and into the *Rhode Island State Guide Plan* (and the Massachusetts equivalent) as appropriate, in order to assure consistency and implementation among state and local authorities. Regional Plans will be incorporated into the local Comprehensive Land Use Plans of the municipalities within the drainage area of the waterbody.	RIDOP, Mass. counterpart	[See RIDOP "Preliminary Agreement," Section 715-05-06 re: incorporation of statewide nonpoint source policies into the *State Guide Plan*.]
II.	Improve the assessment of waterbodies, including wetlands, and identification of potential nonpoint sources of pollution.		

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RECOMMENDED POLICIES AND ACTIONS
SOURCE REDUCTION: NONPOINT SOURCES

CODE	POLICY	AGENCIES	STATUS
II.A.	Rhode Island and Massachusetts should improve their databases on the physical, chemical, and biological effects of land management on water resources.		
II.A. 1.	The EPA is strongly urged to reassess the "eligible uses" of CWA funds for data collection and monitoring.	EPA	
II.A.2. ✓	**A permanent natural resource database center (including water quality, living resource, and land use data) must be maintained in each state, with adequate staff and equipment provided by the state and other users. Inter-agency agreements and long-term funding should be established so that these data are available to all federal, state and municipal authorities responsible for nonpoint pollution assessment and management.**	**R.I., Mass., federal agencies**	**[See USDA SCS "Preliminary Agreement," Section 715-05-06 re: submittal of data to state databases.]**
II.A.3.	The Massachusetts Department of Food and Agriculture (MAFA) and the RIDEM Division of Agriculture shall estimate "non-restricted-use" pesticide usage within the watersheds of priority waterbodies during the next round of *Nonpoint Source Assessments*.	MAFA, RIDEM	[See USDA SCS "Preliminary Agreement," Section 715-05-06 re: assistance in survey of "non-restricted" pesticide use.]
II.A.4.	Federal agencies, including EPA, the U.S. Department of Agriculture (USDA), and NOAA should fund additional research on the fate of nutrients and pesticides, and the effectiveness of BMPs in interrupting their transport.	EPA,USDA, NOAA	

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CODE	POLICY	AGENCIES	STATUS
II.A.5.	The recently established RIDEM Division of Water Supply Management, in cooperation with the RIDEM Divisions of Agriculture, Groundwater and Water Resources, and representatives of affected users, should develop a more detailed water supply management plan to complement that being prepared by the RIDOP. The supplemental plan should include an analysis of environmental impact on drinking water supplies, including the impact of private withdrawals, the relationships between groundwater and surface water flows, the status of recharge areas, and the effect of out-of-basin transfers on fish and wildlife and habitat needs, and downstream water quality. This activity must be coordinated with water supply utilities and municipalities charged with the development of water supply management plans. a. The RIDEM Groundwater Division, in cooperation with the U.S. Geological Survey (USGS), should begin to assess the impact of groundwater withdrawals on stream flow for those aquifers which are approaching "safe-yield." b. The USDA Soil Conservation Service (SCS) should complete the compilation and evaluation of the agricultural water use inventory, and publish the results. c. The water supply management plan developed pursuant to Recommendation II.A.5. should become a part of the *Rhode Island State Guide Plan.* d. Equivalent Massachusetts agencies should begin to prepare a similar water supply management plan.	RIDEM, USGS, USDA, municpalities, water suppliers, Mass. counterparts	[See USGS, USDA SCS, and RIDEM "Preliminary Agreements," Section 715-05-06 re: development of water use databases.]

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II.A.6.	The USDA SCS and RIDEM should evaluate the effect of farming activities on wetlands in the Narragansett Bay basin. a. The USDA SCS should determine the number of acres of wetlands on farms in the Bay basin based upon both the 1990 Farm Bill and hydric soil definitions of wetlands. The USDA SCS should also determine the number of acres of wetlands currently being farmed in order to determine eligibility for USDA subsidies, and report its findings to the public. [Note: The definition of "wetlands" in the 1990 Farm Bill differs from the Federal Clean Water Act (Section 404) and Rhode Island Freshwater Wetlands Act (R.I.G.L. 2-1-22) definitions. In addition, farmers who cultivate or use wetlands for farming purposes, as defined in the 1990 Farm Bill, are no longer eligible for USDA subsidies.] b. The RIDEM Division of Agriculture should provide the RIDEM Division of Freshwater Wetlands and the public with annual reports regarding the number of agricultural exemptions granted from the Rhode Island Freshwater Wetlands Act with respect to wetland alteration and water withdrawal.	USDA SCS, RIDEM	[See USDA SCS "Preliminary Agreement," Section 715-05-06 re: survey of water, nutrient, and pesticide use, soil loss and wetlands.]
II.A.7.	The Conservation Districts and USDA SCS should report to the public on the impacts of the 1985 and 1990 Farm Bills in addressing the cropland soil erosion problem in the Bay watershed. The report should include an assessment of the work remaining to be done once the approved erosion control plans are fully implemented.	USDA SCS, Conservation Districts	[See USDA SCS "Preliminary Agreement," Section 715-05-06 re: survey of water, nutrient, and pesticide use, soil loss and wetlands.]
II.A.8.	The State Floodplain Managers, the U.S. Army Corps of Engineers (ACOE) and USDA SCS should review their files to determine the feasibility of updating existing floodplain management studies, and report their findings to the State and Coastal Nonpoint Source Coordinators and the Rhode Island and Massachusetts EDCs.	ACOE, USDA SCS, state Floodplain managers	

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II.A.9.	The Massachusetts and Rhode Island EDCs should work with the Massachusetts Department of Environmental Protection (MADEP), RIDEM, the Rhode Island and Massachusetts Departments of Transportation (RIDOT/MADOT), Conservation Districts, Massachusetts Coastal Zone Management (MACZM), and Rhode Island Coastal Resources Management Council (CRMC) to develop a simplified system for recording the type and location of permitted activities and BMPs. The Rhode Island and Massachusetts Nonpoint Source Coordinators will be responsible for collecting and entering this information, depending on funding availability.	RIDOP, RIDEM, CRMC, RIDOT, URI EDC, Mass. counterparts	[See USDA SCS "Preliminary Agreement," Section 715-05-06 re: submittal of site-specific data to state databases.]

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II.B.	The Rhode Island and Massachusetts *Nonpoint Source Assessments* and Section 319 *Nonpoint Source Management Plans* should be prepared in a manner that is useful to implementing agencies and organizations, as well as meeting the requirements of the CWA and final guidance developed for the states' CZMA Section 6217 CNPCPs. 1. An assessment should be made of those segments of the Blackstone and Taunton Rivers which were not evaluated in the Massachusetts *Nonpoint Source Assessment*. 2. The states' Section 319 *Nonpoint Source Assessments* should include information on wetlands impacts and priorities, including identification of historic wetlands that should be targeted for restoration. 3. As part of the update of the Rhode Island and Massachusetts *Nonpoint Source Assessments*, the Conservation Districts should report to the Nonpoint Source Coordinators on the status of cropland erosion within the watersheds of priority waterbodies. 4. Results of citizens' monitoring programs should continue to be incorporated into Rhode Island and Massachusetts *Nonpoint Source Assessments*. These programs should be encouraged and expanded, with permanent funds for coordinating the programs. 5. The Rhode Island and Massachusetts *Nonpoint Source Assessments* and Section 319 *Nonpoint Source Management Plans* priorities should be used in determining funding and establishing projects for nonpoint source planning and implementation. These priorities should be used to implement the states' CZMA Section 6217 CNPCPs, and should be reconciled with the states' 305(b) and 303(d) waterbody priority lists to the maximum extent possible. An Executive Summary should be prepared to allow agencies and organizations to quickly determine priority waterbodies and the specific nonpoint source problems associated with them. The Executive Summary should be distributed widely.	RIDEM, CRMC, MADEP, MACZM, all nonpoint source implementing authorities	[See "Preliminary Agreements," Section 715-05-06; EPA Region I re: nonpoint source assessments in the Blackstone and Taunton River basins; RIDEM and USDA SCS re: use of citizen-collected data in nonpoint source assessment; USDA SCS re: compilation of water, nutrient, pesticide use, and soil loss data.]

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RECOMMENDED POLICIES AND ACTIONS
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III.	Adjust state regulatory programs to improve nonpoint source management.		
III.A.	The Section 401 Water Quality Certification process should be used by RIDEM and MADEP as one procedure for reviewing nonpoint source pollution controls for all proposed land development activities subject to state environmental controls and that require federal licenses or permits, unless or until more specific regulatory requirements are developed. 1. RIDEM and MADEP should adopt regulations related to nonpoint source control for the Section 401 Water Quality Certification program as soon as possible. These regulations should include applicability criteria, and provisions for the review and certification of the proposed management of stormwater and nutrients, and soil erosion and sediment control. 2. RIDEM, CRMC, and appropriate Massachusetts agencies should incorporate relevant nonpoint source pollution control regulations and policies into existing environmental permit programs. 3. RIDEM, CRMC, and appropriate Massachusetts agencies should evaluate the extent to which environmental permit programs currently address nonpoint sources of pollution and should revise their regulations and policies accordingly using the final CZMA Section 6217 guidance as the basis for determining minimum nonpoint source control requirements; 4. RIDEM, RIDOP, and CRMC should work closely to develop a CZMA Section 6217 Coastal Nonpoint Pollution Control Program that results in improved regulation of nonpoint sources of pollution through existing environmental permits programs and planning programs; 5. RIDEM, RIDOP, and CRMC, in formulating the CZMA Section 6217 CNPCP, should evaluate the extent to which new regulatory authority is needed to control nonpoint sources of pollution at both state and local levels and develop these programs with broad input from the public and local governments; and 6. RIDEM and CRMC should involve the local governments and the public in implementing this recommendation and coordinate efforts and public input using an advisory committee structure.	RIDEM, CRMC, RIDOP, MADEP	RIDEM expects to release amended water quality regulations for public comment in 1992.

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III.B.	RIDEM and MADEP regulatory programs should be revised as quickly as possible to include stormwater management regulations. The draft stormwater regulations prepared by RIDEM's Division of Water Resources should be adopted. Revision of the regulations should be a high priority. 1. Rhode Island and Massachusetts should provide adequate staff to enforce the stormwater regulations. Active regular and periodic on-site inspections by agency personnel will be absolutely necessary to ensure compliance with the programs. 2. The posting of performance bonds or irrevocable letters of credit should be considered as a condition to assure compliance with the stormwater requirements to the satisfaction of the respective regulatory agency.	RIDEM, MADEP	RIDEM expects to release amended RIPDES regulations, including stormwater management requirements, for public comment in 1992.

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III.C.	The EPA should establish a procedure for targeting those storm drain outlets with the greatest environmental impacts first, and should prioritize the discharges using criteria consistent with the Section 319 *Nonpoint Source Management Plan* waterbody prioritization process. 1. A storm drain notification and improvement program should be jointly developed between RIDEM Division of Water Resources, MADEP Division of Water Pollution Control and the municipalities in priority watersheds to retrofit storm drain outlets for pollution abatement consistent with National Pollutant Discharge Elimination System (NPDES) program requirements on a worst-case-first basis. 2. The State of Rhode Island should establish priorities for abating and/or eliminating significant stormwater discharges to prevent adverse impacts to receiving waters. These priorities should recognize the need to regulate new discharges; abate existing discharges; prevent shifting pollutants to the groundwater; and should be linked to the level of impact on the receiving water. 3. Rhode Island cities and towns should systematically survey all storm drains in their jurisdictions in order to detect illegal, dry weather flows to Narragansett Bay and its tributaries. RIDEM, the Rhode Island Department of Health (RIDOH), CRMC, EPA, and local governments should collaborate to eliminate these inputs. 4. Shoreline survey data collected by citizens' monitoring groups should be used by the state and local implementing authorities to detect illegal dry weather storm drain flows.	EPA, RIDEM, CRMC, RIDOH, Mass. counterparts	[See "Preliminary Agreements," Section 715-05-06; EPA Region I re: technical assistance to municipalities in identifying illegal dry weather discharges; USDA SCS re: storm drain inventories.]

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III.D.	Within two years, pesticide regulations should be revised as needed to reflect special considerations within the watersheds of priority waterbodies, following a review of information from other jurisdictions and Categories 1 and 3 applications within those watersheds. Possible considerations should include: • Category 1 applicators (Agricultural Pest Control) must implement a pest management plan approved by the local Conservation District in order to remain eligible for certification (with an appeals process set up through the RIDEM Division of Agriculture and MAFA). • Category 3 applicators (Ornamental and Turf Pest Control) must maintain records of the soil/pesticide interaction analyses they perform when selecting pesticides for specific sites within the priority sub-basins. Those records must be available to the RIDEM Division of Agriculture and MAFA on demand.	RIDEM, MAFA	
III.D.1.	During the certification test, Category 3 Commercial Applicators (Ornamental and Turf Pest Control) should demonstrate their ability to use the soil survey, soil sensitivity ratings, and pesticide ratings.	RIDEM, MAFA	
III.D.2.	The "water quality considerations" portion of the pesticide applicators' training program should be strengthened. Funding for homeowner and applicator pesticide training should be increased.	RIDEM, MAFA	
III.D.3.	The RIDEM Division of Agriculture and MAFA should review pesticide labels and revise as appropriate to include water quality considerations.	RIDEM, MAFA	[See USDA SCS "Preliminary Agreement," Section 715-05-06 re: review of pesticide labeling.]

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III.E.	The RIDEM Division of Agriculture, MAFA, MADEP Division of Water Pollution Control, RIDEM Division of Water Resources, and the Conservation Districts should develop a nutrient management program comparable to the Highly Erodible Land program of the Farm Bills. Land uses should be identified that may need nutrient management plans, and criteria for evaluating whether plans are needed should be developed. Once plans are determined to be needed, property owners or designated land managers should be required to implement plans approved by the local Districts. These plans should consider the agricultural nonpoint source pollution management measures presented in the guidance for development of CZMA Section 6217 CNPCPs.	RIDEM, MAFA, MADEP, Conservation Districts	[See USDA SCS "Preliminary Agreement," Section 715-05-06 re: development of nutrient management strategy with state agencies.]
III.E.1.	The RIDEM Division of Agriculture, MAFA, MADEP Division of Water Pollution Control, RIDEM Division of Water Resources, the Conservation Districts, and USDA agencies shall develop an enforcement strategy to address noncompliance with the nutrient management program, which includes linkage to benefit programs. Other enforcement options will need to be considered for those who do not participate in benefit programs. The development of the enforcement strategy should be coordinated with development of the states' CZMA Section 6217 CNPCPs to the maximum extent practicable.	RIDEM, MAFA, MADEP, Conservation Districts	
III.E.2.	The RIDEM Division of Agriculture and MAFA should require labels on fertilizers which describe the proper use, and potential water quality problems associated with the improper use of fertilizers.	RIDEM, MAFA	
III.E.3.	Applications of sewage or septage sludge in any form to cropland and forestland needs to be carefully regulated, so as to minimize future problems related to pathogens and toxic pollutant residues.	RIDEM, RIDOH, MADEP, MADPH	
III.E.4.	Composting of animal wastes and/or sewage sludge with leaves and grass clippings should be further demonstrated, researched and encouraged. In Rhode Island, RIDEM and the Solid Waste Management Corporation should coordinate composting activities with the Rhode Island Sustainable Agriculture Committee (RISA).	RIDEM, SWMC, RISA, Mass. counterparts	

✓ - High Priority Action

RECOMMENDED POLICIES AND ACTIONS
SOURCE REDUCTION: NONPOINT SOURCES

CODE	POLICY	AGENCIES	STATUS
III.F.	RIDEM, in cooperation with RIDOT and the Attorney General's Office, should establish a team of consistency reviewers to monitor state and local contractor compliance with contract specifications for control of highway and road runoff. Similar efforts to improve highway-related nonpoint source pollution control should be undertaken in Massachusetts. These efforts should be coordinated with the development of the Section 6217 program in each state such that Section 307 federal consistency authority applies to projects using federal financial assistance.	RIDEM, RIDOT, R.I. Atty. Gen. Office, Mass. counterparts	[See USDA SCS "Preliminary Agreement," Section 715-05-06 re: oversight of Conservation District Site Inspection Services.]
IV.	Improve the effectiveness of municipal and land user efforts to implement nonpoint source controls.		
IV.A. ✓	**As soon as possible, nonpoint source public information efforts should be coordinated by the involved agencies and organizations to reduce unnecessary duplication of effort, and to demonstrate united concern.** **1. The State and Coastal Nonpoint Source Coordinators should ensure that the coordination of information and outreach activities continue.** **2. The University of Rhode Island and University of Massachusetts Cooperative Extension Services should, in consultation with the State and Coastal Nonpoint Source Coordinators, develop, collect and disseminate materials on nonpoint source issues.**	**All R.I. and Mass. organizations with nonpoint source education programs**	**[See USDA SCS and CRMC "Preliminary Agreements," Section 715-05-06 re: coordination of outreach materials.]**
IV.B. ✓	**Rhode Island and Massachusetts agencies and organizations should increase efforts to educate and assist municipalities on the sources of nonpoint source pollutants, their effects on natural resources, and implementation of BMPs.**	**All R.I. and Mass. organizations with nonpoint source education programs**	**[See RIDEM, RIDOP, and CRMC "Preliminary Agreements," Section 715-05-06 re: proposed public education and technical assistance.]**
IV.B.1. ✓	**The State and Coastal Nonpoint Source Coordinators and RIDOP/Massachusetts Regional Planning Agencies should develop a comprehensive training program for municipal boards and officials on nonpoint source issues and use of the guidance handbooks referenced in Recommendation I.C.1.**	**State Nonpoint Source Coordinators, RIDOP, Mass. counterparts**	**[See RIDOP "Preliminary Agreement," Section 715-05-06 re: development of training program for local officials and board members.]**

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RECOMMENDED POLICIES AND ACTIONS
SOURCE REDUCTION: NONPOINT SOURCES

CODE	POLICY	AGENCIES	STATUS
IV.B.2.	Rhode Island municipalities should adopt the Soil Erosion and Sediment Control Ordinance to reduce, to the greatest extent possible, the loss of soil and sediment to receiving waters. The Massachusetts Nonpoint Source Coordinator and Conservation Districts should review and adopt consistent regulations and ordinances as needed for Massachusetts municipalities.	R.I. and Mass. municipalities	Twelve of thirty-nine R.I. municipalities have adopted the Soil Erosion Ordinance as of 6/92; ten are considering adoption of revised ordinance.
IV.B.3.	Within two years of adoption of the new freshwater wetlands regulations that include provisions for stormwater management, the State and Coastal Nonpoint Source Coordinators should determine the need for development of a model stormwater management ordinance and enabling legislation for adoption by all municipalities. The model ordinance should stipulate that wetlands cannot be used for primary treatment of stormwater, and should be considered as a potential "enforceable policy" in the state's CZMA Section 6217 CNPCP.	State Nonpoint Source Coordinators	
IV.B.4.	The Rhode Island Conservation Districts should continue to offer site plan review and inspection services to municipalities. Massachusetts Conservation Districts should implement a similar program.	R.I. and Mass. Conservation Districts	[See USDA SCS "Preliminary Agreement," Section 715-05-06 re: Conservation Districts.]
IV.B.5.	The State and Coastal Nonpoint Source Coordinators, RIDOP, RIDOT, MADOT, and Massachusetts Regional Planning agencies should encourage and consider requiring the use and maintenance of BMPs on local and private road projects to minimize highway and road runoff. These agencies should also encourage the use of appropriate source reduction measures such as minimizing the amount of paved surface; reducing the volume of traffic by encouraging mass transit and alternative means of transportation; and supporting more stringent motor vehicle emission standards. These efforts should be coordinated with the development of the states' CZMA Section 6217 CNPCPs to the greatest extent possible.	RIDEM, CRMC, RIDOP, RIDOT, Mass. counterparts	
IV.C.	The USDA Agricultural Stabilization and Conservation Service (ASCS), USDA SCS, and the University of Rhode Island and University of Massachusetts Cooperative Extension Services should complete their Regional Project Plans of Work as soon as possible, and begin implementation efforts as quickly as funding is found.	USDA agencies	

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RECOMMENDED POLICIES AND ACTIONS
SOURCE REDUCTION: NONPOINT SOURCES

CODE	POLICY	AGENCIES	STATUS
IV.C.1. ✓	**Among the information efforts to be coordinated as recommended in Recommendation IV.A. should be a strong information campaign to help the public identify nonpoint source problems in surface waters, including wetlands.**	**All R.I. and Mass. organizations with nonpoint source education programs**	
IV.C.2. ✓	**The Rhode Island Sustainable Agriculture Committee (RISA) should be used as an information tool by its sponsors. A similar Committee should be established in the Massachusetts' portion of the watershed.**	**USDA, RIDEM, Mass. counterparts**	
IV.C.3. ✓	**Among the information efforts to be coordinated as recommended in Recommendation IV.A., an information strategy and materials aimed at homeowners' use of water, pesticides and fertilizers should be developed. The Cooperative Extension Service should be the lead agency for this effort. The program should receive yearly funding (rather than grant monies) from federal, state, and local sources.**	**R.I., Mass., Cooperative Extensions**	[See USDA SCS "Preliminary Agreement," Section 715-05-06 re: homeowner education.]
IV.C.4.	The USDA agencies should develop a strategy for expanding integrated pest management (IPM) programs to additional crops and pests. Leadership and staff support for the strategy should be provided by the Cooperative Extension Service.	USDA agencies, RIDEM, MAFA	[See USDA SCS "Preliminary Agreement," Section 715-05-06 re: integrated pest management program development.]
IV.C.5.	Nutrient management demonstrations should include lower-fertility crop varieties, high-yielding early corn varieties, and earlier-established cover crops, all of which will reduce autumn movement of nitrate. Demonstration sites should be established for homeowners as well as farmers.	R.I. and Mass. Cooperative Extensions	
IV.C.6.	The URI soil-testing lab should improve its services to provide traditional soil test results in a more timely manner, and add manure testing and June nitrate tests. Adequate staff and equipment must be provided by the University, and supported by increased testing fees.	R.I. and Mass. Cooperative Extensions	
IV.C.7.	The Universities of Massachusetts and Rhode Island should expand their research on vegetative and cultural practices to reduce the movement of soil and its attached pollutants.	R.I. and Mass. Cooperative Extensions	

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RECOMMENDED POLICIES AND ACTIONS
SOURCE REDUCTION: NONPOINT SOURCES

CODE	POLICY	AGENCIES	STATUS
IV.C.8.	The USDA ASCS, USDA SCS, the University of Rhode Island and University of Massachusetts Cooperative Extension Services, the RIDEM Division of Agriculture, and MAFA should carefully review the 1990 Farm Bill guidelines when they are issued, to determine the feasibility of financial assistance in the establishment of buffer zones for agricultural lands adjacent to surface waters.	USDA agencies, RIDEM, MAFA	
IV.C.9.	RIDEM/MADEP should prepare an information pamphlet clarifying federal and state wetlands regulations.	RIDEM, MADEP	
IV.C. 10.	The EPA, NOAA, USDA, and the U.S. Fish and Wildlife Service should encourage research on wetlands, including their water quality improvement and wildlife habitat functions, and should prepare educational materials to communicate this information to the public.	EPA, NOAA, USDA, USFWS	
IV.D.	The State of Rhode Island and the Commonwealth of Massachusetts should provide financial encouragement for the adoption of BMPs for nonpoint source pollution control on agricultural land. 1. The tax-exempt provisions of R.I. Chapter 44-3-3 (22) should be amended to apply to the installation of BMPs. The RIDEM Division of Agriculture, MAFA and Division of Taxation should explore other tax credit options for farmers implementing conservation management systems, or who are certified conservation farmers. 2. Permanent state funding programs, including grants and revolving loans, should be established within the RIDEM Division of Agriculture and MAFA to assist with the cost of waste storage structures and other high-cost BMPs.	RIDEM, MAFA	

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Cost Estimate Table—Source Reduction: Nonpoint Source

Table 715-04(7) summarizes the estimated costs associated with implementing the recommendations in this chapter. The major cost associated with Element I (Guidance and Standards) is the establishment of interstate and interagency Nonpoint Source Advisory Committees composed of representatives of federal, state, and local environmental agencies. These committees would require a low level of ongoing agency funding to guarantee attendance at meetings. Element II (Waterbody Assessment) includes a one-time cost of $90,000 for the development of a Water Supply Management Plan, a cost that will be shared by RIDEM, RIDOP, water supply companies, and Rhode Island municipalities. The recommended survey of non-restricted pesticide use is costed under 04-01-01 Source Reduction: Toxics.

The Nonpoint Source chapter's largest costs are clustered in Element III (Regulatory Programs). Major staff-intensive actions include regulating significant storm drains via NPDES/RIPDES permitting ($671,000) and surveying storm drains throughout the Narragansett Bay watershed to eliminate dry-weather flows ($5,102,500). These larger costs represent policy development, monitoring and permitting of stormdrains, sampling and analysis of stormdrain effluent, identification and mapping of storm drains, the provision of technical assistance to the 60 municipalities within the Bay watershed, as well as possible legislative actions needed to provide survey funding. The costs of these major actions fall mainly to municipalities within the Bay watershed, although costs could be reduced somewhat by using shoreline survey data collected by citizens' monitoring groups to identify illegal dry weather flows. Post-1997 costs to municipalities for storm drain surveying efforts are estimated at $195,000 annually for all Rhode Island municipalities and $300,000 annually for all Massachusetts municipalities within the Bay watershed. Businesses and individuals with illegal storm drain connections will be required to pay for disconnection and system repair.

Element III also contains recommendations for the use of contract consistency reviewers (to be used on a cost-recovery basis), the development of nutrient management plans (with associated implementation costs for private livestock owners), and a survey of stormdrains in proximity to shellfish beds. Stormwater management regulations recommendations are partially costed under 04-02-01 Resource Protection: Land Use. Future stormwater management activities could include capital costs for retrofitting existing storm drains and structural BMPs (best management practices); it was not possible to estimate these costs as the extent of retrofitting has not yet been determined.

Element VI (Municipal and User Efforts) recommends a coordinated public education effort by all state and federal agencies (costed under Elements I and II). The largest cost associated with this element is the $250,000 annual cost of RIDEM and MADEP continuing to offer site plan review and inspection services to municipalities. Also included are recommendations for public education on wetlands regulations and the adoption of consistent soil erosion and sediment control ordinances throughout the Bay watershed. Recommendations concerning training on nonpoint source issues for municipal boards and officers are costed under 04-02-01 Resource Protection: Land Use.

Rhode Island and Massachusetts municipalities would be responsible for most of the costs associated with implementing this section of the *CCMP*. If *Nonpoint Management Plans* developed for municipalities require the retrofitting of existing storm drains, municipalities could face substantial capital costs; these costs will vary from community to community depending upon the type and amount of retrofitting to be done. Requiring state transportation agencies to use BMPs when constructing or repairing state highways could add significant costs to highway projects. Coordination, planning, public education, and technical assistance activities for RIDEM and MADEP would require significant additional funding for personnel.

For further details regarding the *CCMP* cost estimation process and funding strategies, refer to the *Narragansett Bay CCMP Cost Estimation and Funding Report* (Apogee Research Inc./NBP, 1992).

Table 715-04(7)

ESTIMATED COST OF IMPLEMENTATION
SOURCE REDUCTION: NONPOINT SOURCES

COST ESTIMATES BY ELEMENT

	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
I-Guidance and Standards	103,750	0	30,000	0	30,000	0	30,000	0	30,000	0	223,750	0
II-Waterbody Assessment	115,000	0	5,000	0	5,000	0	5,000	0	5,000	0	135,000	0
III-Regulatory Programs	232,500	0	55,000	0	479,500	85,000	2,877,000	85,000	2,777,000	85,000	6,421,000	255,000
IV-Municipal and User Efforts	377,500	12,000	310,000	12,000	366,250	12,000	260,000	12,000	260,000	12,000	1,573,750	60,000
TOTALS	828,750	12,000	400,000	12,000	880,750	97,000	3,172,000	97,000	3,072,000	97,000	8,353,500	315,000
TOTAL BY YEAR		840,750		412,000		977,750		3,269,000		3,169,000		8,668,500

COST ESTIMATES BY AGENCY

	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
RIDEM	367,500	6,000	165,000	6,000	391,250	6,000	315,000	6,000	215,000	6,000	1,453,750	30,000
RI CRMC	5,000	0	5,000	0	5,000	0	5,000	0	5,000	0	25,000	0
RIDOP	5,000	0	0	0	0	0	0	0	0	0	5,000	0
RIDOH	5,000	0	0	0	0	0	0	0	0	0	5,000	0
RIDOT	10,000	0	10,000	0	60,000	0	60,000	0	60,000	0	200,000	0
RI EDC	5,000	0	0	0	0	0	0	0	0	0	5,000	0
RI Atty. General's Office	0	0	0	0	50,000	0	50,000	0	50,000	0	150,000	0
MADEP	298,750	6,000	210,000	6,000	211,250	6,000	210,000	6,000	210,000	6,000	1,140,000	30,000
MACZM	5,000	0	5,000	0	5,000	0	5,000	0	5,000	0	25,000	0
MA EOTC	5,000	0	5,000	0	5,000	0	5,000	0	5,000	0	25,000	0
MAFA	12,500	0	0	0	0	0	0	0	0	0	12,500	0
Municipalities*	35,000	0	0	0	153,250	85,000	2,522,000	85,000	2,522,000	85,000	5,232,250	255,000
Conservation Districts	45,000	0	0	0	0	0	0	0	0	0	45,000	0
Water Supply Utilities	30,000	0	0	0	0	0	0	0	0	0	30,000	0
TOTALS	828,750	12,000	400,000	12,000	880,750	97,000	3,172,000	97,000	3,072,000	97,000	8,353,500	315,000
TOTAL BY YEAR		840,750		412,000		977,750		3,269,000		3,169,000		8,668,500

* Ultimate implementation costs will vary for each municipality depending on its particular environmental and institutional conditions. In addition, the estimated municipal implementation costs do not include ultimate program and capital costs that may result from completion of underlying planning activities, or costs that are expected to be completely recoverable from user fees.

04-02 Resource Protection

The health of the Narragansett Bay ecosystem is integrally related to patterns of population growth and development in the Bay basin, as well as to the degree and manner in which Bay resources are used and exploited. The distribution and density of residential, commercial, and industrial development dictate the point of discharge, volume, and chemical characteristics of both direct wastewater discharges and stormwater runoff. As a result, the location, type, and density of development directly affect water quality-dependent uses of the Bay, as well as public health. The location and density of development also determine the remaining distribution of undisturbed breeding and nursery habitats for Bay-dependent species. In addition, consumptive uses of Bay resources, including fishing, shellfishing, and alteration of aquatic habitats, directly affect the status of individual species, and indirectly affect the function of the ecosystem.

This section addresses use and management of the land with respect to the region's need to reduce pollutant loadings, protect public health, and protect the function of remaining critical resource areas. This section also addresses the use and management of living natural resources with respect to the need to protect public health, as well as to protect the resources themselves for their commercial, recreational, and ecological value.

04-02-01 Land Use

Objective for Land Use

The State of Rhode Island and the Commonwealth of Massachusetts should adopt land use management strategies for the long-term water quality protection of Narragansett Bay and its tributaries, and for the mitigation of existing land-use derived contamination sources, wherever possible.

Introduction

The scientific community and regulatory agencies recognize that water quality is strongly related to land use (RIDOA, 1990a). The water quality impacts on Narragansett Bay from an individual residential subdivision, commercial mall, or industrial park may not always, by themselves, be of serious concern. However, the cumulative impacts from all development—past, present, and future—may pose a very serious threat. If current regulations provide limited control over the conversion of open space to more intensive land uses, it becomes crucial to manage future growth in a manner that will not adversely affect water and habitat quality, while at the same time providing sites for economic development, housing, and other needs (RIDOA, 1991:2).

Statement of the Problem

Although the Narragansett Bay basin is believed to have been occupied by humans for over 10,000 years, the most significant human-induced (anthropogenic) changes in the landscape date from the period of European colonization and settlement beginning in the 1600s. The most visible consequence of European settlement in the Narragansett Bay basin is the physical modification, or outright destruction, of natural features such as forests, wetlands, the shoreline, and river flow and drainage patterns. However, the development of open space within the watershed, including the dredging and filling of wetlands, can also disrupt the natural hydrological cycle, increase stormwater runoff, promote erosion and result in the incremental physical destruction of natural habitats.

Based on 1988 aerial survey data, 36 percent of Rhode Island can be described as "developed", and an additional seven percent of the state is in active agricultural use (RIGIS, 1991). The remaining 57 percent of the state's 1988 land cover is classified as undeveloped 'open space': 39 percent forested, 15 percent open water and wetlands, and three percent 'barren' (RIGIS, 1991). However, there are no remaining stands of virgin forest in the state, and a 15 percent decrease in forested lands occurred between 1982 and 1988 (RIDOA, 1989a: 4.15). Similarly, the U.S. Department of Interior National Wetlands Inventory estimates that 37 percent of Rhode Island's wetlands were filled or destroyed between the 1780s and the 1980s (USFWS, 1990), noting that many of the region's oldest cities, including Providence, were built on filled wetlands and tidelands in the 1600s. In addition, all of Rhode Island's major rivers are dammed—the U.S. Geological Survey (USGS) notes that in the 1800s, dams were constructed at one mile intervals along the Blackstone River and its tributaries (Ries, 1990: 4), and several have been physically relocated to accommodate urban development. There are also significant out-of- basin water withdrawals from many of the region's river basins (Ries, 1990: 6). The ultimate consequence of this history and pattern of land use in the Narragansett Bay basin is habitat loss and degradation, and decrease in biological diversity associated with habitat loss.

The integrity of ecosystem quality and function throughout the Bay watershed is also affected by population density and the generation of pollutants in concentrations and volumes greater than the environment's assimilative capacity. Approximately 1.8 million people reside in the Narragansett Bay basin based on 1980 census figures—887,863 in Rhode Island and 949,465 in Massachusetts—making the basin one of the most densely populated estuarine watersheds in the nation. For example, the population density in the Narragansett Bay basin is 1,109 people per square mile (mi^2)—1,375 people/mi^2 in the Rhode Island portion of the basin—compared to a national average of 64 people/mi^2, 90 people/mi^2 in the Albemarle-Pamlico Sound, 200 people/mi^2 in the Chesapeake Bay basin, 600 people/mi^2 in Massachusetts' Buzzards Bay basin and 1,000 people/mi^2 in the Long Island Sound basin (NOAA, 1990). Although Providence and Warwick, Rhode Island, and Worcester, Massachusetts continue to be the major population centers in the Bay basin, the trend in recent decades is toward increased suburbanization and development of rural areas (RIDOA, 1989a: 4.7).

Social consequences of the rate and pattern of population growth in the Bay basin include increasing demand on drinking water supplies associated with increased population and associated infrastructure, and an increased burden on wastewater treatment systems. There are 33 publicly owned wastewater treatment facilities (WWTF) in the basin, discharging approximately 250 million gallons per day of treated domestic and industrial wastewater to Narragansett Bay and its tributaries. However, 12 of Rhode Island's municipalities are completely unsewered, and approximately 37 percent of Rhode Island's population is served by on-site sewage disposal systems or OSDS (RIDOA, 1989a: 5.11). As a direct result of WWTF discharges, combined sewer overflows (CSO), and failed or failing OSDSs, 40 percent of the Bay is currently restricted to shellfish harvesting due to actual or suspected fecal contamination of coastal waters (RIDEM, 1992).

In general, land use controls have not been very effective in mitigating pollutant impacts on receiving waters. For example, the Rhode Island Coastal Resources Management Council (CRMC) recommended two acre zoning to reduce OSDS densities in the Salt Pond (1984) and Narrow River (1986) Special Area Management (SAM) Plans, and the Town of South Kingstown endorsed the recommendations in its 1986 Comprehensive Land Use Plan. However, in 1990, the Towns of South Kingstown and Narragansett were awarded Rhode Island Aqua Fund grants to assist in sewering the Narrow River to alleviate failing OSDS and stormwater problems; and, in 1991, the Rhode Island Department of

Environmental Management (RIDEM) permanently closed the upper end of Point Judith Pond to shellfishing because of fecal contamination.

In addition, wastes generated by domestic, commercial, industrial, urban and agricultural activities in the basin have resulted in contamination of ground and surface waters. The RIDEM estimates that 510 miles of 674 assessed river miles (76 percent) are fully supporting their designated uses, *i.e.*, not exceeding acute toxicity criteria for the protection of public health or aquatic life. However, 45 percent of the state's river miles are identified as threatened, *i.e.*, chronic toxicity criteria are periodically exceeded by nonpoint and/or point sources of pollution, although fully supporting their designated uses. An additional 25 percent of the state's rivers are only partially supporting or not supporting their designated uses in terms of protection of aquatic life and/or swimmable standards as the result of nonpoint and/or point sources of pollution (RIDEM, 1992).

Population trends in the Bay basin pose increasing future risks to the environment. The Rhode Island Division of Planning (RIDOP) has projected an average 20 percent growth rate for Rhode Island's suburban and rural communities between 1985 and 2010, compared to a 2.6 percent growth rate in the state's cities, and a statewide growth rate of 9.5 percent (RIDOA, 1989a: 4.1). Although 69 percent of the state's population already lives in a coastal city or town (RIDOA, 1989a: 4.14), coastal communities are expected to grow more rapidly than the state averages. For example, the RIDOP estimates that the populations of coastal communities such as Charlestown, Narragansett, North Kingstown, Portsmouth, Jamestown, and East Greenwich will grow by 56 percent, 33 percent, 31 percent, 27 percent, 21 percent, and 21 percent, respectively, between 1985 and 2010. Based on these growth projections, an additional 128,700 acres of raw land, including accessory services such as roads, schools, *etc.*, will be developed by 2010 (RIDOA, 1989a: 5.22). At this projected rate of development, the State of Rhode Island will be 88 percent developed by 2010 (RIDOA, 1989a: 5.22). If this trend toward suburbanization and development of rural areas materializes—noting that RIDOP's projections of 1990 population were within .08 percent of the 1990 census figures, statewide—there will be profound consequences for the state's wastewater and waste disposal infrastructure, as well as the state's natural resources and remnant critical areas related to habitat loss and degradation.

In summary, land use, population distribution, and population density impose different, although related, effects on the environment. In the absence of appropriate land use and growth management controls, development standards and environmentally sensitive design, increasingly intensive residential, urban, commercial, and industrial uses will degrade surface and groundwater quality, damage or destroy critical resources, and ultimately limit future use and enjoyment of available natural resources (RIDOA, 1991:1-2).

Existing Policies

A growing body of federal and state water quality regulation recognizes the relationship between water quality and land use. The federal Water Pollution Control Act of 1972 (the Clean Water Act or CWA), as amended, established a national goal of controlling nonpoint sources of water pollution through a variety of planning initiatives, including the Section 208 Areawide Waste Treatment Management Program, the Section 319 Nonpoint Source Pollution Management Program, and the Section 320 National Estuary Program. Rhode Island and Massachusetts adopted Section 208 Areawide Basin Plans in the late 1970s that address various land use effects on water quality. In addition, both states have adopted state nonpoint source management plans in conformance with Section 319 of the Act, and both states participate in the U.S. Environmental Protection Agency (EPA) National Estuary Program.

The Coastal Zone Management Act (CZMA) reauthorization amendments of 1990 similarly recognize the effects of land use on water quality. Section 6217 of the CZMA reauthorization amendments of 1990 specifi-

cally requires each coastal state with a federally approved coastal zone management program to develop a "Coastal Nonpoint Pollution Control Program (CNPCP)" in cooperation with the state's Nonpoint Source Management, National Estuary and Section 208 Basin Planning Programs for approval by the EPA and the National Oceanic and Atmospheric Administration (NOAA). Unlike the federal CWA planning initiatives, the CZMA reauthorization amendments also require state CNPCPs to contain "enforceable policies" and mechanisms to implement nonpoint pollution management in the coastal zone (P.L. 101-508). [See 04-01-07 Source Reduction: Nonpoint Sources for a more complete discussion of federal nonpoint source control initiatives.]

State Programs

The RIDEM is the designated state water pollution control agency in Rhode Island under Chapter 46-12 of the Rhode Island General Laws. The RIDEM is responsible for the implementation of the applicable provisions of the CWA and the state Water Pollution Act. The RIDEM also establishes water quality standards and maintains them by implementing various regulatory programs, *e.g.*, for point source discharges (the Rhode Island Pollution Discharge Elimination System or RIPDES), septic systems, wetlands, underground storage tanks, pesticides, solid waste, underground injection control, and water quality certifications (RIDOA, 1991:9-10).

The RIDEM does not, however, have the authority to regulate land use types or densities that may impact water quality or critical areas. For example, the RIDEM can control physical alteration and point source discharges to a wetland, but it cannot control the land use pattern within a watershed that may adversely affect the wetland (RIDOA, 1991:10). RIDEM's Nonpoint Source Management Program and the Narragansett Bay Project-affiliated Land Management Project have, however, initiated technical assistance programs for cities and towns in conjunction with a variety of federal, regional, state, local and private organizations. The technical assistance programs have focussed on developing technical guidance in the use of land use and growth management best management practices (BMPs).

The CRMC also has broad regulatory powers over specific land use activities that potentially affect the structure or function of critical coastal features such as tidal wetlands and barrier beaches. However, like the RIDEM, the CRMC lacks the statutory authority to regulate the density, or the rate or pattern of development except on a permit-by-permit basis, although the draft guidance prepared by EPA for development of state CNPCPs proposes the use of enforceable density-based onsite sewage disposal system and pollutant-based controls in order to address the cumulative environmental impacts of development (EPA, 1991a).

The Rhode Island Division of Planning (RIDOP) also lacks specific authority to regulate land uses impacting water quality. As the state's primary strategic planning agency, RIDOP historically focussed its efforts on evaluating the relationship between population distribution and trends and public infrastructure, social needs, environmental protection and the state's economic needs. However, as the custodian of the *Rhode Island State Guide Plan*, and the primary state implementing authority under the Comprehensive Planning and Land Use Regulation Act of 1988 (R.I.G.L. 45-22.2-1 *et seq.*), RIDOP promulgated guidelines for Rhode Island municipalities to follow in preparing local comprehensive plans. RIDOP's authority under the Act enables it to review local plans for consistency with agency guidelines and the *Rhode Island State Guide Plan* with respect to the effect of proposed future land use distribution and density on natural resources.

However, in spite of the federal and state initiatives on water quality, primary control over land use within the Bay watershed—the most effective means of proactively protecting water quality and other natural resources—remains with the cities and towns.

Local Environmental Protection Ordinances

There are 98 cities and towns in the Narragansett Bay watershed—33 in Rhode Island and 65 in Massachusetts. These communities generally exercise direct and exclusive control over land use within their jurisdiction, subject only to state regulatory authority over specific, statutorily defined activities. The local governments' most effective planning and regulatory tool lies in their authority to enact and enforce zoning ordinances to control the pattern and density of land use. However, some communities have also adopted land use management and environmental protection ordinances that supplement their zoning powers. Soil erosion control, stormwater management and septic system maintenance ordinances are good examples (RIDOA, 1991:34).

Until recently, there has been no mechanism or incentive for municipalities to develop consistent, environmentally protective land use policies other than through federal and state grants-in-aid programs. However, the Rhode Island Land Use Commission's efforts between 1987 and 1992 to address the issue of land use have resulted in a trilogy of sweeping land use reforms. Passage of the Rhode Island Comprehensive Planning and Land Use Regulation Act in 1988 (R.I.G.L. 45-22.2-1 *et seq.*), and the Rhode Island Zoning Enabling Act in 1991 (R.I.G.L. 45-24-27 *et seq.*) established the statutory basis for requiring Rhode Island municipalities to develop land use plans that take into account the effect of existing and projected population growth and land development on local resources. The recently passed (July 1992) Subdivision Enabling legislation prepared by the Rhode Island Land Use Commission requires similarly comprehensive changes in local governance of subdivision development.

Under the Comprehensive Planning and Land Use Regulation Act, each Rhode Island municipality is required to prepare a local comprehensive plan by December 1991 which is subject to state review and approval. Each municipality then has eighteen months following adoption of the local plan to prepare a zoning ordinance and zoning map in conformance with the approved land use plan. The plans and zoning ordinances are expected to address the effect of existing and future growth on local and shared natural resources, including drinking water supplies, aquifer recharge areas, surface waters, wetlands and significant natural and cultural resource areas. The Commonwealth of Massachusetts has established regional planning agencies which exercise some of the same comprehensive resource planning functions in Massachusetts.

A variety of organizations currently provide low-cost or no-cost programs and information sources to assist communities in planning and resource protection activities. For example, technical assistance programs are maintained by the U.S. Department of Agriculture Soil Conservation Service (USDA SCS), the University of Rhode Island (URI) Cooperative Extension Service, RIDOP's Office of Municipal Affairs, the RIDEM Nonpoint Source Management Program, the NBP-sponsored Land Management Project, the Rhode Island Resource, Conservation, and Development Area (RC&D), the Rhode Island Conservation Districts, and private organizations such as Save the Bay (RIDOA, 1991:45). In addition, the RIDOP, using state funding available pursuant to the Comprehensive Planning and Land Use Regulation Act, assisted Rhode Island cities and towns in developing Rhode Island Geographic Information System (RIGIS)-based land use maps to assist in the planning process. RIGIS maps, using updated aerial surveys, are expected to provide a consistent basis for future state and local land use planning activities.

Land Use Conflict Resolution

The resolution of conflicts arising from municipal land use decisions is handled quite differently in the State of Rhode Island and Commonwealth of Massachusetts. The Commonwealth founded a Land Court in 1898. A key focus of this court is to resolve zoning disputes with judiciary who are qualified and experienced to render decisions regarding land use issues. In Rhode Island, however, any party who is aggrieved by a

state regulatory decision affecting the private use of property must first appeal the decision through the agency's administrative appeals process before appealing the (adverse) decision in Superior Court. A party who is aggrieved by a municipal land use decision must appeal to Superior Court (RIDOA, 1991:35-36).

Analysis

Historically, the key to proactive land use control has been at the local level, in the zoning and subdivision regulations, rather than in the state system of case-by-case permitting, which is fundamentally reactive and not conducive to comprehensive management decisions (Adams and McCreary, 1989; RIDOA, 1991).

Guidance and Technical Assistance

Because water and habitat quality is linked to land use, zoning and subdivision regulations play a vital role in protecting the Narragansett Bay watershed. State and federal plans, laws, and regulations that address water quality protection cannot be effective without land use planning and management by the cities and towns. Recognizing this, state and federal officials can provide needed guidance and technical assistance to the communities to improve land use and growth management, encouraging creativity, flexibility, and the development of objective standards to address the cumulative impacts of development (RIDOA, 1991:4).

Guidance and technical assistance should include training for zoning enforcement officers, planning and zoning board members, and attorneys representing municipalities with respect to land use decisions. Training for these individuals should include all applicable land use management statutes, public meeting procedures, and potential conflict of interest standards. Training programs and minimum qualifications can be further established by the Rhode Island Chapter of the American Planning Association (APA), in conjunction with the URI, and the RIDOP. The actual training could be offered through the RIDOP or a local college or university (RIDOA, 1991:33).

Training that goes beyond the zoning and subdivision regulations is provided by the Rhode Island Conservation Districts. This is a boon to communities with special-purpose environmental protection ordinances but which lack properly trained enforcement staff, particularly since enforcement may be beyond the expertise and time constraints of the average building inspector or zoning enforcement officer. Given the complexity of federal, state, and local environmental regulations, the communities should consider appointing local environmental ordinance enforcement officers with a background in the environmental sciences or engineering (RIDOA, 1991:34).

The authority for communities to designate an environmental enforcement officer could be added to the appropriate enabling acts that establish programs like soil erosion control and septic system maintenance. Alternatively, Chapter 45-51 of the Rhode Island General Laws (the "Environmental Advocates Act") could be amended to grant a community environmental officer the authority to enforce applicable environmental protection ordinances (RIDOA, 1991:35).

Conflict Resolution

A conflict resolution mechanism for settling disputes arising from land use decisions is an essential part of any land use management program. As stated above, aggrieved parties in Rhode Island do not have recourse to a special Land Court; rather, they must appeal to Superior Court, a process that is time-consuming and expensive. The Rhode Island legal system must deal with all aspects of law, and its practitioners may not always be well-versed in the intricacies of the state's land use laws. Not surprisingly, there have been inconsistent court decisions (Varin, 1987; RIDOA, 1991:35).

There is also a demonstrated need for coordination among various units of government on land use policy and regulation with respect to protection of water and habitat quality. For example, the EPA, USDA,

NOAA and the Federal Highway Administration all have programs directed at the control of nonpoint source pollution. However, these programs are rarely coordinated, resulting in inconsistent policies, guidance and regulatory requirements among their affiliated state programs. State programs are also rarely consistently coordinated. For example, CRMC and RIDEM have different requirements for the protection of tidal and non-tidal wetlands, and inconsistencies between CRMC's and RIDEM's environmental policies and marine water use classifications also create the potential for inconsistent state regulation. In addition, although the 100 municipalities in Rhode Island and Massachusetts portions of the Narragansett Bay basin exercise direct control over land use planning, there is, as yet, no common basis for managing shared natural resources (*e.g.*, aquifers, surface waters, open space) that cross political boundaries in terms of growth management strategies or hierarchies of appropriate land use strategies.

A comprehensive statewide water quality plan, developed as an element of the *Rhode Island State Guide Plan,* could build upon the Narragansett Bay *Comprehensive Conservation and Management Plan* (*CCMP*), the state's nonpoint source pollution control plans, other elements of the *Rhode Island State Guide Plan,* the *Scituate Reservoir Watershed Management Plan,* and the initiatives of the CZMA reauthorization amendments of 1990. The plan should establish goals for the protection of ecosystem structure and function on an inter-jurisdictional basis, recognizing the incremental and cumulative impact of development. Specific recommendations for the protection of all state and interstate waters and sensitive natural resources, including wetlands, could be developed within that element, and made consistent with other policies in the *Rhode Island State Guide Plan*, and the states' environmental protection and Coastal Resources Management Programs (RIDOA, 1991:51-52).

State Permitting

A perceived weakness in the permit process, at least regarding septic systems, is that cumulative impacts from development are not considered in permit decisions. For example, a septic system permit may be granted if minimum regulatory requirements can be satisfied, even though the site or the area may already be impacting water quality, or there is strong potential that septic system leachate will impact an adjacent water body. This is important not only in the coastal zone, but in areas where "grandfathered" lot sizes are too small to protect on-site drinking supplies from septic system contaminants (RIDOA, 1991:53).

The application process for state permits remains daunting. A unified regulatory permit process could promote coordination between applicable regulatory programs, improve compliance with all applicable regulations, make it easier for applicants to understand the scope and requirements of all regulations, and provide more flexibility for the regulatory and building community to go forward with a project that causes the least environmental impact (RIDOA, 1991:54).

Recommended Policies and Actions and *Estimated Cost of Implementation* are presented in the following pages.

RECOMMENDED POLICIES AND ACTIONS
LAND USE

CODE	POLICY	AGENCIES	STATUS
I.	Municipal governments should be given more authority to prevent land use impacts on water quality.		
I.A.	The State of Rhode Island and the Commonwealth of Massachusetts should adopt enabling legislation to authorize communities to implement special purpose programs to protect and/or restore sensitive natural resources. All such programs need to be consistent and equitable throughout the watershed and the state. The following types of enabling legislation should receive a high priority: 1. Adoption of the Rhode Island Land Use Commission's proposed revisions to the Subdivision Enabling Act, submitted in the 1992 legislative session. 2. Authorizing municipalities to establish community land trusts in order to complement private efforts. 3. Authorizing municipalities to assess impact fees to establish a more predictable and sustainable source of funds to purchase sensitive natural areas. Impact fees should be consistent with community comprehensive plans and capital budgets. 4. Authorizing or requiring municipalities to implement stormwater runoff utility districts and wastewater management districts to mitigate existing land use impacts on sensitive natural resources, including wetlands. These districts should have the ability to issue regulations and to raise funds through user fees, bond issues, or taxes to pay for stormwater runoff abatement and septic system management.	R.I. Land Use Commission, R.I. Legislature, Mass. Legislature	The revised Rhode Island Subdivision Enabling Act was passed by the R.I. Legislature in July 1992.

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RECOMMENDED POLICIES AND ACTIONS
LAND USE

CODE	POLICY	AGENCIES	STATUS
II.	Municipal land use management programs should be improved to enhance the protection of environmental resources.		
II.A.	Communities should adopt and implement more creative land use techniques to enhance growth management, protect water quality, and preserve other sensitive natural resources.		
II.A.1.	All communities should clearly identify, map, and develop protection strategies for sensitive natural resources in their comprehensive plans in accordance with the Rhode Island Comprehensive Planning and Land Use Regulation Act (R.I.G.L. 45-22.2-1 *et seq.*). The Rhode Island Geographic Information System (RIGIS) should be used in order to establish standardized, statewide maps for planning purposes, recognizing that RIGIS is not appropriate for lot-scale planning or regulation at the present time. [*Note*: A definition of "sensitive natural area" should be developed by the Rhode Island Department of Environmental Management (RIDEM) and the Rhode Island Coastal Resources Management Council (CRMC) in conjunction with other appropriate parties. See 04-02-02 Resource Protection: Protection of Critical Areas for further discussion.]	Muncipalities	
II.A.2.	All communities should clearly identify and map areas that can accommodate new growth without adverse impact on sensitive natural resources. These areas should have, wherever possible, the existing or proposed infrastructure to support new development adequately.	Muncipalities	(R.I.) local comprehensive plans are expected to include "land capability" analyses (14 of 39 submitted as of June 1992).

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RECOMMENDED POLICIES AND ACTIONS
LAND USE

CODE	POLICY	AGENCIES	STATUS
II.A.3. a.	Communities should adopt and implement more innovative and flexible land use management techniques to accommodate new growth without damaging sensitive natural resources, and to the best of its ability, the Rhode Island Division of Planning (RIDOP) should enforce existing deadlines that require Rhode Island municipalities to: i. Submit their local comprehensive plans to RIDOP for review in accordance with the Rhode Island Comprehensive Planning and Land Use Regulation Act (R.I.G.L. 45-22.2-1 *et seq.*); [*Note*: The extended deadline for submittal of local comprehensive plans was December, 31 1991. As of June 1992, 19 of 39 draft plans had been submitted for review.] ii. Complete their revised zoning ordinances and zoning maps within 18 months after state approval of the local comprehensive plan in accordance with the Rhode Island Zoning Enabling Act (R.I.G.L. 45-24-27 *et seq.*).	RIDOP, municipalities	Fourteen of 39 (R.I.) local comprehensive plans submitted as of June 1992.
II.A.3. b. ✓	**The RIDOP, RIDEM, CRMC and other state and regional planning authorities throughout the Narragansett Bay watershed should encourage communities to apply effective land use and growth management techniques, and should provide municipal officials with appropriate technical guidance and assistance to aid in implementation. Appropriate land use and growth management techniques include, but are not limited to, wastewater management districts, cluster zoning, planned unit development, overlay districts, flexible zoning, site plan review, phased growth controls, development standards, transfer of development rights, or special environmental protection ordinances.**	**RIDOP, RIDEM, CRMC, Mass. counterparts**	**[See RIDOP and RIDEM "Preliminary Agreements," Section 715-05-06.]**
II.A.3. c.	Communities should review proposed land use and growth management techniques with state or municipal planners and legal advisors prior to adoption.	Municipalities	

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RECOMMENDED POLICIES AND ACTIONS
LAND USE

CODE	POLICY	AGENCIES	STATUS
II.A.4.	Communities should participate in coordinated pre-application conferences early in the design process in order to anticipate and correct potential environmental problems with the project design, and to coordinate the municipal and state permitting process. The applicant and relevant municipal, state and other public officials should participate on the explicit understanding that the coordinated project review does not preempt established permitting procedures or regulatory requirements, or constitute a final decision by a municipal or state permitting authority.	R.I., Mass., municipalities	The revised Subdivision Enabling Act , passed during the 1992 R.I. Legislative session, includes a provision for coordinated pre-application conferences.
II.A.5.	Communities should carefully evaluate their existing subdivision regulations and should reduce or eliminate any requirements that are not necessary for public safety and are contributing to environmental impacts. For example, many rural and suburban towns have excessive subdivision road requirements, including widths that can be twice the size of existing town roads and curbs. To avoid the need for costly structural drainage collection devices, the requirement for curbs should be relaxed whenever side-of-the-road drainage is feasible.	Municipalities	
II.A.6.	Neighboring communities should collaborate on consistent regional or watershed-based approaches for growth management to prevent future, and mitigate existing, land use-derived impacts to shared waters and sensitive natural resources. RIDOP, in accordance with the Rhode Island Comprehensive Planning and Land Use Regulation Act, should review the adequacy of local comprehensive plans with respect to municipal provisions for managing multi-jurisdictional resources.	Municipalities, RIDOP, RIDEM	

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RECOMMENDED POLICIES AND ACTIONS
LAND USE

CODE	POLICY	AGENCIES	STATUS
II.B.	Enhanced procedures for the administration and enforcement of municipal land use management programs should be required.		
II.B.1.	Each community should designate a person, such as the Chair of the Conservation Commission, to receive all notices regarding public comment on any permit decisions within the community or that may impact the community. Conservation Commissions should also be encouraged to comment on all applicable proposals before the planning and zoning boards.	Municipalities	
II.B.2.	The duties of zoning officers, building inspectors, environmental enforcement officers, and planning and zoning board members should be defined in local ordinances, consistent with state law. In addition, zoning enforcement officers, building inspectors, and planning and zoning board members should be required to attend appropriate training and certification programs, or meet minimum qualifications as a condition of appointment. At a minimum, training for local officials should include all applicable land use management statutes, public meeting procedures, and potential conflict of interest standards. Zoning enforcement officers, building inspectors, and environmental enforcement officers should receive training regarding state environmental laws sufficient to recognize possible on-site sewage disposal system problems, wetlands violations, and other violations of state environmental protection statutes. a. Training programs and minimum qualifications can be further established by the Rhode Island Chapter of the American Planning Association (APA) in conjunction with the University of Rhode Island (URI) Community Planning Department and the RIDOP. b. The actual training should be offered through the RIDOP, the URI Cooperative Extension program, or other qualified organizations. c. A reasonable fee should be charged trainees to defer the cost of the training.	R.I. Land Use Commission, R.I. Legislature, Mass. Legislature, R.I. Chapter of the APA, URI, RIDOP	
II.B.3.	The zoning officer should be an appointed, not an elected, position and should be primarily responsible for the enforcement of the zoning ordinance. Zoning enforcement officers are on the front line of enforcement, so it is crucial that they be properly trained to provide more equitable and uniform decisions.	Municipalities	

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RECOMMENDED POLICIES AND ACTIONS
LAND USE

CODE	POLICY	AGENCIES	STATUS
II.B.4.	All communities should give the authority for subdivision approval to their planning boards. City and town councils should *not* continue to have the authority for subdivision approval, as is currently the situation in some Rhode Island communities.	Municipalities	
II.B.5	All communities should hire a full- or part-time professional planner to assist the community with the adoption and implementation of proper land use management strategies.	Municipalities	
II.C.	Training should be a requirement for attorneys representing municipalities to enhance their knowledge of land use management statutes and regulations. 1. All city and town attorneys should be required to demonstrate a proficiency in land use law prior to serving as municipal legal counsel. The Rhode Island Chapter of the APA should collaborate with the Rhode Island Bar Association to determine the necessary standards based on education and experience. 2. All cities and towns should select legal counsel who can demonstrate a proficiency relative to land use law. 3. The Rhode Island Attorney General's Environmental Advocate Program and/or the Rhode Island Bar Association should establish a program to provide low or no-cost legal assistance to cities and towns in defending litigation over local land use and natural resource decisions. The Rhode Island Bar Association should consider establishing a recognized specialty in land use law. 4. State agencies and public universities, including the URI's proposed Coastal Institute, should establish a mechanism to provide expert witnesses at low or no-cost to cities and towns in defending litigation over local land use and natural resource decisions.	Municipalities, R.I. Attorney General's Environmental Advocate Program, R.I. Bar Association, URI Coastal Institute	

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RECOMMENDED POLICIES AND ACTIONS
LAND USE

CODE	POLICY	AGENCIES	STATUS
II.D.	Communities should be granted the authority to designate an appropriately trained environmental official to enforce applicable environmental protection ordinances. 1.Each community should be granted the authority to designate an appropriately trained environmental enforcement officer. This will provide for the effective administration and enforcement of highly technical special-purpose environmental ordinances, allow zoning enforcement officers and building inspectors to devote proper time and effort to their other responsibilities, and ensure better communication with the development community and more uniform and equitable enforcement policies. a. The authority for communities to designate an environmental enforcement officer could be added to the appropriate enabling acts that establish programs such as soil erosion control and septic system maintenance. b. Another approach would be to amend Chapter 45-51 of the Rhode Island General Laws entitled "Environmental Advocates Act" to grant a community environmental officer the authority to enforce applicable environmental protection ordinances. (This act should be re-named the "Environmental Enforcement Officer Act.") This act also requires the environmental officer to have formal training and/or education in environmental disciplines, unless the community designates its attorney as said officer, who is not required to have such training or expertise. c. In the event Chapter 45-51 is amended to authorize environmental ordinance enforcement powers, there should be no exclusions from the training and/or education requirements.	R.I. Land Use Commission, R.I. Legislature, Mass. Legislature	
II.E.	A land court should be established to render consistent decisions and to expedite land use disputes. 1. The Rhode Island Land Use Commission should assess the feasibility of establishing a land court in Rhode Island to render more consistent decisions and expedite resolution of land use disputes. 2. All judges appointed to a land court should be proficient in land use law and be aware of the relationship between land use and potential environmental impacts. The Rhode Island Chapter of APA and the Rhode Island Bar Association should collaborate to determine the necessary standards of proficiency in land use law, based on education and experience.	R.I. Land Use Commission, R.I. Legislature, R.I. Chapter of the APA, R.I. Bar Association	

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RECOMMENDED POLICIES AND ACTIONS
LAND USE

CODE	POLICY	AGENCIES	STATUS
II.F.	Communities should improve the coordination of all land use management programs. When communities review their zoning ordinances to insure compliance with a revised/updated comprehensive plan, as required by the Comprehensive Planning and Land Use Regulation Act, they should also review all land use ordinances for consistency and consolidate these ordinances into one document. There are two options to enhance the coordination of community land use ordinances. 1. The first and simplest is to place all separate ordinances into a three-ring binder or similar cover so amended pages can be easily added or replaced. A check list or flow chart should be included so that all applicable development standards can be easily referenced. In addition, a map to delineate the zoning districts, as well as historic, flood plain, or other special districts, would assist in determining what standards may apply to a parcel of land. A reasonable fee should be charged to cover the cost of this document. 2. The second option is to enact a unified development ordinance. This approach consolidates all community land use ordinances, including zoning and subdivision, into a single land use management ordinance. No special statutory authority should be required to combine zoning, subdivision, and other ordinances into a single ordinance, since this involves a change in form rather than substance (Brough 1985), however, the Rhode Island General Assembly should explicitly grant the authority to communities to establish unified development ordinances to avoid potential legal challenges.	Municipalities	

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RECOMMENDED POLICIES AND ACTIONS
LAND USE

CODE	POLICY	AGENCIES	STATUS
III.	The State of Rhode Island should enhance its role with respect to land use management issues.		
III.A.	RIDEM and CRMC should have the authority to establish reasonable minimum and enforceable development standards to prevent cumulative land use impacts to water quality without directly controlling land use types or densities.		
III.A.1. ✓	**The RIDEM and CRMC, in conjunction with other applicable state, local, and private-sector officials, should establish and adopt enforceable minimum development standards to protect water quality and critical areas from cumulative land use impacts. These standards should be promulgated within the constraints of staff, funding, and supporting scientific research. The RIDEM and CRMC should work together to develop the necessary statutory authority in the event that existing legislation is insufficient to adopt the proposed development standards. [*Note*: The Coastal Zone Management Act (CZMA) Section 6217 Coastal Nonpoint Pollution Control Program (CNPCP), to be developed by CRMC in cooperation with the state Nonpoint Source Management Program, will provide the federal statutory authority and technical guidance to support promulgation of minimum development standards.]**	**RIDEM, CRMC, RIDOP, Mass. counterparts, municipalities**	**[See RIDOP "Preliminary Agreement," Section 715-05-06.]**
III.A.1.a.	Minimum standards to address soil erosion, stormwater runoff, wastewater disposal, groundwater, and wetland impacts should be required for all new development. These requirements could be included as written standards within applicable regulatory programs such as wetlands regulations. The cumulative impacts of development should also be addressed, where possible.	RIDEM, CRMC, RIDOP, Mass. counterparts, municipalities	[See RIDOP "Preliminary Agreement," Section 715-05-06.]
III.A.1.b.	Enforceable minimum development standards should be applied statewide, not just along the coastal zone, to protect the entire watershed of Narragansett Bay and inland critical areas such as public drinking water supplies. Reasonable applicability criteria should be established for all minimum development standards.	RIDEM, CRMC, RIDOP, Mass. counterparts, municipalities	[See RIDOP "Preliminary Agreement," Section 715-05-06.]
III.A.1.c.	The proposed development standards should also be adopted in accordance with the water quality classification to be protected. However, regardless of the water quality classification, there should be development standards to prevent subsequent land use impacts. The State of North Carolina's water quality classification with required development standards should be used as a starting point.	RIDEM, CRMC, RIDOP, Mass. counterparts, municipalities	[See RIDOP "Preliminary Agreement," Section 715-05-06.]

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RECOMMENDED POLICIES AND ACTIONS
LAND USE

CODE	POLICY	AGENCIES	STATUS
III.A.1.d.	Development standards should be administered at the local level, whenever possible, pending state approval that an ordinance provides consistent minimum development standards, and that the technical expertise is available to implement and enforce the standards.	RIDEM, CRMC, RIDOP, Mass. counterparts, municipalities	[See RIDOP "Preliminary Agreement," Section 715-05-06.]
III.A.1.e.	Compliance with a local ordinance does not supersede or eliminate the need for an applicant to obtain applicable state or federal regulatory permits.	RIDEM, CRMC, RIDOP, Mass. counterparts, municipalities	[See RIDOP "Preliminary Agreement," Section 715-05-06.]
III.A.1.f.	Applicable state regulatory agencies should retain the authority to enforce development standards in the event a community fails to adopt or enforce said standards. Existing state environmental regulatory staff should be used to provide technical expertise to assist community officials with complicated development projects. The more routine developments should be handled at the local level, where feasible.	RIDEM, CRMC, RIDOP, Mass. counterparts, municipalities	[See RIDOP "Preliminary Agreement," Section 715-05-06.]
III.A.1.g.	All development standard ordinances should require the applicant to pay a user fee commensurate with cost for administering the ordinance as it relates to their project. Applicants should not be charged fees that are used to supplement community general funds.	RIDEM, CRMC, RIDOP, Mass. counterparts, municipalities	[See RIDOP "Preliminary Agreement," Section 715-05-06.]
III.A.1.h.	The adoption by the state of minimum enforceable development standards should encourage local governments to adopt more flexible and innovative growth management policies, and builders to propose more creative developments to avoid, wherever possible, development impacts to water quality and sensitive natural resources.	RIDEM, CRMC, RIDOP, Mass. counterparts, municipalities	[See RIDOP "Preliminary Agreement," Section 715-05-06.]
III.A.1.i.	The state Nonpoint Source Management Program coordinator and the state CNPCP coordinator should establish a state Nonpoint Source Advisory Group to develop the appropriate development standards and the necessary procedures to implement this concept.	RIDEM, CRMC, RIDOP, Mass. counterparts, municipalities	[See RIDOP "Preliminary Agreement," Section 715-05-06.]

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RECOMMENDED POLICIES AND ACTIONS
LAND USE

CODE	POLICY	AGENCIES	STATUS
III.A.2.	In non-coastal areas, the RIDEM should continue their plans to regulate stormwater runoff from new development through the wetland and water quality certification programs. In addition, RIDEM and CRMC should continue to work closely together to develop consistent stormwater runoff regulations. Guidance available from the states' CWA Section 319 Nonpoint Source Programs, CZMA Section 6217 CNPCP, and the U.S. Department of Agriculture Soil Conservation Service should be reviewed and used to the maximum extent possible. [See 04-01-07 Source Reduction: Nonpoint Sources for a more complete discussion of proposed stormwater management initiatives.]	RIDEM, CRMC	[See USDA SCS, RIDEM "Preliminary Agreements," Section 715-05-06.]
III.A.3	In sensitive natural resource areas that traverse in-state political boundaries, RIDEM or CRMC, in conjunction with RIDOP, should establish an overlay protection district for the watershed or aquifer in the event that communities do not adopt appropriate land use controls, as recommended in the *Rhode Island State Guide Plan*. The RIDEM, CRMC, and RIDOP should work together to develop the necessary legislation. a. The proposed development standards should be tailored to the resource area and its unique problems. The overlay districts established by the Town of Narragansett should be used as a model or starting point. b. In the event that this concept is successful, the necessary legislation and cooperative state agreements should be pursued to address sensitive natural resources that span the border between Rhode Island and a neighboring state.	RIDEM, CRMC, RIDOP, Mass. counterparts, municipalities	[See RIDOP, RIDEM "Preliminary Agreements," Section 715-05-06.]
III.A.4.	The RIDEM, CRMC, and RIDOP should work together to coordinate and promote interstate growth management and nonpoint source pollution prevention and mitigation strategies for the protection of Narragansett Bay and its watershed.	RIDEM, CRMC, RIDOP	

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RECOMMENDED POLICIES AND ACTIONS
LAND USE

CODE	POLICY	AGENCIES	STATUS
III.B.	The State of Rhode Island should have enforceable policies relative to new growth and the availability of supporting water and sewer facilities.		
III.B.1.	The Rhode Island Land Use Commission should examine options to enhance the enforceability of *Rhode Island State Guide Plan* growth management policies by requiring new development, wherever possible, to be concentrated in growth centers that will be adequately served by public water and sewer facilities. Proposed growth centers should be located to avoid areas with land development constraints. In addition, public water and sewers should not be extended into areas where new growth could adversely impact water quality or critical areas.	R.I. Land Use Commission	
III.B.2.	The State of Rhode Island should use financial incentives to encourage communities to comply with *Rhode Island State Guide Plan* growth management policies. For example, existing state funding sources to assist with municipal public water and sewer construction should, as appropriate, give some priority to projects that will promote compact development by providing public water and/or sewer facilities.	RIDEM, RIDOP	
III.B.3.	Areas that are currently served by public water and sewers and can support additional development without adversely impacting water quality and sensitive natural resources should be required to accommodate compact development, in accordance with the Comprehensive Planning and Land Use Regulation Act (R.I.G.L. Chapter 45-22.2).	RIDEM, RIDOP, municipalities	
III.C.	The State of Rhode Island should provide technical assistance to communities to assist with improved land use management decisions to protect sensitive natural resources.		
III.C.1. ✓	**The RIDOP should serve as a clearinghouse for innovative land use management techniques that protect sensitive environmental resources while accommodating balanced growth. The RIDOP should enhance efforts to develop technical handbooks, workshops, and model ordinances to make local planning officials aware of new land use management techniques and the "how-tos" of implementation.**	RIDOP	[See RIDOP, RIDEM "Preliminary Agreements," Section 715-05-06.]
III.C.2. ✓	**All other state agencies and organizations that assist local governments with land use management programs should coordinate their efforts with RIDOP to avoid, as much as possible, duplicating effort and inconsistent information.**	RIDOP, public and private technical assistance programs	

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RECOMMENDED POLICIES AND ACTIONS
LAND USE

CODE	POLICY	AGENCIES	STATUS
III.C.3.	The RIDEM should continue to establish technical standards for specific nonpoint source control techniques such as those contained in the *Recommendations of the Stormwater Management and Erosion Control Committee Regarding the Development and Implementation of Technical Guidelines for Stormwater Management* (1988b). The CNPCP should incorporate those aspects of these plans that meet final Section 6217 guidance requirements.	RIDEM	
III.C.4.	The CRMC, in conjunction with RIDOP and RIDEM, should continue to develop Special Area Management (SAM) Plans for the enhanced management of critical areas. These agencies should provide the technical expertise necessary to assist local governments with the implementation of SAM Plans. [See 04-02-02 Protection of Critical Areas for additional recommendations regarding SAM Plans.]	CRMC, RIDEM, RIDOP, municipalities	
III.C.5.	The URI Cooperative Extension should continue its public education outreach programs to make people aware of the impacts of certain land use activities and appropriate best management practices (BMPs). In addition, the URI Cooperative Extension, the Rhode Island Chapter of the APA and/or the RIDOP should prepare a "developers' handbook" that describes existing minimum development standards, and environmentally-sensitive development and construction practices.	URI Cooperative Extension, R.I. Chapter of the APA, RIDOP, Mass. counterparts	
III.C.6.	The URI Graduate Curriculum in Community Planning and Area Development should continue to focus student projects on sensitive natural resources and recommended creative approaches for their protection. These can be coordinated with critical areas identified by the RIDEM and CRMC.	URI	

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RECOMMENDED POLICIES AND ACTIONS
LAND USE

CODE	POLICY	AGENCIES	STATUS
III.C.7.	The Land Management Project (LMP) and/or the state Nonpoint Source Management Program should assist professional planners and environmental regulators by bridging the gap between science and the incorporation of new technical information into environmental and land use management regulatory programs. The LMP should continue to sponsor workshops, applicable research, and synthesize new research findings into public policy.	RIDEM	[See RIDEM "Preliminary Agreement," Section 715-05-06.]
III.C.8.	The Rhode Island Conservation Districts should continue to offer technical assistance, on a contractual basis, to communities in implementing erosion, sediment, and stormwater runoff control ordinances. In addition, the Districts should consider broadening the scope of their technical assistance to include a full site plan review service for communities without professional engineers or planners.	R.I and Mass. Conservation Districts	[See USDA SCS "Preliminary Agreement," Section 715-05-06.]
IV.	Existing federal and state regulatory programs should be enhanced/better coordinated to prevent land use impacts to water quality more effectively.		
IV.A.	Existing federal water quality regulatory programs should be improved/better coordinated to more effectively prevent land use impacts to water quality. 1. The EPA and NOAA should continue to coordinate applicable state water quality and coastal zone programs and local land use management programs in accordance with Section 6217 of the CZMA reauthorization amendments of 1990, to prevent land use impacts to water quality. 2. The technical assistance to state and local governments required to be provided by the EPA and the National Oceanic and Atmospheric Administration (NOAA) as a consequence of the CZMA reauthorization amendments should build on and be consistent with those successful efforts by state and local governments to manage land use wisely and protect sensitive natural resources. In addition, any land use management options for the coastal zone should recognize that it is crucial to manage land use properly within the entire watershed of a coastal feature. 3. The EPA and the NOAA should also coordinate and negotiate clear, consistent policies for the protection of sensitive natural resources with sister federal agencies whose actions can strongly influence land use. This group includes, but is not limited to, the U.S. Department of Agriculture, the Federal Highway Administration, and the U.S. Department of Housing and Urban Development.	EPA, NOAA	EPA issued "Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters" (1991). Final is due in 1992.

✓ - High Priority Action

RECOMMENDED POLICIES AND ACTIONS
LAND USE

CODE	POLICY	AGENCIES	STATUS
IV.B.	Existing Rhode Island water quality regulatory programs should be enhanced/better coordinated to more effectively prevent land use impacts to water quality.		
IV.B.1.	The RIDOP, in conjunction with RIDEM, CRMC, and all other applicable parties, should develop a *Rhode Island State Guide Plan* element for the enhanced management of water quality and critical areas to establish clear goals and enforceable policies for the protection of these sensitive environmental resources. a. The plan should build on the *CCMP*, the state Nonpoint Source Management Plan, the state Coastal Resources Management Program, the *Scituate Reservoir Watershed Management Plan* (1990a), and the technical guidance developed pursuant to the CZMA reauthorization amendments of 1990. b. The plan should be incorporated into the Rhode Island Coastal Resources Management Program and the statewide Environmental Plan to be prepared by the proposed Department of the Environment (RIDOE) in accordance with Chapter 42-17.14-14 of the Rhode Island General Laws.	RIDOP, RIDEM, CRMC	
IV.B.2.	All new or revised environmental protection statutes and regulations and local ordinances should also be consistent with the state water quality management plan, the *Rhode Island State Guide Plan,* The Coastal Resources Management Program, and Special Area Management (SAM) Plans.	R.I. Legislature, state agencies and municipalities	
IV.B.3.	The recommendations of the Environmental Quality Study Commission, with respect to the enhancement of existing state environmental policy, planning, and regulatory programs in Rhode Island, should continue to be implemented in accordance with the restructuring of the RIDEM and other resource management authorities into the RIDOE, within state budget constraints.	R.I. Governor's Office, R.I. Legislature, RIDEM	Reorganization of R.I.'s environmental agencies into RIDOE has been postponed until July 1992. Postponement until July 1993 is under consideration by the R.I. Governor and Legislature.
IV.B.4.	The RIDEM and CRMC, in conjunction with the RIDOP and the RIGIS, should continue to identify and map sensitive environmental resources. In addition, clear policies for the protection of these resources need to be developed and incorporated into the statewide Environmental Plan.	RIDEM, CRMC, RIDOP, URI	

✓ - **High Priority Action**

RECOMMENDED POLICIES AND ACTIONS
LAND USE

CODE	POLICY	AGENCIES	STATUS
IV.B.5.	The RIDEM and CRMC, in conjunction with the RIDOP, should take the lead to continue to develop innovative and consistent approaches to assist municipalities and the building community with avoiding and/or attenuating land use impacts to sensitive natural resources. The RIDOP should develop and promote more effective local land use techniques that reinforce state environmental regulatory policies and utilize appropriate development standards developed by RIDEM and CRMC. a. The Rhode Island enabling legislation that establishes a model soil erosion control ordinance may be used as an example of how subsequent community environmental protection programs should be developed. b. The hierarchy of land uses developed by RIDOP for the *Scituate Reservoir Watershed Management Plan* (1990a) should be modified to provide guidance to all communities. This hierarchy ranked land uses in accordance with their potential to cause water quality contamination, and recommended appropriate techniques to mitigate potential impacts.	RIDOP, RIDEM, CRMC	[See RIDOP "Preliminary Agreement," Section 715-05-06.]
IV.B.6.	The RIDEM, CRMC and other relevant federal and state agencies should coordinate with local officials and builders early in the design phases of a project in a coordinated project review to reduce the environmental impacts of a proposed project. a. This early coordinated review process should be expanded to include all projects with a potential impact on sensitive environmental resources. b. A conference fee, commensurate with implementing such a program, should be charged to the developer. c. The details for a coordinated project review with respect to applicability criteria, staff requirements, statutory constraints, and funding should be established on a uniform basis between the RIDEM and municipal government. The existing agreement used by CRMC should be used as a guide. d. Developers must present their entire proposal for review and not withhold information relative to aspects of the project that may be environmentally damaging. e. The RIDEM, CRMC and municipalities should require that all wetlands be identified and verified by the state prior to the review of a proposed development site plan.	RIDEM, CRMC, relevant federal, state, local agencies, individuals	See Rec. II.A.4.

✓ - **High Priority Action**

CODE	POLICY	AGENCIES	STATUS
IV.B.7.	State regulatory programs should assess cumulative impacts from development in permit decisions, when possible. If an area is currently experiencing contamination problems or if there is strong evidence to document future environmental impacts from new development, the cumulative impacts should be considered and appropriate development standards or alternative designs required.	RIDEM, CRMC	
IV.B.8.	State regulatory programs should establish clear and objective criteria as the basis of all permit decisions in order to provide clear and consistent notice to the regulated community regarding the scope and intent of the regulations, and to reduce discretionary decision-making that produces inconsistent regulatory decisions and increased litigation. For example, the environmental regulatory agencies in Rhode Island and Massachusetts should consider replacing the current plant community definition of wetlands with the hydric soils definition, and/or use aerial photographs to map the margins of all tidal and non-tidal wetlands (including a 100 foot margin) on a biennial basis in order to avoid wetlands delineation on a case-by-case basis. All property owners holding property within a mapped wetland area would be presumed to be on notice regarding state wetlands regulations.	RIDEM, CRMC	
IV.B.9.	State regulatory programs should make the limits of state environmental regulations clear to local officials.	RIDEM, CRMC, RIDOP	
IV.B. 10.	The RIDEM should consider adopting a streamlined regulatory permit program similar to what was previously described for a community unified ordinance. [See Recommendation II.F., above.] [Note: the intent of this recommendation is to improve regulatory coordination, but *not* to suggest a single permit be issued to include separate regulatory programs. It would not be practical to place all of RIDEM's regulatory requirements into one unified regulation, although certain programs should be considered—such as the wetland, water quality certification, underground injection control, and septic system programs—because of their overlaps. At a minimum, all regulations should contain a flow chart and cross references that make it easier for applicants to determine other applicable regulatory requirements.]	RIDEM	

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RECOMMENDED POLICIES AND ACTIONS
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CODE	POLICY	AGENCIES	STATUS
IV.B. 11.	The states' water quality and coastal zone agencies should devote future planning resources toward development of watershed and ecosystem-level environmental protection programs that address the cumulative and cross-media impacts of development.	RIDEM, CRMC, Mass. counterparts	
IV.B. 12.	Enforcement of state regulations should tie in better with local growth management programs, so that programs support each other. For example, water table verification and percolation tests should be conducted on a lot in accordance with community zoning setback requirements for front, side, and rear lot lines to insure that these tests correspond to where development will actually occur on a parcel of land.	RIDEM, CRMC, Mass. counterparts	
IV.B. 13.	The State regulatory field personnel should be trained and directed to recognize obvious environmental violations and to increase enforcement capability, where appropriate. All appropriately trained field staff should have the authority to stop a project in the event a flagrant violation is discovered.	RIDEM, CRMC, Mass. counterparts	
IV.B. 14.	The RIDEM should request that the Rhode Island General Assembly add hydric soils to the definition of a wetland. a. The addition of hydric soils in the wetland definition should be phased in to allow the wetland section to train staff adequately. b. Appropriate funds should be allocated for said training. c. The adoption of hydric soils into the wetland definition would make it much easier for communities to identify, map, and establish land use policies for the protection of wetlands. Communities could use this information to establish hydric soil overlay protection districts to reinforce state regulatory policies.	RIDEM, R.I. Legislature	Hydric soils are mapped in the RIGIS database.

✓ - High Priority Action

RECOMMENDED POLICIES AND ACTIONS
LAND USE

CODE	POLICY	AGENCIES	STATUS
IV.B. 15.	The Rhode Island General Assembly should increase the fines relative to freshwater and coastal wetlands violations to be more consistent with the U.S. Army Corps of Engineers (USACOE), the EPA, and neighboring states. The fines collected by RIDEM and CRMC could be used to restore or create wetlands.	RIDEM, CRMC, R.I. Legislature	
IV.B. 16.	The RIDEM and CRMC, in conjunction with local government, should explore the concept of giving credit to development projects that yield a net environmental benefit not otherwise required by law, *e.g.*, density bonuses to promote cluster development, dedication of conservation easements, more protective riparian buffers, and/or preservation of open space. The criteria should not conflict with applicable policies of the *Rhode Island State Guide Plan*, agency regulations or policies, or community comprehensive plans.	RIDEM, CRMC, municipal-ities	

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✓ - High Priority Action

Estimated Cost of Implementation—Land Use

Table 715-04(8) summarizes the estimated costs associated with implementing the recommendations in this chapter. The Land Use chapter focuses primarily on activities within the State of Rhode Island. The major costs associated with implementing Element II (Municipal Management) include: the hiring of full or part time professional planners for all Rhode Island municipalities ($150,000 annual ongoing costs), the legislative requirement that all zoning enforcement officers and other officials receive special training, and the enactment of a unified development ordinance that combines all community land use ordinances. The cost associated with the recommendation that all municipalities hire a full or half-time planner is based on the provision of a half-time planner each (at $25,000 per year) for the six municipalities that currently do not have any planning personnel. Also included in Element II is a recommendation that municipalities hire environmental enforcement officers to enforce existing ordinances and the new local environmental ordinances that will be created as allowed by the revised Rhode Island Zoning and Enabling Act; this would create additional municipal staff costs.

Additionally, Element II contains recommendations that call for the establishment of volunteer advisory groups. One of these programs is designed to provide low or no-cost legal advice to municipalities in defending land use and resource protection lawsuits. The other seeks to establish a mechanism to provide expert witnesses (from state agencies and universities) at low or no-cost to municipalities to participate in land use and resource protection litigation. It is possible that these programs may entail some costs at a later date if the volunteer nature of these programs proves to be infeasible.

Element III (Land Use Management) contains actions that are also recommended (and costed) in the Protection of Critical Areas chapter (04-02-02). These actions include the establishment of minimum development standards (which could affect development costs) and environmentally protective overlay districts. Element III also includes an ongoing annual cost for technical assistance and clearinghouse functions assigned to RIDOP and Massachusetts Regional Planning. Additionally, Rhode Island Conservation Districts are assigned annual (for five years) technical assistance tasks regarding implementation of erosion and sedimentation and stormwater runoff control ordinances. Major actions recommended in Element VI (Regulatory Programs) include the development of a *Rhode Island State Guide Plan* element for enhanced protection of water quality and critical areas , and required state agency involvement in a coordinated, pre-application review process for major development projects (this review activity would have annual, ongoing personnel costs).

In keeping with the Rhode Island focus of the recommendation, the majority of costs are allocated to Rhode Island municipalities (approximately $560,000) for coordination, policy, and administrative activities, and to Rhode Island Conservation Districts ($375,000) for staff-intensive technical assistance tasks. RIDOP costs derive from coordination, drafting legislation, and annual review and technical assistance activities. Massachusetts Regional Planning agencies are assigned annual technical assistance activities.

For further details regarding the *CCMP* cost estimation process and funding strategies, refer to the *Narragansett Bay CCMP Cost Estimation and Funding Report* (Apogee Research Inc./NBP, 1992).

Table 715-04(8)

ESTIMATED COST OF IMPLEMENTATION
LAND USE

COST ESTIMATES BY ELEMENT

	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
I-Municipal Authorities	2,500	0	0	0	0	0	0	0	0	0	2,500	0
II-Municipal Management	62,500	0	5,000	0	173,750	0	155,000	0	155,000	0	551,250	0
III-RI Management	140,000	6,000	147,500	6,000	160,000	6,000	160,000	6,000	135,000	6,000	742,500	30,000
IV-Regulatory Programs	52,500	6,000	15,000	6,000	103,750	6,000	15,000	6,000	15,000	6,000	201,250	30,000
TOTALS	257,500	12,000	167,500	12,000	437,500	12,000	330,000	12,000	305,000	12,000	1,497,500	60,000
TOTAL BY YEAR		269,500		179,500		449,500		342,000		317,000		1,557,500

COST ESTIMATES BY AGENCY

	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
RIDEM	36,250	0	17,500	0	18,750	0	5,000	0	5,000	0	82,500	0
RI CRMC	17,500	0	5,000	0	5,000	0	5,000	0	5,000	0	37,500	0
RIDOP	36,250	6,000	25,000	6,000	118,750	6,000	50,000	6,000	25,000	6,000	255,000	30,000
RI Legislature	12,500	0	0	0	0	0	0	0	0	0	12,500	0
URI	10,000	6,000	10,000	6,000	10,000	6,000	10,000	6,000	10,000	6,000	50,000	30,000
MA Regional Plng. Agencies	25,000	0	25,000	0	25,000	0	25,000	0	25,000	0	125,000	0
RI Municipalities*	45,000	0	10,000	0	185,000	0	160,000	0	160,000	0	560,000	0
Conservation Districts	75,000	0	75,000	0	75,000	0	75,000	0	75,000	0	375,000	0
TOTALS	257,500	12,000	167,500	12,000	437,500	12,000	330,000	12,000	305,000	12,000	1,497,500	60,000
TOTAL BY YEAR		269,500		179,500		449,500		342,000		317,000		1,557,500

* Ultimate implementation costs will vary for each municipality depending on its particular environmental and institutional conditions. In addition, the estimated municipal implementation costs do not include ultimate program and capital costs that may result from completion of underlying planning activities, or costs that are expected to be completely recoverable from user fees.

04-02-02 Protection of Critical Areas

Objective for the Protection of Critical Areas

The State of Rhode Island and the Commonwealth of Massachusetts should protect all critical natural resources; manage all designated critical resource areas for the benefit of the public and the ecological protection of the Bay and its tributaries; protect these critical resource areas from any irreversible degradation; and, where necessary, restore impaired critical resources.

Introduction

Preserving critical habitat for fish production, protecting our scenic and coastal areas, and protecting endangered Bay-dependent species may all require the strict protection of natural areas. Effective management of these natural areas, or critical resource areas, however, cannot be conducted independently of managing the adjacent or upstream land areas. In protecting critical habitat and natural resources from the effects of land-based activities and nonpoint source pollutants, efficiencies can be created by setting priorities for protection activities. Development of a policy for targeting the areas that are truly critical for the ecological integrity of the Bay or for its human uses will allow public agencies and the private sector to focus their limited funds on protecting those areas of highest priority (Dixon *et al.*, 1991:1).

This section is primarily geared toward the Rhode Island portion of the Bay watershed since several of the recommended approaches are already in place or under development in Massachusetts. Examples include the *Massachusetts Areas of Critical Environmental Concern Program* and the *Wetlands Conservancy Program* (Dixon *et al.*, 1991:1). While few detailed recommendations are directed to the Commonwealth of Massachusetts, the Massachusetts Coastal Zone Management (MACZM), Massachusetts Department of Environmental Management (MADEP), and those Massachusetts municipalities within the Narragansett Bay watershed should consider adoption of policies and programs similar to these recommendations.

Critical resource areas, as used in the *CCMP*, are significant areas of outstanding ecological or public use value with resources that are vulnerable to various anthropogenic activities that cause environmental degradation. *Critical resource areas of outstanding ecological significance* include areas that have already achieved federal or state recognition for their ecological value, areas that contain rare species or support rare or diverse natural communities, and areas that provide important breeding, feeding, or nursery areas for native and migratory fish and wildlife. *Critical resource areas of outstanding public use value* include public drinking water supplies and their watersheds, areas of exceptional recreational value, areas that support important commercial or recreational fisheries, natural hazard areas, and outstanding scenic areas and cultural sites.

Some of the general types of habitats and resources that could be considered critical resource areas are listed below, and generally mapped in Figure 715-04(5). Although each of these habitat types is significant for its ecological or public use value, not all of the individual sites throughout the watershed would necessarily be considered *critical resource areas*.

Ecologically Critical Resources:

1. *Estuarine wetlands:* Salt marshes; tidal flats; eelgrass beds.

2. *Freshwater wetlands:* Open water wetlands; emergent wetlands; scrub-shrub wetlands; forested wetlands.

3. *Fishery habitat:* Anadromous fish runs; spawning and nursery areas (*e.g.*, for winter flounder, juvenile lobster); current and historic shellfish beds.

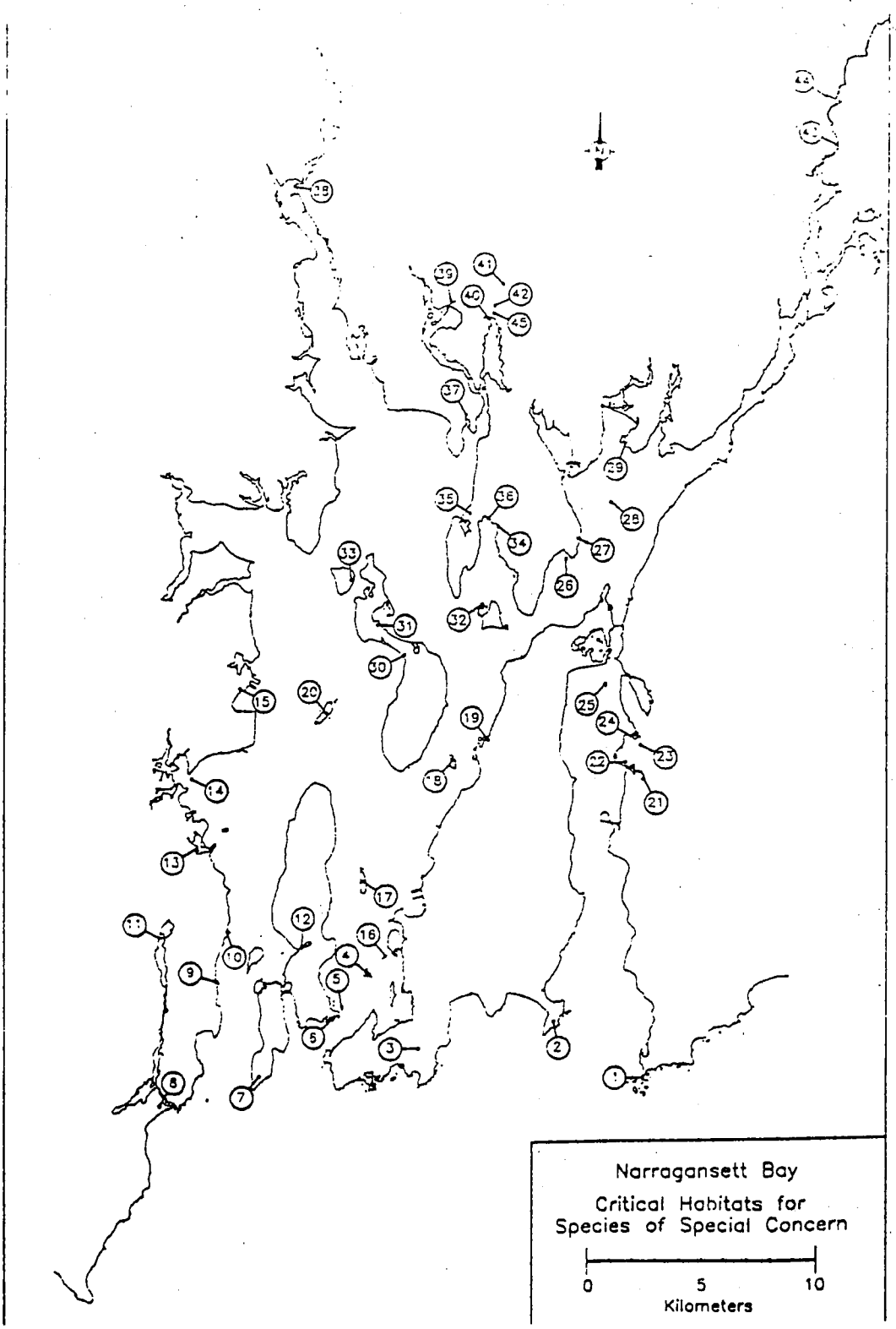
4. *Habitat resources:* Habitat for rare species or exemplary natural communities; subtidal and intertidal areas of high biotic diversity.

5. *Nutrient sensitive resources:* Threatened embayments; threatened salt ponds; threatened freshwater ponds; threatened bogs and fens.

6. *Coastal features:* Natural dunes; barrier or coastal beaches; rocky intertidal shores.

7. *Outstanding National Resource Waters (ONRWs):* Identified and regulated by the states pursuant to the Clean Water Act. Under the state's antidegradation policy, the water quality of ONRWs shall be maintained and protected, *i.e.*, no degradation of water quality is permissible (Dixon *et al.*, 1991:3-4).

Figure 715-04(5). Critical habitiats for species of special concern in Narragansett Bay. Sites 1-6, 14-18, 20-25, 28-29, 31-32, 37-40 are habitat for birds of special concern; sites 7-13, 19, 21, 27, 30, 33-36 are sites of plants of special concern (French *et al.*, 1992).



Critical Resources for Public Health or Recreational Needs:

1. *High priority surface waters* identified through the Rhode Island Clean Water Strategy prioritization process (RIDEM, 1989d):

   a. Threatened drinking water supplies needing protection.

   b. Threatened bathing and recreational waters needing protection.

   c. Threatened habitat areas needing protection.

   d. Impaired drinking water supplies needing restoration.

   e. Impaired bathing and recreational waters needing restoration.

   f. Impaired habitat areas needing restoration.

2. *Water supply areas:* Surface water reservoirs, groundwater aquifers and associated wetlands and recharge areas.

3. *Special use areas:* Significant scenic sites; public recreational areas; historic and archaeological resources in the coastal area, including historic shipwrecks.

4. *Natural hazard areas:* Floodplains; erosion areas; areas potentially affected by predicted sea level rise (Dixon *et al.*, 1991:5).

Habitat, wildlife and fisheries, and water quality can be maintained or improved by proper use and protection of wetlands, riparian corridors, and vegetated buffer strips (EPA, 1991a: 7-2). Wetlands, which are defined as "waters of the State" for the purpose of the State's water quality protection statutes (R.I.G.L. 46-12-5), are identified by vegetation, soil type and other hydrological characteristics. Riparian areas are the lands contiguous to a waterbody (EPA ,1991a: 7-2). Natural riparian areas and wetlands are important to the hydrological and ecological functioning of the adjacent waterbodies. Significantly, riparian areas and wetlands also filter subsurface as well as surface water flows. Furthermore, since undisturbed riparian areas and wetlands include indigenous, natural vegetation, they perform important wildlife habitat functions. Vegetated buffer (or filter) strips are maintained strips of vegetation placed between nonpoint sources of pollution and some receiving waters (EPA, 1991a:7-3). Vegetated buffer strips are designed to filter out surface water-borne pollutants. Wetlands, riparian areas, and vegetated buffer strips all have extremely important roles in controlling nonpoint source pollution.

Statement of the Problem

The effects of land-based activities on habitat and water quality are magnified by the sensitive nature of many critical resources. In addition to the potential for ground and surface water contamination, certain activities, if located without regard to adjacent critical resources, may disrupt habitat functions or aesthetic values. General categories of impacts are as follows:

1. *Irreversible impacts:* Physical destruction or damage to fragile areas where any alteration may cause irreversible loss or impairment.

2. *Impacts on quality or uniqueness of area:* Loss or alteration of unique features including habitat for endangered species, geological features, and resources of educational value can impair future human uses of the resource.

3. *Loss of productivity:* Degradation of aquatic and riparian areas providing critical habitat for diverse communities of shell and finfish, waterfowl, and other wildlife can result in loss of productivity and biotic diversity.

4. *Threats to public health through inappropriate use:* Development activities, such as pollution of water supply, pollutant introduction into the food chain, land alteration that adversely affects

land stability or natural protection, and construction in areas of existing natural hazards, can threaten public health, safety, and welfare.

5. *Economic and use impacts:* Impacts that adversely affect recreational opportunities, natural areas that attract tourists, fisheries development, public water supply areas, and public access can impair future human uses of the resource (Dixon *et al.*, 1991:2).

The Narragansett Bay watershed is heavily developed relative to other East Coast estuaries. Based on a 1988 aerial survey, 24 percent of the State of Rhode Island is in residential development, and an additional 12 percent is in commercial, industrial, transportation, or miscellaneous urban uses (RIGIS, 1991). Although 39 percent of the state is classified as "forested" and another 15 percent is classified as "wetlands and open water" (RIGIS, 1991), only 15 percent of the state is defined as having "severe development constraints" (RIDOA, 1989a:6.5). Since the Rhode Island Division of Planning (RIDOP) estimates that 88 percent of the state's "developable lands" could be fully developed by the year 2010 based on the current rate of growth and the trend toward development of suburban and rural areas, it is essential to protect those remaining coastal, riparian, water, or land-based natural resources considered critical to future public use and enjoyment, or to the integrity of the Bay ecosystem (Dixon *et al.*, 1991:3).

Existing Policies

Federal, state, and local programs and regulations provide varying levels of protection to many types of critical resource areas, including wildlife habitat, coastal features, water supply areas, and natural hazard areas (Dixon et al., 1991: Appendices B and C). The Rhode Island Department of Environmental Management (RIDEM) and the Rhode Island Coastal Resources Management Council (CRMC) are the two Rhode Island agencies with primary authority for managing the state's natural living resources and habitats. In particular, CRMC's Special Area Management (SAM) Plans can provide the basis to afford watershed-level protection to identified significant natural resources. Within RIDEM a number of divisions have planning and/or regulatory authority over the state's natural resources. RIDEM's regulatory and planning groups with some jurisdiction regarding protection of critical resource areas include:

- Division of Freshwater Wetlands (*i.e.*, administers the Freshwater Wetlands Permit Process),
- Division of Groundwater and individual sewage disposal system or ISDS (*i.e.*, administers the ISDS Permit Process),
- Division of Water Resources (*i.e.*, administers the Water Quality Certification Process),
- Office of Environmental Coordination (*i.e.*, administers the National Heritage Program, the Nonpoint Source Management Plan, the Division of Planning and Development with responsibility for protection of threatened and endangered species, nonpoint source planning and land acquisition),
- Division of Fish and Wildlife (*i.e.*, manages the state's living resources)
- Division of Parks and Recreation (*i.e.*, manages the state's parks and other natural areas).

In addition, the RIDOP is the custodian of the *Rhode Island State Guide Plan*, which is intended to serve as the compendium of state policies and strategic plans, including those related to natural resources. Significantly, local comprehensive plans are required to be consistent with relevant elements of the *Rhode Island State Guide Plan.*

The federal government exercises jurisdiction over environmentally sensitive and economically important resources via land acquisition, regulation of activities that

affect environmental quality, research and monitoring, legislative requirements for resource management, and grants to state and local governments for resource protection. For example, fish and wildlife resource protection has been addressed by the federal government with either the specific protection of wildlife types (*e.g.*, the Endangered Species Conservation Act, the Migratory Bird Treaty Act, the Fish and Wildlife Coordination Act) or the protection of wildlife habitat area (*e.g.*, the Wild and Scenic Rivers Act, the Anadromous Fish Conservation Act, the Migratory Bird Conservation Act, the Recreational Use of Conservation Areas Act). These Acts can require mitigation measures and control certain activities that can alter habitat (*i.e.*, dredging, filling, stream channelization). The Wild and Scenic Rivers Act also provides for the preservation and maintenance of aesthetic and recreational values. Goals of these programs are the maintenance of self-perpetuating levels of fish and wildlife populations and the preservation of representatives of all plant and animal communities for the benefit of future generations.

Although water quality legislation at the federal level dates back to the Rivers and Harbors Act of 1899 (prohibiting the dumping of refuse, excluding municipal sewage, into navigable waters), it was through the enactment of the Federal Water Pollution Control Act in 1948 (and its subsequent amendments) that the basic legal authority for federal regulation of water quality was instituted. Although initially aimed at point sources of water pollution, the Act was amended in 1987 by the Clean Water Act (CWA), which provides for the development and implementation of nonpoint source pollution management plans. The states are given great discretion in setting water quality standards and in creating plans for maintaining desired quality levels. The Coastal Zone Management Act (CZMA) is another example of a federal statute that is implemented by the states subject to federal oversight with the general mandate of protecting and managing the nation's coastal zone.

In summary, the federal programs have followed a trend in which the federal government returns responsibility for program development and implementation to the states while retaining the power to approve or reject the adequacy of such programs. States rely on federal funding for a significant portion of program operating budgets and for technical assistance. Federal policies require that federally-funded projects and activities take environmental considerations and impacts on public lands into account.

Analysis

While numerous programs and regulations exist, they may fall far short of the level necessary to ensure the continued integrity and productivity of many areas and categories of critical resources (Dixon *et al.*, 1991:7). For example, existing wetland buffers and riparian areas may not fully protect habitat areas or water quality from the cumulative impacts of adjacent land uses (Myers, 1988).

Because they reflect different legislative mandates, regulatory programs conducted by different agencies and levels of government can leave significant gaps that hinder the development of effective protection. Prior studies have noted that policy formation and change are difficult to achieve because of fragmented state and local agency jurisdiction over shore areas (Adams and McCreary, 1989; Kumekawa *et al.*, 1987; Lacouture, 1990). Identified areas of inconsistency include CRMC-allowed water uses *vs.* RIDEM water quality classifications and conflicts between CRMC policies and local coastal zone ordinances (Dixon *et al.*, 1991:7).

Institutions, boards, and commissions charged with the control of land development may also perform inconsistently, and measures to encourage consistent approaches may need to be developed. Local variance procedures can weaken the effect of regulations designed to provide some control over land use. Board and commission members are called on to make technical decisions for which they may have had little or no training

(Myers, 1988). In addition, an adequate number of trained staff can be a limiting resource for many of the environmental management programs at all levels of government (Dixon *et al.*, 1991).

While many discrete sources of pollution or disruption to the ecosystem are addressed in existing programs, several major threats continue to present concerns. These include:

1. Cumulative development impacts (such as cumulative nutrient and toxics loads, changes in stormwater quantity and quality, or changes in the aesthetics of a resource),

2. Limited protection for locally rare plant and animal species, and loss of wildlife habitat,

3. Nutrient loading in sensitive embayments or other waterbodies,

4. Poor quality of stormwater runoff and groundwater in developed watersheds,

5. Fragmented approach to environmental protection that fails to apply watershed-based planning and management,

6. Diverse land and water-based activities affecting submerged habitat areas.

Contemporary scientific findings should enable regulators to make environmental regulations more effective at protecting identified critical resources. For example, critical resource protection areas should be delineated and protected using an "environmental science approach". This approach combines site-specific data (soils, slope, habitat, indigenous fauna, *etc.*) and recent scientific research on pollutant transport, pollutant assimilation and wildlife needs to producing buffer and setback requirements that are appropriately protective of the specific resource (Horsley Witten Hegemann Inc.., 1990; Dixon *et al.*, 1991:7). This approach contrasts with the traditional method of using prescriptive regulatory mechanisms that can be over- or underprotective of the resource in question.

Narragansett Bay's critical resources comprise a limited number of aquatic, riparian, and terrestrial resources. While diverse in nature and location, they each provide a critical link in the ecological chain or support a valued human use. Given the existing high percentage of developed, urbanized land in the Bay watershed, particular concern must be given to the irreplaceable nature of each remaining critical resource area in Rhode Island. Despite the diverse types of critical resources, therefore, a unified goal for their protection is needed (Dixon *et al.*, 1991:8).

Recommended Policies and Actions and *Estimated Cost of Implementation* are presented in the following pages.

RECOMMENDED POLICIES AND ACTIONS
PROTECTION OF CRITICAL AREAS

CODE	POLICY	AGENCIES	STATUS
I.	The State of Rhode Island should develop a fully cohesive mechanism for coordinating state and local oversight, protection, and restoration of critical resources. A phased approach is proposed below for delineating and protecting critical natural resources.		
I.A. ✓	**The Rhode Island Department of Environmental Management (RIDEM) should convene a Critical Resource Policy Committee to develop and implement a Critical Resource Protection Policy. The Committee should comprise representatives of the RIDEM, Rhode Island Coastal Resources Management Council (CRMC), Rhode Island Division of Planning (RIDOP), municipal governments, and interested private organizations. The RIDEM Office of Policy and Planning, or RIDOP, should provide support for further development and preparation of implementation plans for a statewide policy. The Committee's first task must include responsibility for designation of critical resource areas (including *Areas of State Concern*) to be covered by the policy on a site-specific basis.**	RIDEM, RIDOP, CRMC, municipal planners, private organizations, Mass. counterparts, federal agencies	[See USDA SCS, RIDEM, RIDOP, CRMC "Preliminary Agreements," Section 715-05-06 re: support for cooperative effort to establish critical resource protection policy.]

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RECOMMENDED POLICIES AND ACTIONS
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CODE	POLICY	AGENCIES	STATUS
I.B. ✓	The Critical Resource Policy Committee should develop a unified *Critical Resource Protection Policy* based on the general strategy outlined herein. The *Critical Resource Protection Policy* should focus on interagency consistency, improving existing standards where needed to ensure long-term resource protection, and enforcement. Statewide critical resource protection efforts should accomplish the following: 1. Outline goals and objectives for ensuring long-term protection of critical resources. 2. Establish agreed-upon definitions of "critical resources" and "critical resource protection areas". 3. Produce a mapped delineation of "critical resource areas" as the basis for future planning efforts. 4. Ensure that state regulatory programs protect critical resources in a cohesive, consistent, and efficient way. 5. Provide consistent guidelines to municipalities in their efforts to protect critical resources. 6. Provide guidelines for interstate coordination for protection of critical resources shared between Massachusetts and Rhode Island (and, outside of the Bay watershed, between Connecticut and Rhode Island). 7. Establish priorities for efforts to protect and restore critical resources, and conduct watershed-based planning. 8. Provide guidance for efforts to conduct multi-jurisdictional planning or regional stormwater management efforts. 9. Provide guidance for non-regulatory government actions within the critical resource protection area.	RIDEM, RIDOP, CRMC, municipal planners, private organizations, Mass. counterparts, federal agencies	[See USDA SCS, RIDEM, RIDOP, CRMC "Preliminary Agreements," Section 715-05-06 re: support for cooperative effort to establish critical resource protection policy.]

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CODE	POLICY	AGENCIES	STATUS
I.C.	Legislation should be proposed by the Critical Resource Policy Committee for consideration in the 1993 legislative session establishing a process for designation of *Areas of State Concern*. (*State Guide Plan* Element 121, entitled Land Use 2010, defines *Areas of State Concern* as "geographically-defined areas within the state, including land and/or waterbodies, subsurface areas, or air space, which represent special resources and/or characteristics that are considered critical to state interests.") The legislative basis for conducting this process could be established through amendments to the statute establishing the RIDEM (R.I.G.L. 42-17.1-1 *et seq.*). 1. Designation of *Areas of State Concern* in the category of habitat resources should be guided by the findings of RIDEM's Natural Heritage Program and RIDOP's *Greenspace 2000* initiative and should be based upon a legislative change enabling significant habitats of rare species to be identified and designated. 2. Designation of *Areas of State Concern* in categories encompassing other significant estuarine and coastal resources, including areas of high intertidal or subtidal species diversity, should be guided by the findings of the final report of the Narragansett Bay Project-sponsored "Habitat Inventory" (French *et al.*, 1992). 3. Designation of *Areas of State Concern* should be based in part upon the U.S. Fish and Wildlife Service's Regional Wetlands Concept Plan and the U. S. Environmental Protection Agency's (EPA) Priority Wetlands list (EPA, 1987b). While both of these documents note that they are not exhaustive lists and that refinement will always be needed, they should be used as resources in identifying *Areas of State Concern* in the wetlands category. 4. Waterbodies receiving Outstanding National Resource Waters (ONRW) designation should be included as *Areas of State Concern*. RIDEM will develop criteria as provided for under the antidegradation provisions of the Clean Water Act. 5. High Priority Waterbodies identified in the *State Clean Water Strategy* and the state *Nonpoint Source Assessment* should be reviewed for possible inclusion as *Areas of State Concern*.	Critical Resource Policy Committee (R.I., Mass.)	

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RECOMMENDED POLICIES AND ACTIONS
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CODE	POLICY	AGENCIES	STATUS
I.D.	Critical resource areas (including *Areas of State Concern*) should be protected through the establishment of "critical resource protection areas" sufficient to protect the resource from adverse effects of adjacent land uses (*i.e.*, the impacts of pollutants carried by both surface and ground water flows should be considered, as well as the habitat requirements of rare or threatened species) where appropriate. The "critical resource protection area" would continue to accommodate compatible uses. 1. The recommended tool for implementing delineation and protection of these areas is establishment of "environmental protection overlay districts". a. The state's role in development of environmental protection overlay districts should include delineation of the district and development of guidelines for appropriate levels and types of activity and best management practices (BMPs). b. The municipalities should adopt these districts as zoning overlay districts and implement appropriate protection measures consistent with state guidelines. 2. The following policies should be considered for application within environmental protection overlay districts: a. Guidelines for minimum development/performance standards should be developed to establish a hierarchy of allowable uses within the environmental protection overlay district (*i.e.*, identify compatible uses, and direct identified high risk activities away from the critical resource protection area). b. Guidance for the use of vegetated buffer strips should be developed to apply within environmental protection districts. c. State and local land acquisition efforts should give priority consideration to protection districts. d. Regional and municipal planning for both nutrient management and stormwater management should be conducted on a subwatershed basis. By conducting such evaluations on a subwatershed basis, the quality of receiving waters can be considered in determining appropriate types of controls. Where the cumulative effects of nutrients are a concern, a recommended method of control is to limit the total loading of sources throughout the watershed. This can be accomplished through density or loadings limitations within the subwatersheds of nutrient-sensitive resources.	Critical Resource Policy Committee (R.I., Mass.)	[See RIDOP "Preliminary Agreement," Section 715-05-06 re: technical guidance for state and local planners, and *innovative* land use and growth management protection and heirarchy of permitted uses to protect critical resources. See CRMC "Preliminary Agreement," Section 715-05-06 re: development of enforceable policies to further protect significant critical habitats and threatened coastal species.]

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RECOMMENDED POLICIES AND ACTIONS
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CODE	POLICY	AGENCIES	STATUS
I.E.	A Vegetated Buffer Strip Delineation Work Group involving CRMC, RIDEM, interested private organizations, and the University of Rhode Island should be convened in order to encourage a consistent approach to buffer and riparian area delineation statewide and to develop BMPs for vegetated buffer strip use and maintenance. This Work Group should strongly consider utilization of guidance on vegetated buffer strip delineation provided in *Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters* (EPA, 1991a), IEP, Inc. (1991), Dixon *et al.* (1991) and Penniman *et al.* (1991b). The Work Group should advise the Nonpoint Source Advisory Committee on the range of BMPs for nonpoint source pollution control. [See 04-01-07 Source Reduction: Nonpoint Sources.] 1. The Vegetated Buffer Strip Delineation Work Group should focus on development of BMPs for buffer strip use under various site conditions, including soil type, slope, existing pollutant burden, and existing vegetation. a. The Work Group should develop a formula to adjust undisturbed vegetated buffer strip width requirements based upon slope in order to better account for the ability of buffers to prevent erosion, and remove pollutants in areas with significant slopes and to identify conditions requiring other BMPs as substitutes or supplements. b. The Work Group should consider guidance stipulating that more steeply sloped areas remain undisturbed as natural riparian areas or buffers, or are "counted" at a fraction of their width in the calculation of surface runoff buffer protection requirements.	RIDEM, CRMC, RIDOP, URI, private organizations, Mass. counterparts	[See CRMC "Preliminary Agreement," Section 715-05-06 re: development of shoreline buffer policies, public education.]

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I.E.2.	The Work Group should review information on natural riparian vegetation and vegetated buffer strip requirements for habitat and species protection and develop guidance for regulatory application in the Narragansett Bay watershed. a. The Work Group should recommend a standard minimum undisturbed vegetated buffer to protect the structure and function of designated critical resource areas. Recognizing that a prescribed minimum buffer may be either over or under-protective, the Work Group should also establish objective criteria for varying the buffer width based upon site-specific information about pollutant sources; the presence of rare plants, animals or minerals; and existing protected uses of the proposed area. (The work group should consider Groffman *et al.* (1991) and IEP, Inc. (1991) as the basis for a 300 foot undisturbed vegetated buffer based on data collected in Rhode Island and a survey of buffer distances used in other jurisdictions.) b. The following guideline is recommended for consideration by the Work Group in order to preserve the ability of landowners to develop land surrounding critical resource areas while achieving some measure of protection for wildlife. Within 300 feet of the boundaries of critical resource areas, 50 percent of each parcel should remain undisturbed provided such disturbance does not threaten to degrade the values for which the critical resource area is designated. Strict erosion and sediment control measures, as well as restrictions on identified high-impact or high-risk activities, should be required for any disturbance of land within the 300 foot area. c. RIDEM and CRMC should explore means of improving interagency coordination in order to ensure that information on the locations and habitat requirements of rare species is fully utilized for maximum protection of these species through vegetated buffer strip requirements.	Vegetated Buffer Strip Delineation Work Group (R.I., Mass.)	[See CRMC "Preliminary Agreement," Section 715-05-06 re: development of shoreline buffer policies, public education.]

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RECOMMENDED POLICIES AND ACTIONS
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CODE	POLICY	AGENCIES	STATUS
II.	The State of Rhode Island should strengthen existing planning, regulatory, and implementation programs for critical resource protection.		
II.A.	CRMC's Special Area Management (SAM) Plan Process should be strengthened, and:		
II.A.1.	Consideration should be given to expanding the SAM Plan process within the coastal zone to develop more detailed management, protection, or restoration plans for coastal wetlands, eelgrass beds, lobster nursery areas, waterfowl nesting or feeding areas, and other specific coastal or submerged resource areas of special local importance. This recommendation applies to future *SAM Plans* as well as to revisions to existing plans.	CRMC, relevant state and municipal agencies	[See CRMC "Preliminary Agreement," Section 715-05-06 re: 1) proposed MOU with RIDEM Wetlands regarding regulation; 2) proposed research on submerged aquatic vegetation in Pawcatuck River, Pt. Judith Pond, Ninigret Pond.]
II.A.2.	Policies outlined in SAM Plans should be developed, adopted, and enforced by all authorities with jurisdiction over the delineated area. a. All state agency regulations and policies should be consistent with approved SAM Plan policies when those policies are more protective than existing agency regulations, and when the affected state agency has had an opportunity to participate in the SAM Plan process. b. Local comprehensive plans and local zoning should be in conformance with SAM Plans in order to ensure adoption and enforcement of SAM Plan policies by municipal governments. c. Availability of federal or state funds for open space land acquisition and environmental projects should be contingent upon local enforcement of SAM Plan policies; this funding policy should take effect as soon as possible.	federal, state, local agencies (R.I., Mass.)	[See CRMC "Preliminary Agreement," Section 715-05-06 re: development of legislation to ensure that state agency activities are consistent with *SAM Plan* policies.]

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RECOMMENDED POLICIES AND ACTIONS
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CODE	POLICY	AGENCIES	STATUS
II.A.3.	The coordinated permit review process established in SAM Plans should be strengthened through coordinated agency participation and the establishment of appropriate funding mechanisms. [Note: The Rhode Island Land Use Commission's proposed amendments to the Subdivision Enabling Act (1992) address this issue, in part.] Assuming a reasonable time period to ensure that staff requirements are met, municipal governments and state agencies should agree to participate fully in the coordinated permit review process established by SAM Plans, including attendance at all pre-application conferences. a. Applicants must be clearly informed that participating regulatory agencies will not agree to issue a permit for a project that would not be consistent with the agency's regulatory mandate. To support the process, an appropriate pre-application conference fee should be charged to cover agency costs. b. The coordinated permit review process should be viewed as a limited procedure to ensure that significant development projects (*e.g.*, projects larger than six units, or projects larger than five acres) are protective of the environment and critical resource areas. A potential means of managing these reviews would be through regional coordinators, perhaps within CRMC. c. Complete documentation of guidance provided, as well as the provision that this guidance could change based upon new developments, should be required to protect agencies from potential legal challenges. d. Fairly complete plans should be required prior to the pre-application conference, and, as noted above, pre-application conference fees must be set to compensate agencies for staff time required to minimize any extra agency staff time requirement. e. Agencies should consider establishment of a dedicated account for pre-application conference fees that is not directly linked to funding for the conferences themselves in order to allow environmental agencies to maintain stable staffing levels that are not subject to fluctuations in the building industry.	CRMC, RIDEM, affected state municipal agencies and individuals	The R.I. Subdivision Enabling Act will provide for coordinated permit review, if enacted (1992). [See CRMC "Preliminary Agreement," Section 715-05-06 re: implementation of coordinated permit review process.]

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RECOMMENDED POLICIES AND ACTIONS
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II.A.4.	Development of a *SAM Plan* for Greenwich Bay should be undertaken as the highest priority. In addition, *SAM Plans* for Mount Hope Bay (involving an interstate planning effort), to be undertaken as soon as is feasible, and the Sakonnet River should be given high priority. a. A Greenwich Bay *SAM Plan* that considers protection of the Bay's shoreline for its habitat, wildlife and recreational value, should be initiated upon completion of the currently-funded preliminary basin plan for Greenwich Bay; b. The CRMC, RIDEM and Massachusetts counterparts should evaluate the need for additional interstate research and planning efforts in Mount Hope Bay following completion of the interstate Section 309 assessment in 1992. c. The CRMC should schedule initiation of a Sakonnet River *SAM Plan* based on progress in completing plans for Greenwich Bay and Mount Hope Bay. d. The Resource Management Plan for the Narragansett Bay National Estuarine Research Reserve (NB-NERR) should be updated by 1993 and should be enforced by all authorities with jurisdiction over the delineated area.	CRMC, RIDEM, affected state and local agencies	[See RIDEM, CRMC "Preliminary Agreements," Section 715-05-06 re: Greenwich Bay Basin Plan.] $150,000 R.I. Aqua Fund grant to NBP (1990) and RIDEM-CRMC-NBP MOA (1991) are in place to support Greenwich Bay Basin Plan. [See RIDEM "Preliminary Agreement," Section 715-05-06 re: Narragansett Bay NERR Management Plan.] [See "Preliminary Agreement," Section 715-05-06 re: Mt. Hope Bay, Sakonnet River *Sam Plans*.]

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II.B.	The RIDEM should institute a limited program of support for development of basin plans for significant non-coastal aquatic resources. Priority areas for basin planning should be selected in conjunction with the RIDEM Nonpoint Source Program and the RIDEM Natural Heritage Program, based upon the high priority water bodies identified in the *Rhode Island Clean Water Strategy (Nonpoint Source Element)* and identified ONRW's. Particular attention should be given to high priority water bodies that are also associated with significant riparian habitats identified by the Natural Heritage Program. The newly created Rhode Island Rivers Council (established under R.I.G.L. 46-27) should serve as the mechanism for developing these plans. Suggested elements for inclusion in a watershed-based riverine planning process include the following: 1. A policy statement in its statutes enumerating those qualities for which rivers should be protected and managed. 2. A *bona fide* system of protected rivers and river segments. 3. A selection method based on a statewide river inventory or assessment. 4. "Non-degradation" provisions, which may include prohibitions on dam construction, water quality degradation, channelization, and/or sand and gravel extractions for the most exceptional river segments. 5. A "consistency provision", requiring that actions of all state agencies be consistent with river management plans promulgated under the program. 6. A lead agency to run the program with at least one full-time staff person assigned to the program. 7. The authority to protect riparian corridors. 8. An emphasis on coordination of existing protective authorities, such as flood plain laws, erosion control regulations, land acquisition, *etc* 9. An emphasis on local government regional watershed planning involving public participation in formulating and carrying out the program. (From New England Governors' Conference Resolution No. 98)	RIDEM, CRMC, R.I. Rivers Council	**[See RIDEM, RIDOP "Preliminary Agreements," Section 715-05-06 re: participation on R.I. Rivers Council.] [See USDA SCS "Preliminary Agreement," Section 715-05-06 re: selection of priority basins in Blackstone and Taunton River watersheds to focus future implementation efforts.]**

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II.C.	Minimum development standards for construction and development should be developed to apply specifically to all designated critical resource areas and critical resource protection areas, including SAM Plan areas. Additionally, when BMPs alone do not adequately address all environmental risks posed, a hierarchy of allowable land uses and activities should be developed and applied to critical protection areas, in order to direct certain high-risk activities out of the watersheds of critical resources. [See Section 04-02-01 Resource Protection: Land Use.] These standards should be applied by all relevant divisions within RIDEM, CRMC, the Rhode Island Department of Transportation (RIDOT), and municipalities.	RIDEM, RIDOP, CRMC, RIDOT, Municipalities, Mass. counterparts	[See RIDOP "Preliminary Agreement," Section 715-05-06 re: technical assistance regarding minimum development standards, hierarchy of permitted uses.] [See CRMC "Preliminary Agreement," Section 715-05-06 re: development of policies to mitigate cumulative and secondary impacts of development.]

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II.D.	Existing regulations for protection of priority habitat areas should be strengthened. For example,		
II.D.1.	Rhode Island's Endangered Species Act (R.I.G.L. 20-37) should be revised to address habitat loss through provisions allowing for designation of significant habitats and appropriate permit standards for protection of designated areas. Two models should be reviewed for applicability to Rhode Island: a. The Massachusetts Endangered Species legislation (M.G.L., c. 131A) provides administrative procedures to list and protect indigenous plant and animal species that are endangered, threatened, or of special concern. It also creates a process for designation of significant habitats, and requires a permit for alteration (except certain agricultural, forestry and vegetation management practices) of a designated "significant habitat." b. The New Jersey freshwater wetlands statute provides a classification system for identifying wetlands of exceptional resource value, including wetlands "which are present habitats for threatened or endangered species, or those which are documented habitats for threatened or endangered species which remain suitable for breeding, rest, or feeding..." (N.J.G.L. 13:9B-7). Wetlands of exceptional resource value are then *required* to have transition areas of 75 to 150 feet as a buffer.	RIDEM, Mass. counterparts	
II.D.2.	RIDEM's Freshwater Wetlands Regulations or, if necessary, Rhode Island's Wetlands Protection Act (R.I.G.L. 2-1-20), should be revised to explicitly include a 50-foot perimeter around identified wetlands within the definition of a wetland, and include strengthened provisions for increased buffers in order to protect the wetland. The revisions should recognize that the wetland buffer also provides critical upland habitat and water quality improvement functions that need to be protected. The proposed target date for this effort is January 1993; revisions should be developed by the RIDEM Natural Heritage Program and the RIDEM Freshwater Wetlands Division.	RIDEM	[See CRMC "Preliminary Agreement," Section 715-05-06 re: proposed interagency MOU with RIDEM to coordinate wetlands regulations.]

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II.E.	The State of Rhode Island and the Commonwealth of Massachusetts should review their priorities for acquiring open space to include protection and restoration of critical resource protection areas. For example, 1. RIDEM should consider adding proximity to critical resource areas or, eventually, *Areas of State Concern*, as elements to be considered in weighing Open Space Bond Fund applications. 2. The RIDEM and Massachusetts Department of Environmental Protection (MADEP) *Nonpoint Source Assessments*, conducted as part of the states' *Clean Water Strategy*, should identify priorities for restoration of threatened and impaired wetlands and riparian habitat in order to restore the water quality improvement functions of these areas. The states should then consider adding water quality goals as an element to be considered in acquiring open space. For example, wetlands, riparian lands or lands in the watersheds of high quality waters might receive greater priority for acquisition. 3. The RIDEM Nonpoint Source Management Program and Natural Heritage Program in conjunction with RIDEM's Division of Freshwater Wetlands and CRMC's and RIDEM's (to be proposed) Section 6217 Coastal Nonpoint Pollution Control Program should consider cooperative activities geared to identify priority areas for land acquisition and potential habitat restoration efforts, with a suggested priority on buffers for salt marshes. The focus of this effort would be to enlarge or buffer existing protected wildlife habitat through the preparation of habitat restoration plans and increased targeting of Open Space Bond Funds to these areas. 4. An ideal forum for defining and coordinating these land acquisition efforts may be the RIDOP's *GreenSpace 2000* initiative, currently under development as a *Rhode Island State Guide Plan* element. To effectively protect critical habitat resources as well as meeting its other priorities, the *GreenSpace 2000* element should include habitat concerns as an important planning consideration. *GreenSpace 2000* should also explore the potential for creating a separate funding pool for acquisition of critical resource areas in order to avoid competition with proposals for acquisition of recreational lands.	federal agencies, (USFWS, National Park Service), RIDEM, municipalities, public and private land trusts, Mass. counterparts	[See RIDEM "Preliminary Agreement," Section 715-05-06 re: 1) future eligibility for state Open Space Grants; 2) economic incentive to protect "forest legacy" areas.]

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II.F.	Technical support and any necessary training should be supported to enable the RIDEM Division of Freshwater Wetlands and the CRMC to begin utilizing Rhode Island Geographic Information System (RIGIS)-based wetlands information as soon as possible. In order to provide a flag to ensure that a field verification is requested prior to alteration of potential wetlands, RIGIS wetlands maps should be made available to towns for overlay on town maps for use by town officials and the public. As more precise mapped information becomes available, the State should consider establishment of a wetlands registration program.	RIDEM, CRMC, EDC, Mass. counterparts	Hydric soils distribution and 1988 areal distribution of wetlands are available in RIGIS.
II.G.	Establishment of a strong, systematic process of ONRW designation and protection (outlined in the Federal Clean Water Act antidegradation provisions) should be strongly supported as an integral component of a critical resource protection policy. Rhode Island's Critical Resource Protection Policy should bolster and complement the development of ONRW designation.	EPA, RIDEM, Mass. counterpart	

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II.H.	The State of Rhode Island and Commonwealth of Massachusetts should incorporate best available information on rates of current sea level rise to develop a comprehensive strategy that will incorporate consideration of sea level rise into all relevant planning and management programs in the Narragansett Bay Basin. These actions should include: 1. Mapping of impact zones under sea level rise scenarios of one foot per 100 years (average historic) and three feet per 100 years. By December 1993, Rhode Island should complete a mapping inventory of Narragansett Bay areas that could be impacted under these sea level rise scenarios similar to that conducted by Massachusetts for its portion of the Narragansett Bay basin. 2. State agencies and municipalities should review their policies to assess their effectiveness in regulating new activities in zones shown to be impacted by sea level rise under conservative to moderate scenarios. 3. On-site sewage disposal systems (OSDS) requirements of minimum depths to ground water should include factors to account for sea-level rise over the life of the septic system. [See 04-01-05 Source Control: On-Site Sewage Disposal Systems for further discussion of OSDSs.] 4. Buffer zones should be established to allow inland migration of salt marshes as a result of sea level rise and for potential establishment of contiguous freshwater wetlands.	ACOE, RIDEM, CRMC, Mass. counterparts	The ACOE will 1) establish 100-year flood elevation markers in selected coastal areas, *e.g.* Narragansett, South Kingstown (1992); 2) establish wetlands restoration project in Galilee Bird Sanctuary Saltmarsh as part of Coastal America Initiative (1992).
II.I.	The Critical Resource Policy Committee and the RIDOP should conduct additional studies to determine the feasibility of a program that would purchase, reconfigure, and resell substandard or poorly configured lots in areas where development would contribute to water quality degradation.	Critical Resources Policy Committee, RIDOP, municipalities	

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II.J.	The RIDOP and Rhode Island municipalities should undertake a regional or local structure for administration of a transfer-of-development-rights (TDR) program for communities in the Narragansett Bay watershed. While this type of program has been implemented in other areas, its complexities must be anticipated through careful planning. In particular, emphasis should be placed upon avoiding excessive impacts to receiving areas. A suggested approach follows: 1. Development credits could be sold by property owners located in critical resource protection areas, in areas designated as appropriate buffers or high value habitat areas, or in other sensitive areas as identified by RIDEM and CRMC. Each development credit could be redeemed for a negotiated incremental increase in development density in a receiving area. The magnitude of density enhancement would depend upon the base zoned land use and density. 2. Local governments would be responsible for designating interim receiving areas (town centers, villages, transportation centers), based upon natural resource evaluations required in support of local comprehensive plans and availability of support services. State assistance should be made available to towns in assessing environmental constraints to the location of receiving areas on a subwatershed basis. 3. Receiving area definitions should recognize the natural and manmade pollutant treatment capacity of each subwatershed. 4. Zoning ordinances would be revised to state where and under what conditions development credits could be used to increase density in receiving areas, for residential, commercial, and industrial use. It is recommended that the RIDOP have responsibility for reviewing the zoning amendments prepared to accommodate density shifting, as an element of the local comprehensive planning review process. 5. To foster a market in development credits, bonus units should be offered not only in areas zoned for high original densities, but also where density increases yield highest profits to developers at low to moderate densities where sensitive areas can be avoided through clustering. Additional bonus units might also be made available for developments in which space or discharge easements were donated for neighborhood or regional stormwater management. 6. A mechanism for "banking" and distributing TDR credits should be investigated in order to minimize loss of property tax revenue by individual municipalities.	RIDOP, municipalities, Mass. counterparts	[See RIDOP "Preliminary Agreement," Section 715-05-06 re: program of technical assistance to cities and towns.]

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Estimated Cost of Implementation—
Protection of Critical Areas

Table 715-04(9) summarizes the estimated costs associated with implementing the recommendations in this chapter. Element I (Development of a Cohesive Mechanism) includes costs for several critical resource protection activities recommended in other chapters. While containing minor legislative and policy costs, this Element's major costs are associated with the creation of a Critical Resource Policy Committee (which assumes minor ongoing coordination costs) and the development of critical resource protection area policies (combined costs of over $500,000). These costs cover delineation and GIS mapping of critical areas, development of regulatory and nonregulatory controls to protect designated critical resource areas, and work associated with developing a buffer strip delineation formula for protection of state waters and adjacent protection areas. State resource management agencies would be responsible for the costs of, administration, and critical resource area delineation and implementation of regulatory controls.

Element II (Strengthen Existing Programs) contains several recommendations regarding future planning activities (coastal and non-coastal). Costs associated with these planning efforts, and resulting regulations and enforcement total nearly $1.5 million (mainly attributed to RIDEM and CRMC). The cost of a Mount Hope Bay SAM Plan is reported under 04-03-01 Areas of Special Concern: Mount Hope Bay. Coordinated preapplication permit review activities and the development of construction design/performance standards recommendations are costed under 04-02-01 Resource Protection: Land Use. Additional minor costs are associated with planning studies for land management programs, *e.g.*, establishment of a TDR program.

For further details regarding the *CCMP* cost estimation process and funding strategies, refer to the *Narragansett Bay CCMP Cost Estimation and Funding Report* (Apogee Research Inc./NBP, 1992).

Table 715-04(9)

ESTIMATED COST OF IMPLEMENTATION
PROTECTION OF CRITICAL AREAS

COST ESTIMATES BY ELEMENT	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
I-Dev. Cohesive Mechanism	216,250	0	120,000	0	153,750	0	105,000	0	105,000	0	700,000	0
II-Strength. Existing Programs	98,750	334,000	45,000	417,000	57,500	250,000	40,000	167,000	40,000	167,000	281,250	1,335,000
TOTALS	315,000	334,000	165,000	417,000	211,250	250,000	145,000	167,000	145,000	167,000	981,250	1,335,000
TOTAL BY YEAR		649,000		582,000		461,250		312,000		312,000		2,316,250

COST ESTIMATES BY AGENCY	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
RIDEM	112,500	167,000	50,000	167,000	57,500	167,000	45,000	167,000	45,000	167,000	310,000	835,000
RI CRMC	85,000	167,000	45,000	250,000	40,000	83,000	40,000	0	40,000	0	250,000	500,000
RIDOT	5,000	0	5,000	0	5,000	0	5,000	0	5,000	0	25,000	
RIDOP	62,500	0	35,000	0	35,000	0	35,000	0	35,000	0	202,500	0
URI	5,000	0	5,000	0	5,000	0	0	0	0	0	15,000	0
Municipalities*	45,000	0	25,000	0	68,750	0	20,000	0	20,000	0	178,750	0
TOTALS	315,000	334,000	165,000	417,000	211,250	250,000	145,000	167,000	145,000	167,000	981,250	1,335,000
TOTAL BY YEAR		649,000		582,000		461,250		312,000		312,000		2,316,250

* Ultimate implementation costs will vary for each municipality depending on its particular environmental and institutional conditions. In addition, the estimated municipal implementation costs do not include ultimate program and capital costs that may result from completion of underlying planning activities, or costs that are expected to be completely recoverable from user fees.

04-02-03 Management of Living Marine Resources [RESERVED]

04-02-04 Public Health

Objective for the Protection of Public Health

The State of Rhode Island and the Commonwealth of Massachusetts should reduce the risk to public health and safety from sewage-derived pathogens and toxics discharged to Narragansett Bay and its tributary waters.

Introduction

The safety of Narragansett Bay for swimming and harvesting of native seafood is a major concern for residents of the Bay area. The Bay receives chronic point and nonpoint source inputs of sewage and toxic pollutants that can contaminate bathing beaches and local fisheries. The Bay also periodically experiences catastrophic events such as the 1989 *World Prodigy* oil spill that can contaminate local fisheries and limit water quality dependent uses of the Bay. The popularity of native seafood and the importance of the commercial fishing and tourism industries in Rhode Island and Massachusetts have prompted efforts to assess and minimize the public health risk related to consumption of Bay fish and shellfish, and swimming in Bay waters.

Statement of the Problem

Two general classes of water-borne pollutants pose a risk to public health and safety. These include sewage-derived pathogens (disease-causing bacteria, viruses, and protozoa) and toxics (metals and organic chemicals). Pathogenic microorganisms can cause infection or illness in people who swim in sewage-contaminated waters or who eat improperly cooked sewage-contaminated shellfish. Toxics concentrated in the edible tissues of fish or shellfish can cause adverse health effects such as an increased risk of cancer, and other physiological problems in human consumers. Relative estimated average lifetime cancer risks from consumption of Narragansett Bay seafood is compared to risks from consumption of other foods in Table 715-04 (10).

Human fecal waste and toxic pollutants enter Narragansett Bay from point and nonpoint sources. Point source discharges of fecal waste include publicly owned wastewater treatment facilities (WWTFs), WWTF bypasses, combined sewer overflows (CSOs) and storm sewers. Nonpoint sources include on-site sewage disposal systems, storm runoff, and boater discharges. (Karp *et al.*, 1990:i) Toxics enter Narragansett Bay from a similar array of sources, including industrial, commercial and household discharges to sewers and on-site sewage disposal systems. Urban, highway and agricultural runoff, direct atmospheric deposition, remobilization of contaminated sediments, and chemical spills represent additional sources of toxics to the Bay and its tributaries. (Penniman *et al.*, 1991a:2)

Historically, cholera, typhoid, and hepatitis were major sewage-derived, water-borne diseases of concern. At the present time, the major public health risk in the Northeast associated with sewage contamination is viral gastroenteritis—a relatively minor illness characterized by fever, vomiting, and diarrhea. (Karp *et al.*, 1990:1-3) As of summer 1991, approximately 40 percent of Narragansett Bay, including Mount Hope Bay, was permanently or conditionally closed to shellfish harvesting in order to protect the public from exposure to sewage-contaminated shellfish.

Although WWTFs are required to disinfect their final effluent, waters in the vicinity of WWTFs are permanently closed to shellfishing and swimming for two reasons. Chlorine, the disinfectant used by all WWTFs in the Bay basin, does not kill all bacteria and viruses that are potentially of public health concern. In addition, the permanent closures provide a safety zone in case the wastewater treatment system fails and raw or partially treated sewage is bypassed to the receiving water. (Penniman *et al.*, 1991a:37-38)

Some areas of Narragansett Bay are conditionally closed to shellfishing after rain storms and periods of snow melt due to

TABLE 715-04(10): Estimated average lifetime cancer risks from oral exposure for various eating and drinking activities.

Source of Risk	Average Lifetime Risk
New York Harbor fish: average (30 lb/yr)	9 in 1000
Lake Michigan fish: average (13 lb/yr)	6 in 1000
Quincy Bay seafood: average (2.5 lb/yr) (including tomalley)	1 in 1000
Diet soda (saccharin): 12.5 oz/day	7 in 10,000
Peanut butter (aflatoxins): 4 tbsp/day	6 in 10,000
Puget Sound seafood: average (10 lb/yr)	2 in 10,000
Milk (aflatoxins): 1 pt/day	1 in 10,000
Quincy Bay seafood: average (2.5 lb/yr) (excluding tomalley)	8 in 100,000
Miami/New Orleans drinking water: 2 lb/day	7 in 100,000
Narragansett Bay Providence River quahogs: average (1 lb/yr)	1 in 100,000
Narragansett Bay Open Areas: average (1 lb/yr)	8 in 1,000,000
Narragansett Bay Mount Hope Bay: average (1 lb/yr)	8 in 1,000,000

the discharge of raw sewage from combined sewers. There has also been a trend toward increasing restrictions on shellfish harvesting in nonurban areas of the Bay due to actual and suspected sewage discharges from septic systems, storm drains, and boats. This trend is primarily related to increased development in coastal communities with inadequate infrastructure to deal with the rate of population growth. (Zingarelli *et al.*, 1991:16-17)

Although toxic pollutant inputs to Narragansett Bay have decreased in recent years, violations of water quality standards intended to protect human health and aquatic life continue to occur in the Providence River, upper Narragansett Bay, and the major rivers. (Penniman *et al.*, 1991a:8) In addition, many of the toxic pollutants of concern are found in combination with each other and are widely distributed throughout the Bay. Available data suggest that people who eat moderate amounts of quahogs and winter flounder harvested from Narragansett Bay are not likely to suffer adverse health effects. However, an increased risk of cancer is predicted for people who consume large quantities of Bay-harvested quahogs or winter flounder, and for people in high risk categories (*e.g.*, children, subsistence fishermen). (Kipp, 1990:31) [See Section 715-02: State of the Bay for a more detailed discussion of the distribution and sources of contaminants in Narragansett Bay.]

Existing Policies

The federal government, the State of Rhode Island, and the Commonwealth of Massachusetts have established a number of policies and regulatory requirements to limit the public's exposure to contaminated seafood. For example, surface waters in open and conditionally open shellfish growing areas are routinely sampled for evidence of sewage contamination (as indicated by fecal coliform bacteria) in order to regulate shellfish harvesting. (RIDEM, 1990a; Karp *et al.*, 1990: 8) The Rhode Island Department of Environmental Management (RIDEM) and the Rhode Island Department of Health (RIDOH) also sample shellfish in the stream of commerce, including wholesale and retail outlets and shellfish transporters, for evidence of sewage contamination. (Karp *et al.*, 1990:10) Edible fish and shellfish tissues are also periodically monitored by RIDEM and RIDOH for evidence of toxics contamination. (Kipp, 1990:26) To protect swimmers, water samples are taken at beaches prior to the beginning of the bathing season and analyzed for evidence of fecal contamination. (Karp *et al.*, 1990:11) Beaches are only sampled during the swimming season if there is a suspected source of sewage contamination.

In addition to monitoring, the states actively enforce prohibitions on harvesting shellfish from permanently and conditionally closed shellfish harvesting areas. The RIDOH and the RIDEM may confiscate shellfish believed to have been harvested from closed areas, or which have been handled or transported in an unsanitary manner. (Karp *et al.*, 1990:10) There is also some degree of "self-policing" by the shellfishermen with respect to enforcement of the harvesting restrictions because of concerns about the marketability of the catch. At present, there are no harvesting restrictions on Narragansett Bay harvested seafood because of chemical contamination. However, the U.S. Food and Drug Administration (FDA), the U.S. Environmental Protection Agency (EPA), and the state health departments periodically issue health advisories about the risks of eating certain fish or shellfish species because of elevated toxics concentrations. For example, advisories are presently in place for "high risk" members of the population with respect to eating bluefish and striped bass. In addition, the RIDOH and RIDEM have established public outreach efforts directed to urban populations that are in "high risk" categories with respect to seafood harvesting in contaminated areas of the Bay basin.

Mostly, however, the federal and state governments rely on regulation and treatment of pollution sources to manage the risk of exposure to contaminated seafood. For example, EPA, the State of Rhode Island, and the Commonwealth of Massachusetts require all WWTFs to treat their final effluents prior to discharge to reduce the total load of bacterial contaminants. In addition, the

state regulatory agencies have established protocols for closing shellfish harvesting areas, subject to certification by the FDA, and bathing beaches in the event of WWTF bypasses, combined sewer overflows, and where there is evidence of sewage contamination from other sources.

Rhode Island has also subsidized a "shellfish relay" program designed to cleanse quahog meats of potential pathogens before they are brought to market. This practice enables shellfishermen to harvest quahogs from conditionally approved harvesting areas in the Providence River and move them to clean-water sites in the Greenwich Bay Shellfish Management Area. The grow-out sites are opened to commercial harvesting approximately six to eight months after the transplant operation, following RIDEM certification.

Municipal and industrial toxics discharges to Narragansett Bay and Bay tributaries are also regulated in order to protect human health and aquatic life. The EPA, the RIDEM, and the Massachusetts Department of Environmental Protection (MADEP) primarily rely on mandatory technology and water quality-based requirements in National Pollutant Discharge Elimination System (NPDES) discharge permits as well as in the Industrial Pretreatment Program to control toxics discharges to receiving waters. However, non-regulatory efforts to encourage reduction in the use, generation and discharge of toxic pollutants also exist. [See 04-01-01 Source Reduction: Toxics for a more complete description of federal and state regulatory and source reduction efforts.]

Analysis

Based on available public health records, federal and state efforts to capture and treat domestic wastes have been effective in minimizing, although not eliminating, human exposure to sewage-derived pathogens. For example, although more effective disinfection technologies exist, secondary wastewater treatment and chlorination of WWTF effluents have significantly reduced loadings of fecal contaminants to the Bay and its tributaries. In addition, federal and state efforts to manage shellfish harvesting areas and enforce harvesting restrictions have significantly reduced the probability that sewage-contaminated shellfish enter the market.

In spite of these efforts, approximately 40 percent of Narragansett Bay is presently restricted to shellfishing and additional areas are being closed due to sewage contamination from nonpoint sources. In addition, illegal shellfish harvesting still occurs in closed and conditionally closed areas of Narragansett Bay in spite of the RIDEM's enforcement activities. (Karp *et al.*, 1990:22) An unknown level of risk associated with eating raw shellfish also exists linked to how the animals are handled, stored, and transported *after* harvesting. (Karp *et al.*, 1990:10) Since Rhode Island is a major exporter of quahogs, a coordinated federal-state effort is necessary to prevent the discharge of improperly treated sewage, eliminate illegal shellfish harvesting, and improve sanitary practices in the handling of seafood.

Federal and state policies implemented pursuant to the Clean Water Act have resulted in measurable reductions in toxics discharges to Narragansett Bay. However, violations of federal and state water quality standards intended to protect human health and aquatic life still occur in portions of upper Narragansett Bay and the Providence River. In addition, many of the toxic pollutants of concern are widely distributed throughout Narragansett Bay, and are found at measurable levels in the edible tissues of fish and shellfish harvested from the Bay. For example, blue mussel tissue samples collected at a relatively uncontaminated site in Narragansett Bay between 1984 and 1987 were among the 20 most contaminated of the 200 National Oceanic and Atmospheric Administration National Status and Trends estuarine sampling sites for copper and lead, and concentrations of PCBs and lead in winter flounder livers collected at the same site ranked 14 and six of 42 estuaries, respectively.

To date, federal and state efforts have focused on regulating municipal and industrial sources of toxics. Additional efforts are nec-

essary, however, to control and reduce other sources and types of toxic pollutants. In addition, the federal and state agencies responsible for protecting public health and environmental quality should coordinate and increase their efforts to understand the relationship between environmental levels of toxic pollutants and human health risk.

Recommended Policies and Actions and *Estimated Cost of Implementation* are presented in the following pages.

RECOMMENDED POLICIES AND ACTIONS
PUBLIC HEALTH

CODE	POLICY	AGENCIES	STATUS
I.	The State of Rhode Island and the Commonwealth of Massachusetts should reduce the public's risk of exposure to sewage-derived pathogens in Narragansett Bay and waters tributary to Narragansett Bay.		
I.A.	The State of Rhode Island and the Commonwealth of Massachusetts should improve the assessment of shellfish growing waters and bathing beaches.		
I.A.1.	Rhode Island and Massachusetts should continue to collect bacteriological samples in surface waters to regulate shellfish growing areas, at least until there is more evidence that alternative procedures, *e.g.*, direct sampling of shellfish, is more protective of human health. In addition: a. Rhode Island and Massachusetts should monitor fecal contaminant levels in shellfish tissue from the time that shellfish are harvested through retail sale, particularly where a sanitary handling, storage or transportation problem is suspected. b. Rhode Island and Massachusetts should conform their shellfish monitoring programs to the maximum extent possible to ensure that consistent procedures are followed. c. State and municipal agencies shall cooperate in identifying and abating the source(s) of fecal contamination where shellfish harvesting waters or bathing beaches are closed due to exceedances of federal or state bacteriological standards.	RIDEM, RIDOH, MADEP, MADPH, MADFW, Mass. County Boards of Health	[See RIDOH "Preliminary Agreement," Section 715-05-06.]

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RECOMMENDED POLICIES AND ACTIONS
PUBLIC HEALTH

CODE	POLICY	AGENCIES	STATUS
I.A.2.	Rhode Island and Massachusetts should continue to collect samples at bathing beaches prior to the bathing season, and randomly monitor bathing beach water quality during the bathing season. In addition: a. The State of Rhode Island should institute a formal procedure for officially closing and posting closed beaches and: i. The RIDOH should issue a general health advisory about swimming in sewage-contaminated waters. ii. The RIDEM and RIDOH should implement a Memorandum of Agreement covering bathing beach monitoring and beach closure policies for implementation as soon as possible. iii. The RIDOH should post beaches in the Providence River region as unsafe for swimming based on their proximity to major urban sources of fecal contamination *and/or* publish a map indicating the location of beaches closed to swimming for water quality reasons. iv. The RIDOH should post beaches as unsafe for swimming if there is actual evidence of fecal contamination *and/or* publish a map indicating the location of beaches closed to swimming for water quality reasons. v. The relevant state and/or local authorities should be required to identify each combined sewer overflow clearly and post the area as unsafe for swimming and shellfishing as a condition of the authority's Rhode Island Discharge Elimination System (RIPDES) permit. b. Coastal cities and towns should be encouraged to develop local bacteriological monitoring programs for town-owned or operated beaches. c. The RIDOH should continue to test alternative analytical procedures that will provide a more rapid turn-around time for results of bacteriological tests for fecal coliform levels in seawater.	RIDEM, RIDOH, MADEP, MADPH, and municipalities	RIDEM and RIDOH executed an interagency MOA in 1991 regarding agency responsibility for bathing beach monitoring. RIDEM collects samples at bathing beaches prior to the bathing season, and at selected beaches on a biweekly or monthly basis during the bathing season. [See RIDOH "Preliminary Agreement," Section 715-05-06 re: beach closure policy.]

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RECOMMENDED POLICIES AND ACTIONS
PUBLIC HEALTH

CODE	POLICY	AGENCIES	STATUS
I.A.3.	Rhode Island and Massachusetts should sample alternative fecal indicators (*e.g.*, *Clostridium perfringens* spores) in addition to fecal coliform bacteria levels to support future decisions about reclassifying closed and/or conditionally approved shellfish growing areas for shellfish harvesting. The RIDEM should particularly use viral indicators to support decisions about certification of shellfish growing areas where septic systems are a suspected source of fecal contamination. In addition: a. The RIDEM and RIDOH should consider submitting letters to the Directors of the EPA Office of Water and the FDA urging both agencies to continue investigating the need for alternative indicators, and to complete their jointly-sponsored epidemiological study of human health effects associated with eating raw shellfish harvested from approved and conditionally approved coastal waters. b. The RIDEM and/or RIDOH should continue to follow developments in gene probe technology with respect to a rapid assay for fecal indicators or direct detection of pathogens. c. The RIDOH should establish reporting requirements for all infectious diseases that may be attributable to shellfish consumption or swimming in Narragansett Bay.	EPA, FDA, RIDEM, RIDOH, MADPH, Mass. County Boards of Health	[See RIDOH "Preliminary Agreement," Section 715-05-06 re: use of viral indicators; mandatory reporting of illnesses related to shellfish consumption and swimming in Narragansett Bay.]

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RECOMMENDED POLICIES AND ACTIONS
PUBLIC HEALTH

CODE	POLICY	AGENCIES	STATUS
I.B.	The State of Rhode Island and the Commonwealth of Massachusetts should take necessary steps to manage and reduce the risk of public exposure to sewage-derived pathogens. *[See 04-01-04 Source Control: Combined Sewer Overflows; 04-01-05 Source Control: On-Site Sewage Disposal Systems; and 04-01-06 Source Control: Boater Discharges for recommendations regarding the control of sewage discharges from these sources.]*		
I.B.1.	The State of Rhode Island should <u>not</u> actively promote shellfish depuration of any kind, including the shellfish relay program, in any way that might relax state initiatives to reverse existing pollution trends in Narragansett Bay contrary to the federal Clean Water Act. In addition, the State of Rhode Island should *not* approve the licensing of commercial and/or non-commercial shellfish purification facilities at this time. However: a. The current shellfish relay system should continue in the absence of any evidence of a significant, unacceptable public health risk resulting from this practice, to the extent that the program also serves acceptable shellfish management objectives. b. The RIDEM should continue to follow developments in depuration technology and should *not* foreclose the option of licensing commercial ventures in the event that a public health problem materializes with shellfish harvested from presently certified waters.		

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RECOMMENDED POLICIES AND ACTIONS
PUBLIC HEALTH

CODE	POLICY	AGENCIES	STATUS
I.B.2.	The RIDEM should increase its present level of enforcement to reduce or eliminate the illegal commercial harvesting of shellfish from uncertified (closed) areas of Narragansett Bay. Specifically, RIDEM should: a. Continue to stagger its patrols of Bay waters to increase the probability of detecting illegal harvesting between dusk and dawn. b. Deploy Boating Safety Officers to enforce the state's fisheries laws when RIDEM Conservation Officers are occupied elsewhere, and/or establish a full-time, year-round marine patrol unit within RIDEM Division of Enforcement, fully deputized to enforce the provisions of Title 20 of the Rhode Island General Laws. c. Upgrade the Division of Enforcement's equipment (*e.g.*, acquire night vision glasses) and adjust its patrols to focus on established patterns of violation, such as immediately following a relay/transplant to shellfish management areas. d. Increase inspections and regulatory oversight of shellfish dealers and distributors suspected of knowingly marketing illegally harvested shellfish. e. Continue cooperating with Massachusetts Fish and Wildlife officials to patrol Mount Hope Bay, and consider entering an interstate Memorandum of Agreement with Massachusetts to provide for: i. Reciprocity with respect to license suspensions/revocations; ii. Periodically exchanging enforcement officers, and iii. Pooling and/or sharing field equipment. f. Systematically follow up on information provided by shellfishermen and others regarding illegal harvesting and/or marketing of shellfish. g. Attempt to equalize the probability that violators are detected and consistently prosecuted for shellfish violations in all regions of Narragansett Bay.	RIDEM, RIDOH, MADFW, MADPH	[See RIDOH "Preliminary Agreement," Section 715-05-06 re: increased inspection of shellfish dealers and distributors.]

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RECOMMENDED POLICIES AND ACTIONS
PUBLIC HEALTH

CODE	POLICY	AGENCIES	STATUS
I.C.	The State of Rhode Island and the Commonwealth of Massachusetts shall require effective and environmentally safe disinfection of WWTF effluents discharged directly or indirectly to Narragansett Bay. *[The following recommendations recognize that a) chlorine disinfection represents the only disinfection process currently used at WWTFs in the Narragansett Bay basin; b) chlorination represents a relatively effective bactericidal treatment process but a relatively ineffective viricidal treatment process; c) chlorine and some chlorinated organic compounds resulting from the disinfection process represent a source of toxicity to some aquatic organisms; and d) effective, environmentally safe, alternative disinfection technologies (e.g., ozonation, ultraviolet light) currently exist.]*		
I.C.I.	At the time of renewal for a WWTF's NPDES/RIPDES permit, the permitting authority (EPA in conjunction with MADEP for Massachusetts; RIDEM for Rhode Island) shall incorporate effluent standards for total residual chlorine into the permit based on the *EPA Quality Criteria for Water*, 1986 ("Gold Book") criteria, or more stringent criteria if appropriate, based on the dilution factor for the individual WWTF; the states' water quality standards; and customary water quality-dependent uses in the vicinity of the discharge. The maximum daily effluent limit shall be no greater than 1 mg/liter.	EPA, RIDEM, MADEP	
I.C.2.	If the effluent standards calculated above and incorporated into the NPDES/RIPDES permit are not achievable under the WWTF's existing disinfection practices, the WWTF shall be required to conduct a disinfection analysis to evaluate all alternative disinfection measures and select an appropriate measure to comply with chlorine—and fecal coliform—limits.	EPA	[See EPA Region I "Preliminary Agreement," Section 715-05-06.]
I.C.3.	Any significant update to a publicly owned WWTF facility plan, conducted for any purpose, shall be required to include a disinfection analysis to evaluate all alternative disinfection measures. This requirement may be postponed by the appropriate regulatory authority (EPA, RIDEM, or MADEP) if performance of a disinfection analysis is considered likely to cause an undue delay to the facility plan update.	EPA, RIDEM, MADEP	The Town of Narragansett has included an alternative disinfection analysis in its revised draft facility plan (1992). The NBC and UBWPAD are presently reviewing their disinfection policies (1992).

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RECOMMENDED POLICIES AND ACTIONS
PUBLIC HEALTH

CODE	POLICY	AGENCIES	STATUS
I.C.4.	Every facility plan for CSO abatement shall be required to include an evaluation, including a review of loading estimates for fecal coliforms, to determine the need for disinfection of the CSO discharge(s). If disinfection is deemed necessary, the facility shall be required to perform a disinfection analysis to determine appropriate disinfection measure(s).	EPA, RIDEM, MADEP	See also 04-01-04 Source Control: Combined Sewer Overflows, Recomm. II.B.
I.C.5.	Seasonal chlorination shall be permitted only in situations where the discharge is sufficiently distant from potential direct contact, public water supplies, and shellfishing areas, to protect those areas from bacterial and viral contamination.	EPA, RIDEM, MADEP	
II.	The State of Rhode Island and the Commonwealth of Massachusetts should reduce the public's risk of exposure to toxic pollutants in seafood harvested from Narragansett Bay and waters tributary to Narragansett Bay.		
II.A.	Immediate risk management should be undertaken to protect public health from consumption of Rhode Island seafood contaminated with toxic pollutants. 1. The regulatory agencies of the State of Rhode Island and the Commonwealth of Massachusetts should hold regular coordination meetings. 2. Additional data on tissue contaminant levels in winter flounder and other commercially harvested species should be collected. 3. Additional samples of quahogs from inadequately sampled and uncertified waters should be collected and evaluated. 4. Local seafood consumption rates should be examined in a broad survey and risk assessment should be reexamined using those figures.	RIDEM, RIDOH, MADPH, MADFW, R.I. Seafood Council	(Draft) R.I. Seafood Consumption Survey (Morrissey and Anderson, 1992) completed in 1992 could be used to recalculate risk assessment. [See RIDOH "Preliminary Agreement," Section 715-05-06.]

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RECOMMENDED POLICIES AND ACTIONS
PUBLIC HEALTH

CODE	POLICY	AGENCIES	STATUS
II.B.	The federal government should develop a consistent, coherent national policy on risk assessment and risk management of contaminated seafood and provide guidance to Rhode Island and Massachusetts.		
II.B.1	The FDA and EPA, as well as other federal agencies, should provide leadership and guidance for a consistent approach for risk assessment, advisories, monitoring, risk management, and risk communication. The federal government should assume responsibility for interstate risk management issues, by: a. Establishing an interagency Fish Contamination Task Force to coordinate and implement federal activities and to provide support/guidance to the states. b. Resolving disagreements between the EPA and FDA regarding risk assessment methodologies. c. Developing and implementing strategies to address interstate and regional issues. d. Having the FDA and EPA develop more and better regulatory guidance limits and safe consumption levels for chemical contaminants in seafood, for application to local consumption situations as well as cases of seafood in interstate commerce. These guidance limits should include action levels or tolerances for many additional chemicals, including polycyclic aromatic hydrocarbons (PAHs), metals, and organic compounds, and appropriate local consumption rates for seafood, including identification of sensitive populations. e. Developing guidance for risk management strategies. f. Developing guidance for sampling and monitoring fish and shellfish for risk evaluation.	FDA, EPA	
II.B.2.	The FDA and EPA should provide technical support and assistance to states on seafood contamination issues. This technical assistance should consist of guidance manuals, workshops, technical support, and funding for—but not limited to—monitoring and sampling, conducting risk assessments, establishing appropriate consumption rates and criteria for issuing advisories and bans, and educational programs regarding seafood safety and seafood handling and storage issues.	FDA, EPA	

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RECOMMENDED POLICIES AND ACTIONS
PUBLIC HEALTH

CODE	POLICY	AGENCIES	STATUS
II.B.3.	Funding should be provided for scientific research needed to support risk assessment and risk management efforts.	FDA, EPA	
II.B.4.	The federal government should establish a laboratory intercomparison and certification program for analysis of fish and shellfish, as well as water and sediment quality parameters.	FDA, EPA	
II.B.5.	The federal government should establish a national seafood inspection program that inspects for chemical contaminants.	FDA, EPA	
II.C.	The RIDEM, RIDOH and their Massachusetts counterparts should develop and adopt a standard coordinated approach to ensure the safety of seafood harvested in Narragansett Bay through a program of risk assessment, risk management, and risk communication for both commercial and recreational fisheries, until the federal government develops a consistent risk assessment/risk management policy including standards for fish safety. The states should then consider adopting the federal approach and standards.		
II.C.1.	The RIDEM and RIDOH should work with Massachusetts and other states and federal agencies on a regional and national basis, to develop a consistent approach to risk assessment, management, and communication.	RIDEM, RIDOH, MADEP, MADPH, MADFW, MADMF, FDA, EPA, R.I. Seafood Council	[See RIDOH "Preliminary Agreement," Section 715-05-06.]
II.C.2.	The RIDOH and MADPH should establish as policy an acceptable risk level for carcinogens, and should develop and adopt state *action levels* that identify unacceptable levels of chemicals in fish tissues.	RIDEM, RIDOH, MADEP, MADPH, MADFW, MADMF, FDA, EPA, R.I. Seafood Council	
II.C.3.	The RIDOH and MADPH should develop and implement a fish and shellfish advisory protocol for protecting human consumers from seafood contaminated with toxics.	RIDEM, RIDOH, MADEP, MADPH, MADFW, MADMF, FDA, EPA, R.I. Seafood Council	RIDOH has developed a health advisory protocol. R.I. advisories exist for striped bass and bluefish.

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RECOMMENDED POLICIES AND ACTIONS
PUBLIC HEALTH

CODE	POLICY	AGENCIES	STATUS
II.C.4.	The RIDEM and RIDOH should expand their respective shellfish monitoring programs to include: a. Coordination with Massachusetts to develop a comprehensive and consistent monitoring strategy for interstate waters. b. Sampling of additional chemicals, stations, and species. i. Tissue analysis should be expanded to include organic chemicals, such as polychlorinated biphenyls (PCBs) and PAHs, and priority pollutant scans should be performed on occasion. ii. Station locations should be reevaluated to target problem areas, areas not previously sampled adequately (*e.g.*, Mount Hope Bay and the Providence River), discharges, and hot spots. iii. Species monitored should include finfish, and both molluscan and crustacean shellfish. iv. Sampling should also include water and sediment sampling. c. Routine sampling of seafood markets. Spot checks of seafood products purchased randomly at markets should be conducted whether or not an inspection program is implemented. d. Monitoring levels of toxics in quahogs collected for the quahog transplant program and for evaluating the feasibility of reopening shellfishing areas. e. Coordination with other RIDEM monitoring programs and with the *Long Term Monitoring Plan for Narragansett Bay* (Taylor et al., 1991).	RIDEM, RIDOH, MADEP, MADPH, MADFW, MADMF, FDA, EPA, R.I. Seafood Council	
II.C.5.	The RIDEM, RIDOH and their Massachusetts counterparts should consider expanding and improving their laboratory capabilities.	RIDEM, RIDOH, MADEP, MADPH, MADFW, MADMF, FDA, EPA, R.I. Seafood Council	
II.C.6	The RIDEM, RIDOH and their Massachusetts counterparts should participate in a laboratory intercomparison program with state, federal, university, and private laboratories.	RIDEM, RIDOH, MADEP, MADPH, MADFW, MADMF, FDA, EPA, R.I. Seafood Council	

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RECOMMENDED POLICIES AND ACTIONS
PUBLIC HEALTH

CODE	POLICY	AGENCIES	STATUS
II.C.7.	The RIDOH, RIDEM Division of Enforcement, MADPH and MADMF in conjunction with federal agencies, should institute a state seafood testing and inspection program.	RIDEM, RIDOH, MADEP, MADPH, MADFW, MADMF, FDA, EPA, R.I. Seafood Council	
II.C.8.	The RIDEM, RIDOH and their Massachusetts counterparts should develop educational programs regarding seafood safety, seafood contamination, and seafood handling and storage issues.	RIDEM, RIDOH, MADEP, MADPH, MADFW, MADMF, FDA, EPA, R.I. Seafood Council	MADPH initiated educational efforts regarding seafood safety following publication of EPA's Quincy Bay Study (1988), which documented high levels of chemical contamination in seafood.

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Estimated Cost of Implementation—Public Health

Table 715-04(11) summarizes the estimated costs associated with implementing the recommendations in this chapter. Element IA (Risk Assessment - Pathogens) includes recommendations for shellfish and water quality sampling in order to monitor indicators of fecal contamination. The cost associated with the recommended compliance monitoring ($1,675,000 of ongoing costs over the five-year period) is assigned primarily to RIDEM and RIDOH. This reflects the staff-intensive nature of the actions and the high costs of laboratory analysis. An additional cost of $135,000 is expected for monitoring of bathing beach water quality during the swimming season (and posting and closing of beaches).

A variety of risk reduction efforts, including regulation of shellfish harvesting, are recommended in Element IB (Risk Management - Pathogens). The total five-year cost ($592,500) reflects capital costs for additional equipment and personnel costs for an expanded enforcement staff. Element IC (Disinfection of Effluents) includes costs for disinfection actions for WWTFs and for review of WWTF facility plans.

Responsibilities associated with Element II (Risk Management - Toxics) are largely assigned to the federal and state public health agencies. Federal agency activities (setting of health risk levels, coordination with state public health agencies) have not been costed. Therefore, the major cost listed in this Element is associated with the expansion of public health agencies' laboratory facilities for both Rhode Island and Massachusetts ($450,000). Funding would be needed for additional personnel and equipment. $375,000 is the estimated cost for RIDEM to collect and analyze data on winter flounder for chemical contaminants. The cost of expanding seafood testing and inspection programs for both Rhode Island and Massachusetts ($115,000) reflects needed additional personnel. Also costed here is an interstate public education effort regarding seafood safety.

For further details regarding the *CCMP* cost estimation process and funding strategies, refer to the *Narragansett Bay CCMP Cost Estimation and Funding Report* (Apogee Research Inc./NBP, 1992).

Table 715-04(11)

ESTIMATED COST OF IMPLEMENTATION
PUBLIC HEALTH

COST ESTIMATES BY ELEMENT

	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
IA-Risk Assess.-Pathogens	164,500	261,550	129,500	247,000	129,500	247,000	129,500	247,000	129,500	247,000	682,500	1,249,550
IB-Risk Mgmt.-Pathogens	112,500	6,000	112,500	6,000	112,500	6,000	112,500	6,000	112,500	6,000	562,500	30,000
IC-Disinfection of Effluents	0	0	0	0	50,000	0	0	0	0	0	50,000	0
II-Risk Management-Toxics	107,000	87,000	39,500	87,000	229,500	102,000	214,500	87,000	229,500	87,000	820,000	450,000
TOTALS	384,000	354,550	281,500	340,000	521,500	355,000	456,500	340,000	471,500	340,000	2,115,000	1,729,550
TOTAL BY YEAR		738,550		621,500		876,500		796,500		811,500		3,844,550

COST ESTIMATES BY AGENCY

	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
RIDEM	169,000	238,000	146,500	232,000	176,500	232,000	146,500	232,000	151,500	232,000	790,000	1,166,000
RIDOH	127,500	97,000	82,500	91,000	177,500	106,000	172,500	91,000	177,500	91,000	737,500	476,000
MADEP	8,500	10,000	3,500	10,000	28,500	10,000	3,500	10,000	3,500	10,000	47,500	50,000
MADPH	50,000	6,000	20,000	6,000	110,000	6,000	105,000	6,000	110,000	6,000	395,000	30,000
MADFW	12,500	1,000	12,500	1,000	12,500	1,000	12,500	1,000	12,500	1,000	62,500	5,000
Municipalities*	16,500	0	16,500	0	16,500	0	16,500	0	16,500	0	82,500	0
WWTFs	0	2,550	0	0	0	0	0	0	0	0	0	2,550
TOTALS	384,000	354,550	281,500	340,000	521,500	355,000	456,500	340,000	471,500	340,000	2,115,000	1,729,550
TOTAL BY YEAR		738,550		621,500		876,500		796,500		811,500		3,844,550

* Ultimate implementation costs will vary for each municipality depending on its particular environmental and institutional conditions. In addition, the estimated municipal implementation costs do not include ultimate program and capital costs that may result from completion of underlying planning activities, or costs that are expected to be completely recoverable from user fees.

04-03 Areas of Special Concern

Narragansett Bay water quality, critical resource areas, and living resources are affected by human activities occurring throughout the Bay watershed. In fact, most of the Bay's present environmental problems originated in the colonial period and are associated with the cumulative effects of population growth, modification of the landscape, and industrialization.

However, human activities have been, and continue to be, concentrated unevenly throughout the watershed. Although the Narragansett Bay watershed is one of the most densely populated estuarine basins in the nation, there are pockets of relatively undisturbed land in remote reaches of the basin as well as corridors of intensive development along major Bay tributaries and the coast. Destruction and incremental loss of critical estuarine and riparian habitats are also related to local patterns and intensity of land use and development. As a result of differential patterns and rates of development, some regions of Narragansett Bay and the Bay basin have experienced more serious environmental, public health and/or use-related impairments than others.

This section focuses on specific, large subregions of the Narragansett Bay basin where existing data indicate that remedial government action is necessary to reverse identified environmental problems or use impairments (Mount Hope Bay, Blackstone River), or where preventive government action is necessary because of an observed trend toward increased water quality degradation, loss of critical habitats or resources, and/or use impairment (Greenwich Bay). Additionally, largely because of historical pollution from toxics, metals, and organic compounds, some areas contain contaminated sediments that may require either remedial action or greater care in their disposal as dredged material.

04-03-01 Mount Hope Bay

Objective for Mount Hope Bay

The State of Rhode Island and the Commonwealth of Massachusetts should jointly develop schedules for pollution abatement in shared water bodies, including Mount Hope Bay, in order to meet water quality standards.

Introduction

While many of the environmental problems of Mount Hope Bay are common to other parts of Narragansett Bay, Mount Hope Bay possesses a number of unique qualities including its potential as a shellfishery and its interstate nature, that warrant separate discussion.

Mount Hope Bay covers 13.6 square miles in the northeastern portion of Narragansett Bay, draining an area of 620 square miles that surrounds the Taunton River in Massachusetts. Although two-thirds of Mount Hope Bay lies within Rhode Island, 90 percent of its drainage area is in Massachusetts (Dixon *et al.*, 1990:1). The Taunton River, Mount Hope Bay's major tributary, is Narragansett Bay's largest freshwater source. The river constitutes over 25 percent of the total measured freshwater flow to Narragansett Bay (Ries, 1990). It represents the largest unaltered (*i.e.*, not dammed) estuary remaining in the Narragansett Bay system. Tidal exchange with Narragansett Bay proper occurs at least up to Taunton, Massachusetts. Since 70 percent of the net flow from the Taunton River is discharged to East Passage, water quality in mid-Narragansett Bay may be affected by pollutants discharged from the Taunton River basin (Dixon *et al.*, 1990:1).

Statement of the Problem

Over the years, Mount Hope Bay has received a wide array of pollutants from domestic and industrial sources. Sewage contamination is currently the most serious and immediate water quality problem in Mount Hope Bay. In the Fall River area, 17 combined sewer overflows (CSO) empty into Mount Hope Bay

or its tributaries. An additional CSO may exist in the City of Taunton. Failed septic systems and stormwater runoff after heavy rainfall add to fecal pollution and may cause seasonal low oxygen problems and fish kills (Kolek, 1988; Dixon *et al.*, 1990:6). The Cole River and Lee's River in Swansea have both exhibited signs of serious sewage contamination (Dixon *et al.*, 1990:6).

Surveys by the U.S. Food and Drug Administration (FDA) in 1987 indicated that, of all these potential sources of sewage contamination, CSOs represent the largest source masking all other inputs of fecal contaminants to Mount Hope Bay. During one wet weather event monitored by the FDA, CSOs accounted for 96 percent of total fecal coliform loading to Mount Hope Bay (Dixon *et al.*, 1990:3). Moreover, CSO pollution has not been restricted to times of heavy precipitation. Until quite recently, when the City of Fall River addressed the problem through improved maintenance, CSO discharges occurred during dry weather as well, contributing up to 98 percent of dry-weather coliform loading to Mount Hope Bay. Dry-weather CSO discharges are illegal (Rippey and Watkins, 1988; Dixon *et al.*, 1990:3).

Metal contamination has also been a problem. Mercury contamination in the 1970s led the Commonwealth of Massachusetts to close the most heavily impacted areas of the Taunton River to shellfishing. [See *Analysis*] Other data show that concentrations of zinc, copper, lead, and nickel increased in mid-Mount Hope Bay from 1979 to 1985 (Dixon *et al.*, 1990).

An apparent hypoxic event observed over the summer of 1990 pointed to another problem whose source needed to be identified. Surveys conducted over the summer of 1990 by the Massachusetts Department of Environmental Protection's (MADEP) Division of Water Pollution Control indicated low levels of dissolved oxygen, suggesting the need for further, more comprehensive studies in cooperation with the Rhode Island Department of Environmental Management (RIDEM) (Dixon *et al.*, 1990:23).

Existing Policies

The policy of U.S. Environmental Protection Agency (EPA) Region I regarding CSO impact abatement is to implement sufficient treatment to achieve water quality standards in receiving waters at all times, or, alternatively, to eliminate CSO discharges completely. The basic regulatory approaches taken by the State of Rhode Island and the Commonwealth of Massachusetts to comply with this policy have already been discussed in detail in 04-01-04 Source Control: Combined Sewer Overflows.

Analysis

CSO Abatement

The City of Fall River has reportedly eliminated illegal dry weather discharges to the Quequechan River as of 1990 (Dixon *et al.*, 1990). Pursuant to a compliance order issued by EPA, Fall River submitted the draft *Phase II Facilities Plan* for elimination of its CSOs in November 1990. EPA is expected to issue a compliance schedule once the preferred CSO abatement strategy is selected (Dixon *et al.*, 1990). Actual construction will depend upon the availability of loan monies from Massachusetts' State Revolving Fund and other federal, state or local sources.

Fish and Shellfish

Although pollution has caused the closure of all Mount Hope Bay to shellfishing, the Bay has the potential for contributing significantly to the supply of seafood landed from Narragansett Bay. Mount Hope Bay has in the past been used by both the State of Rhode Island and the Commonwealth of Massachusetts as a source of quahogs for transplantation programs. It is possible that Mount Hope Bay continues to play a role as a "breeder sanctuary" for quahogs (Pratt *et al.*, 1988:1). Centers of abundance for many of the most abundant species of finfish in Narragansett Bay also occur in Mount Hope Bay (Dixon *et al.*, 1990).

Interstate Cooperation

Rhode Island and Massachusetts address the CSO problem differently and have assigned different water quality classifications to Mount Hope Bay waters, possibly leading to inconsistent enforcement or different management strategies in the adjacent waters of Mount Hope Bay. To avoid that problem, interstate cooperation in the management of Mount Hope Bay and other resources "shared" by both states is advisable.

One mechanism proposed to accomplish that is the *Bay State/Ocean State Initiative*, which has recently established a commission designed to aid in addressing interstate concerns (Dixon *et al.*, 1990:16). Another is the *New England Interstate Water Pollution Control Commission* (NEIWPCC), an interstate organization established by a compact among the six New England states. The Compact has been in existence since 1947 and is codified in the Rhode Island General Laws. It applies to "streams, ponds and lakes which are contiguous to two or more signatory states...and...tidal waters ebbing and flowing past the boundaries of two states" (R.I.G.L. 46-16-1). The NEIWPCC has specific authority to maintain water quality classifications in interstate waters. If waters at or near a state boundary do not meet standards, the Commission can require necessary remedial action and enforce that order judicially (Dixon *et al.*, 1990:17).

Research Needs

Research efforts regarding CSOs and other sources of pollution could also be combined and coordinated to a greater extent than at present. The study of the Taunton River by the Urban Harbors Institute of the University of Massachusetts at Boston, in cooperation with Massachusetts Coastal Zone Management (MACZM) and the Rhode Island Coastal Resources Management Council (CRMC), is one example of the type of coordinated research that is needed. In this instance, NOAA provided federal funding to develop a basin-wide action plan for the Taunton River. The plan will recommend measures to reduce significant sources of pollution and restore impaired resources. Urban Harbors has proposed to involve several agencies and organizations in a steering committee for the project, including the EPA, Massachusetts Department of Environmental Protection Division of Marine Fisheries (MADEP-DMF), MACZM, RIDEM, CRMC, University of Rhode Island, Narragansett Bay Project (NBP), City of Fall River, University of Massachusetts, and Save the Bay (Dixon *et al.*, 1990:21). The synthesis provided by this project should provide a basis for an action plan, or Special Area Management (SAM) Plan, covering the entire Mount Hope Bay.

There is also considerable potential in synthesizing water quality and living resource data collected by National Pollutant Discharge Elimination System (NPDES) permittees, such as the Brayton Point electric power plant. The Brayton Point facility has been collecting, but not analyzing, water quality and living resource data at five to seven stations in Mount Hope Bay since 1973. The University of Rhode Island has partially analyzed Brayton Point fisheries data, but more extensive work is needed. The Brayton Point NPDES permit is in the process of being revised by EPA, which represents an opportunity to require analysis of these data and modification of existing monitoring requirements.

Recommended Policies and Actions and *Estimated Cost of Implementation* are presented in the following pages.

RECOMMENDED POLICIES AND ACTIONS
MOUNT HOPE BAY

CODE	POLICY	AGENCIES	STATUS
I.	CSO Abatement		
I.A. ✓	**The EPA and the Commonwealth of Massachusetts should take action, including financial support, technical assistance, and enforcement measures where appropriate and necessary, to ensure the timely completion of the Fall River CSO abatement project.**	**EPA, Comm. of Mass., City of Fall River**	**The Fall River CSO project ranks 3rd on Massachusetts' SRF priority list (1992). See 04-01-04 Source Reduction: Combined Sewer Overflows.**
I.B.1.	The State of Rhode Island and Commonwealth of Massachusetts should undertake the following planning and regulatory activities and studies concurrent with CSO abatement efforts in order to position the states to manage Mount Hope Bay for shellfishing as soon as conditions allow. These activities should include: The State of Rhode Island and Commonwealth of Massachusetts should bring water quality classifications in their portions of Mount Hope Bay into conformance with one another.	RIDEM, CRMC, MADEP, MACZM, EPA	[See RIDEM "Preliminary Agreement," Section 715-05-06.]
I.B.2. ✓	**The State of Rhode Island and Commonwealth of Massachusetts should develop a Shellfish Management Plan for the harvestable shellfish resources of Mount Hope Bay including quahogs, oysters, soft-shell clams, Bay scallops and whelks. The Plan should consider Mount Hope Bay's role, if any, as a quahog "spawner sanctuary" and whether the Bay should be managed as part of the State's transplant program because of regulatory and monitoring requirements associated with re-opening the Bay to shellfish harvesting.**	**RIDEM, MADFW, MADMF**	**[See RIDEM "Preliminary Agreement," Section 715-05-06.]**
I.B.3.	The State of Rhode Island, the Commonwealth of Massachusetts, and EPA should initiate establishment of a permit review mechanism for activities affecting resources of shared concern.	EPA, RIDEM, RIDOP, CRMC, MACZM	
I.B.4.	The State of Rhode Island and Commonwealth of Massachusetts should enter into interstate agreements establishing appropriate procedures for timely notification of wastewater treatment facility failure.	RIDEM, MADEP	

✓ - **High Priority Action**

RECOMMENDED POLICIES AND ACTIONS
MOUNT HOPE BAY

CODE	POLICY	AGENCIES	STATUS
I.C.	The environmental agencies of Rhode Island and Massachusetts should more fully utilize the authority of the New England Interstate Water Pollution Control Commission (NEIWPCC) to address disputes arising over the management of Mount Hope Bay.	Federal, state and local agencies	
I.D.	The *Bay State/Ocean State Initiative* should be endorsed, and existing agencies used wherever possible to implement recommended remedial actions.	Narragansett Bay *CCMP* Implementation Committee	
II.	Planning		
II.A.	Key state agencies in Rhode Island and Massachusetts should use the opportunity of interstate research grants from the federal government to design and oversee production of a Mount Hope Bay basin plan which is modelled after the Narragansett Bay Comprehensive Conservation and Management Plan (CCMP), and specifically includes enforceable policies.	RIDEM, CRMC, MADEP, MACZM	The CZMA § 309 preliminary assessment of Mt. Hope Bay should be released by MACZM and CRMC in the summer of 1992. See 04-02-02 Protection of Critical Areas, Rec. IIA., re: scope of future SAM Plans.
II.B.	The State of Rhode Island and Commonwealth of Massachusetts should collaborate in the development of a joint contingency plan, including protocols for responsibility for response to significant oil spills or other "catastrophic" spills, nuisance algal blooms, fish kills, hurricanes, *etc.*, in Mount Hope Bay.	RIDEM, MADEP, MADFW, MADMF	RIDEM is revising the state's "Oil Spill Response Plan" in 1992.
II.C.	Additional information on nonpoint sources of pollution should be developed. Specific studies should focus on the Lee's, Kickemuit and Cole Rivers, and communities with septic system failure. Implementing authorities should include the State of Rhode Island, Commonwealth of Massachusetts, the U.S. Department of Agriculture Soil Conservation Service (USDA SCS), and towns where appropriate.	USDA SCS, EPA, NOAA, Conservation Districts, RIDEM, CRMC, MADEP, MACZM, municipalities	EPA funded a "demonstration project" in the Runnins River basin in 1992 to develop an interstate basin plan to address land use and nonpoint source issues.

✓ - **High Priority Action**

RECOMMENDED POLICIES AND ACTIONS
MOUNT HOPE BAY

CODE	POLICY	AGENCIES	STATUS
III.	Data Collection		
III.A.	The EPA and Commonwealth of Massachusetts should encourage New England Power, manager of the Brayton Point electric power station, to participate in analysis of historical data collected in Mount Hope Bay. 1. The EPA, MADEP, and Brayton Point Technical Advisory Group should review and revise quality assurance and quality control (QA/QC) procedures, and identify necessary analyses and reporting schedules, for future monitoring in Mount Hope Bay under the Brayton Point station's NPDES permit. 2. The EPA and Commonwealth of Massachusetts should include requirements for specific analyses, review of existing QA/QC procedures, and data analysis and interpretation in the Brayton Point permit.	EPA, MADEP, RIDEM	[See EPA Region I "Preliminary Agreement," Section 715-05-06 re: analysis of ten-twenty years of MHB data.] Brayton Point's revised NPDES permit should be released for review in 1992.
III.B.	Further study of the potential for, and causes of, hypoxic events in the Lower Taunton River and Mount Hope Bay should be supported.	EPA, MADEP, RIDEM	
III.C.	The EPA, MADEP, RIDEM, and other federal and state agencies should develop additional information on metal and organic contaminants in Mount Hope Bay.	EPA, MADEP, MADPH, RIDEM, RIDOH	

✓ - High Priority Action

Estimated Cost of Implementation—Mount Hope Bay

Table 715-04(12) summarizes the estimated costs associated with implementing the recommendations in this chapter. The establishment of an interstate permit review mechanism and other interstate coordination actions account for the major portion of the costs for Element I (CSO Abatement). Increases in permit fees could provide revenue to be used for the additional personnel costs. Capital costs for the City of Fall River's CSO abatement project are included in 04-01-04 Source Control: Combined Sewer Overflows. Element I costs associated with shellfish management planning will be represented under 04-02-03 Resource Protection: Management of Living Resources. Element II costs are dominated by a one-time expenditure of $250,000 for the development of a Mount Hope Bay SAM Plan. Components of such a Plan include studies and research, regulatory analysis and revision, and the development of coordinated inter-agency actions and procedures; preliminary planning efforts are in progress, funded through CZMA Section 309 funds. Element III (Data Collection) contains monitoring requirements that are costed under 05-02-04 *CCMP* Implementation and Governance: Long-Term Monitoring.

The CRMC is the agency with the largest funding need as identified in this chapter; most of this is for the development of a Mount Hope Bay SAM Plan. RIDEM and MADEP will require additional personnel funding primarily over the first three years of the five-year plan period. Both agencies will be required to participate in coordination activities, planning studies, and the provision of technical assistance.

For further details regarding the *CCMP* cost estimation process and funding strategies, refer to the *Narragansett Bay CCMP Cost Estimation and Funding Report* (Apogee Research Inc./NBP, 1992).

Table 715-04(12)

ESTIMATED COST OF IMPLEMENTATION
MOUNT HOPE BAY

COST ESTIMATES BY ELEMENT	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
I-CSO Abatement	150,000	0	15,000	0	37,500	0	15,000	0	15,000	0	232,500	0
II-Planning	20,000	25,000	0	25,000	0	250,000	0	0	0	0	20,000	300,000
III-Data Collection	12,500	25,000	0	25,000	0	0	0	0	0	0	12,500	50,000
TOTALS	182,500	50,000	15,000	50,000	37,500	250,000	15,000	0	15,000	0	265,000	350,000
TOTAL BY YEAR		232,500		65,000		287,500		15,000		15,000		615,000

COST ESTIMATES BY AGENCY	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
RIDEM	77,500	25,000	5,000	25,000	22,500	0	5,000	0	5,000	0	115,000	50,000
RI CRMC	5,000	0	0	0	0	250,000	0	0	0	0	5,000	250,000
MADEP	95,000	25,000	10,000	25,000	15,000	0	10,000	0	10,000	0	140,000	50,000
MACZM	5,000	0	0	0	0	0	0	0	0	0	5,000	0
Municipalities*	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	182,500	50,000	15,000	50,000	37,500	250,000	15,000	0	15,000	0	265,000	350,000
TOTAL BY YEAR		232,500		65,000		287,500		15,000		15,000		615,000

* Ultimate implementation costs will vary for each municipality depending on its particular environmental and institutional conditions. In addition, the estimated municipal implementation costs do not include ultimate program and capital costs that may result from completion of underlying planning activities, or costs that are expected to be completely recoverable from user fees.

04-03-02 Blackstone River

Objective for the Blackstone River

The State of Rhode Island and the Commonwealth of Massachusetts should improve the water quality, ecological health, and commercial and recreational uses of the Narragansett Bay by eliminating the adverse impacts caused by flows of the Blackstone River, and protect and improve the Blackstone itself. The objective shall be achieved through improving the water quality of the river and its tributaries, eliminating or remediating contaminated sediments in the river, and maintaining and restoring fish and wildlife habitat and aesthetic and recreational uses of the river and its watershed.

Introduction

The Blackstone River is the second largest tributary river to Narragansett Bay. From its origin in Worcester, Massachusetts, it flows through south-central Massachusetts, entering Rhode Island near Woonsocket, and eventually discharging to the Seekonk River near Slater's Mill in Pawtucket. Seventy-one percent of the Blackstone's drainage basin is in Massachusetts (see Fig. 715-04(6)) (Kipp and Zingarelli, 1991:iii).

The Blackstone is considered "the birthplace of America's industrial revolution," with a history of construction of dams for hydropower and industry. Industries and towns along the river have historically used it for disposal of industrial wastes and sewage. While the health of the Blackstone has improved from the late 1960s as a result of regulation and treatment of these discharges, the river and its fish and wildlife habitat remain significantly impaired (Kipp and Zingarelli, 1991:iii).

The recommended policies and actions contained in this chapter focus largely on problems related to water quality. Other topics important in an overall strategy for protecting the Blackstone, such as open space preservation and recreation, are being addressed in detail by groups such as the Blackstone River Valley National Heritage Corridor Commission (BRVNHCC), and are recommended only by reference (Kipp and Zingarelli, 1991:1).

Statement of the Problem

The Blackstone River is a major source of metals, toxic organics, nutrients, and other contaminants to Narragansett Bay during both dry and wet weather. The Blackstone is estimated to be the single largest riverine source of total suspended solids (TSS) and petroleum hydrocarbons (PHCs) to the Bay, at least for the periods sampled during 1985-86. Chronic water quality criteria for the protection of aquatic life are routinely violated on much of the river for cadmium, copper, lead, and polychlorinated biphenyls (PCBs), while acute criteria are frequently violated for copper, and occasionally for cadmium and zinc. [See 04-01-01 Source Reduction: Toxics, Water Quality Criteria for a discussion of water quality criteria.] Dissolved oxygen sags have been noted at several points in the river during low flow conditions. The Blackstone is also a major contributor to water quality violations observed in the Providence and Seekonk Rivers (Wright *et al.*, 1992a; Latimer, 1989; Quinn, 1989; Kipp and Zingarelli, 1991:iii).

Wastewater treatment facilities (WWTFs) have significant effects on the water quality of the Blackstone River. WWTFs represent significant sources of biochemical oxygen demand (BOD) and TSS, which affect dissolved oxygen levels in the river. The WWTFs, particularly the Upper Blackstone Water Pollution Abatement District (UBWPAD) and Woonsocket WWTFs, are also a significant source of toxic metals and organics to the river. An additional issue is the competing desires for effective disinfection of effluent discharges from such facilities and elimination of chlorine toxicity impacts in receiving waters. There are many direct uses of the river, such as canoeing and fishing, that require effective disinfection of WWTF effluents. However, chlorine toxicity has been identified as a potential problem in the Blackstone, particularly downstream of the UBWPAD WWTF (Kipp and Zingarelli, 1991:25).

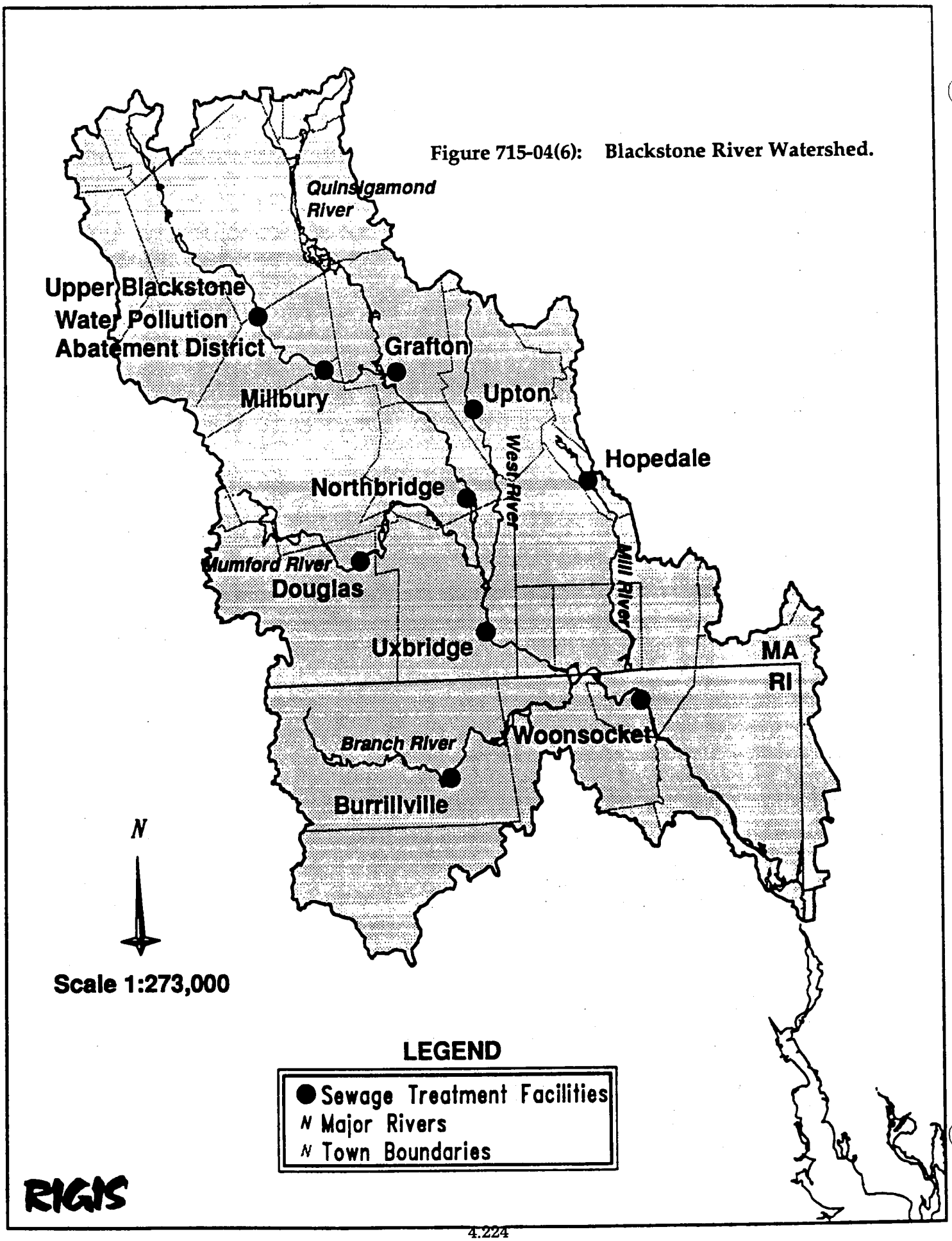

Figure 715-04(6): Blackstone River Watershed.

Nonpoint sources of pollutants to the Blackstone may include agricultural and urban runoff, leachate from landfills, leaking underground storage tanks, hazardous waste sites, soil erosion and sediment resuspension, atmospheric deposition, and effluent from failed septic systems. Typically, loadings from these sources are exacerbated by wet weather. Pollutants associated with nonpoint sources include suspended solids, toxic metals and organics, nutrients, and pathogens (Kipp and Zingarelli, 1991:11).

Few data exist for nonpoint sources and associated pollutant loadings to the Blackstone but they are likely to be significant. Many industries that had historically polluted the river are no longer in operation, leaving a legacy of waste sites or other potential environmental hazards. At the same time, population growth has been rapid as the communities surrounding Worcester and Woonsocket have evolved into bedroom communities for Boston. Land use has been changing to suburban sprawl. These pressures are likely to continue (Kipp and Zingarelli, 1991:11).

Sediments in the Blackstone River are severely contaminated with metals, particularly in impoundments behind dams in Massachusetts. Aquatic life is adversely impacted by these contaminated sediments. The sediments may contribute to poor water quality when they are resuspended during high flow conditions (Kipp and Zingarelli, 1991:iii).

Poor water and sediment quality have contributed to the loss or impairment of fish and wildlife habitat and aesthetic and recreational uses of the Blackstone. Loss of habitat has also occurred because of changes in land use resulting from population growth and fluctuations in water flow due to hydropower dams. Dams have also eliminated anadromous fisheries on the river, although poor water quality now impedes efforts to reintroduce anadromous species to the Blackstone (Kipp and Zingarelli, 1991:iii).

For all its history, there are still some gaps in our knowledge and understanding of the Blackstone. These include lack of a synoptic interstate river water quality survey, and lack of adequate information on wet weather inputs, nonpoint source locations and inputs, sediment interactions, water withdrawal impacts, and biological responses. These data gaps can make it necessary to conduct additional research prior to developing detailed management strategies with great certainty (Kipp and Zingarelli, 1991:iii-iv).

Also, cooperation and coordination among affected federal, state, and local agencies, and, in particular, between Massachusetts and Rhode Island, has not been adequate to protect the Blackstone. While much effort has been focused on the river, individual activities have often been conducted independently of other agencies. To solve the Blackstone's many problems, coordination of effort and pooling of resources is necessary (Kipp and Zingarelli, 1991:iv).

Existing Policies

In general, prior to the enactment of the Federal Water Pollution Control Act (Clean Water Act) in 1972, sewage and wastes were inadequately regulated, and, in fact, were at one time discharged directly into the river in large quantities. Construction of several wastewater treatment facilities occurred in the late 1960s in the Massachusetts portion of the Blackstone, and the upgrading of these facilities and the institution of pretreatment programs has helped make measurable improvements in water quality. However, the closure of many industries along the river has also contributed to these improvements (Hoffman, 1988; Kipp and Zingarelli, 1991:2).

Water Quality Classifications

The water quality classifications assigned to the Blackstone River by the State of Rhode Island and Commonwealth of Massachusetts are different. In Rhode Island the river is designated as Class C, while Massachusetts classifies it as Class B, which establishes a goal of making the river "fishable, swimmable." However, nearly the entire river in both states does not support the "fishable, swimmable" goal because of coliforms, nutrients, metals, and dissolved

oxygen levels (MADEP, 1990b; RIDEM, 1990a; Kipp and Zingarelli, 1991:5).

Permitted Point Sources

There are presently 41 point source dischargers to the Blackstone River and its tributaries permitted under the National Pollutant Discharge Elimination System (NPDES). (In Rhode Island the permit program is delegated to the state, which issues Rhode Island Pollutant Discharge Elimination System (RIPDES) permits.) Twenty-eight of the dischargers are industrial, and 13 are municipal dischargers. The Massachusetts portion has ten major (seven municipal) and 12 minor dischargers, and Rhode Island has four major (three municipal) and 15 minor dischargers. Only two of the 11 WWTFs (UBWPAD and Woonsocket) have pretreatment programs; neither have local limits. [See 04-01-01 Source Reduction: Toxics, Regulation of Discharges to Receiving Waters, for a discussion of pretreatment programs.] Three WWTFs (UBWPAD, Hopedale, and Northbridge in Massachusetts) currently provide seasonal advanced treatment for the removal of BOD and TSS. Three (UBWPAD, Hopedale, and Burrillville, R.I.) provide seasonal nitrification; Hopedale also has seasonal phosphorus removal. Worcester, which is served by UBWPAD, has one combined sewer overflow (CSO) with a treatment facility; Pawtucket and Central Falls, R.I., have 18 CSOs, which discharge to the Blackstone. These CSOs are the responsibility of the Narragansett Bay Commission (NBC), which acquired the responsibility as a result of its merger with the Blackstone Valley District Commission (BVDC) in January 1992.

A draft facility plan was completed for these CSOs by the NBC in February 1992. The facility plan recommends the construction of storage facilities throughout the NBC Bucklin Point (formerly BVDC) service area to store wet weather flows until they could be routed to the Bucklin Point WWTF for subsequent treatment and discharge (Beta Engineering and CH2M Hill, 1992).

The Worcester CSO facility has been partially operating (pumping dry weather flows and some storm flows to UBWPAD) since about 1986, and achieved full operation with the issuance of its NPDES permit in December 1990. The facility provides screening and chlorination/detention for flows resulting from rain events up to the severity of the five-year design storm. The CSO facility has not been evaluated as to its effectiveness; because it was only recently issued a permit, no limits have existed for comparative purposes. However, the permit requires implementation of a monitoring program. There may also be many illegal connections to Mill Brook as it flows underground through Worcester (Save The Bay, 1990; Kipp and Zingarelli, 1991:10-11).

Storm Sewer Systems

NPDES permits are required for separate storm sewer systems in cities of over 100,000 people under U.S. Environmental Protection Agency (EPA) regulations (40 CFR 122) issued in 1990. Worcester and Providence thus will be required to obtain such permits or apply for an exemption if the population serviced by separate sewers, rather than combined sewers, is less than 100,000. The permits for discharges from municipal separate storm sewer systems will include a requirement to prohibit non-stormwater discharges into the storm sewers and controls to reduce the discharge of pollutants to the maximum extent practicable. Many industrial facilities that generate and discharge stormwater runoff will also be required to obtain stormwater permits (Kipp and Zingarelli, 1991:11).

Hydropower Facilities

There are six hydropower operations licensed by the Federal Energy Regulatory Commission (FERC) in the Blackstone River watershed, five in Rhode Island and one in Massachusetts. The hydropower plants are permitted as "run-of-the-river" operations, meaning that flows are to be generally maintained at the natural rate of river flow. Hydropower operations have the potential of causing water quality problems if turbines are not operated properly, by causing unnatu-

ral rapid fluctuations in flow. Unnaturally low river flows may result in decreases in dissolved oxygen levels and increased chemical concentrations of pollutants, while sudden releases of water to the river can cause resuspension of sediments and associated contaminants. Such conditions of low and high flow have been frequently observed on the Blackstone (Kipp and Zingarelli, 1991).

Under Sections 10(a)(1) and (2) of the Federal Power Act, FERC is required to consider the recommendations of all comprehensive plans recognized by FERC when evaluating any proposal for a new or reissued hydropower permit (Kipp and Zingarelli, 1991:32).

Water Supply Withdrawals

Drinking water supply is provided by the diversion of water from surface and groundwater sources. For the most part, this water is returned to the river in the form of treated effluent from WWTFs; however, an out-of-basin transfer is possible under the Massachusetts Interbasin Transfer Act if the service area straddles two basins. Since most of Worcester's drinking water comes from outside the basin, there is actually a net transfer into the basin, which ends up as UBWPAD effluent. Water may also be withdrawn from the river for industrial purposes, *e.g.*, for operating the Ocean State Power cogeneration plant (Kipp and Zingarelli, 1991:13).

Recent Initiatives

To help solve the Blackstone's water quality problems on an interstate basis, EPA recently called special attention to the river by establishing the Blackstone River Initiative, an internal EPA Region I effort. Some EPA regional resources have been reallocated to support the Initiative's activities, and a two-year work plan has been developed. Activities include coordination with other agencies, an intensive field survey of the river, a Memorandum of Understanding with the BRVNHCC, increased focus of EPA water regulatory programs on the Blackstone, and reissuance of minor permits (Kipp and Zingarelli, 1991:17-18).

Another important federal initiative is Public Law 99-647, which established the Blackstone River Valley National Heritage Corridor. Under Section 9 of that law, federal agencies are required to coordinate their activities with the BRVNHCC. It is envisioned that this could form the basis of a formal consistency program to ensure that all activities that are federally sponsored are consistent with the goals and objectives of the *Cultural Heritage and Land Management Plan* for the Corridor (Kipp and Zingarelli, 1991:41).

The Blackstone River and Canal Commission (BRCC) was established through Chapter 155 of the Acts of 1988 (Massachusetts). The BRCC is notified of all proposed projects that might impact upon the river and canal, and has had success in negotiating modifications to development proposals before they are modified. The Commission cannot, however, require modifications.

Analysis

The water quality and fish and wildlife habitat of the Blackstone River are affected by multiple factors. These include point sources, nonpoint sources, water diversions and withdrawals, and contaminated sediments.

Permits issued to point source dischargers under the NPDES and RIPDES permits have not been consistent between the two states. Consistent permit limits and monitoring requirements might facilitate evaluation of trends in water quality, determination of nonpoint source inputs, and a better understanding of point source loadings (Wright *et al.*, 1992b; Kipp and Zingarelli, 1991:19).

Eighteen of the CSO discharges under the jurisdiction of the NBC discharge to the Blackstone River. Abatement of these discharges is critical to the water quality of the Blackstone, the Providence River, and, potentially, Upper Narragansett Bay. Every effort should be made to complete design and construction of the facilities identified in the draft facility plan as rapidly as possible.

Runoff and leachate from landfills and other sources (*e.g.*, scrap metal yards, agricultural land) potentially represent a major loading source for nutrients, metals, and toxic organics to the Blackstone. Leachate from the former City of Worcester landfill, for example, which is located next to the UBWPAD treatment plant, is suspected of containing high levels of metals that are eventually discharged to the river. The landfill site might be an excellent location for a pilot program to capture and sample runoff, quantify loadings, and make recommendations for reducing those loadings (Kipp and Zingarelli, 1991:29).

Several circumstances adversely affect the use of FERC licenses and the licensing process to maintain water quality. For one thing, some hydropower projects (specifically, those that have been in continuous operation since before 1936) do not require licenses. Additionally, licenses typically run for 30 to 50 years, and cannot be reopened unless the original stipulations of the license have been violated. Thus, hydropower operations being conducted under perfectly legal conditions (either legally unlicensed or operating with a valid, albeit old, license) may have severe impacts on stream water quality. Action by the U.S. Congress would be needed to require all hydropower operations, even those in operation prior to 1936, to obtain a FERC license. In the case of new or reissued FERC licenses, Massachusetts and Rhode Island can insert "reopener" clauses similar to those in NPDES/RIPDES permits, that allow for revision of the license stipulations if necessary to remain consistent with the Clean Water Act (CWA) (Kipp and Zingarelli, 1991:33).

The flow and diversion stipulations in FERC licenses for hydropower projects can vary widely depending on when the license was issued and the level of controversy the license generated during the application process. Some existing licenses do not contain specific minimum flow releases, while others allow diversions from a significant length of the river (*e.g.*, approximately one mile in the case of Tupperware Dam). In those cases, negotiating agreements with the dam owners would likely be the only way to maintain minimum flow releases until the existing license expires and is reissued (Kipp and Zingarelli, 1991:31).

Industries also may withdraw, but not return, water from the Blackstone River, through consumptive cooling uses. For example, when the Ocean State Power plant is fully operational, it could take and not return up to approximately four million gallons of water per day from the Blackstone. Such net withdrawals will result in lower river flow and may have potential water quality impacts due to lower aeration and lower dilution, as well as potential impacts on available physical habitat (Kipp and Zingarelli, 1991:30).

Many historic dams along the Blackstone are in various states of disrepair. Should a dam fail, the sudden flows created by the failure could cause increased sediment resuspension. At least one dam has undergone a temporary repair that is causing water quality problems. The sluice gate of the Fisherville Dam was welded open in 1986 to prevent possible undermining of the dam. The former impoundment is now exposed, leaving a shifting river bed that is believed to be eroding contaminated sediments during high river flows (Kipp and Zingarelli, 1991:34).

A major unanswered question in addressing the water quality problems of the Blackstone is the relative importance of toxics and nutrient loadings from various sources, during both dry and wet weather conditions. While violations of water quality criteria have been documented in both dry and wet weather conditions, it is difficult to determine which sources create the greatest impact. An appropriate water quality computer model, whether a new model or extension of an existing state model, would allow for a stronger effort in those areas expected to achieve the greatest return (Wright *et al.*, 1992b; Kipp and Zingarelli, 1991:38).

The process of improving the water quality of the Blackstone River will require participation from many levels: federal and state agencies, local communities, business, and industry. A public information program, established as part of the EPA's Blackstone

River Initiative, could be an important step in achieving the needed participation. Together with both states and groups such as the Blackstone River Watershed Association and Save The Bay, public awareness of the need to clean up the Blackstone could be greatly improved (Kipp and Zingarelli, 1991:40).

Recommended Policies and Actions and *Estimated Cost of Implementation* are presented in the following pages.

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I.	The State of Rhode Island and the Commonwealth of Massachusetts shall improve the water quality of the Blackstone River and its tributaries to meet existing water quality standards for each stream segment, or, in the case of those segments currently classified as Class C, to meet Class B or Class B-subcategory water quality standards. *[See Recommendation I.C.1. for Note on Class-B partial use subcategory.]*		
I.A.	Point source abatement		
I.A.1. ✓	**The Massachusetts Department of Environmental Protection (MADEP), the Rhode Island Department of Environmental Management (RIDEM), and the EPA should, as discharge permits issued to wastewater treatment facilities (WWTFs) in the Blackstone River watershed under the NPDES/RIPDES program are reissued, incorporate water quality based effluent limits for nutrients and toxics, as well as effluent toxicity limits. EPA should be the lead agency in insuring that these permits contain consistent and enforceable limits and monitoring requirements.** *[As NPDES/RIPDES permits are reissued to WWTFs, these permits should include effluent limits on nutrients and toxic metals and organics, where appropriate. It should be noted that recent permits issued for the Blackstone, including the recent draft permit of the Upper Blackstone Water Pollution Abatement District (UBWPAD), does include stringent water quality based limits and toxicity limits. This process should continue as other NPDES/RIPDES permits are reissued. For this and all recommendations concerning permit limits, EPA should also ensure that the permit limits are sufficient to meet water quality standards in both the State and the Commonwealth.]*	**MADEP, RIDEM, EPA**	
I.A.2.	MADEP, RIDEM, and EPA should evaluate, as part of the Triennial Review of Water Quality Regulations, whether site-specific criteria for toxics should be developed for use in NPDES/RIPDES permits issued to WWTFs in the Blackstone River watershed. If development of site-specific aquatic life criteria is considered appropriate for the Blackstone River, they should be developed subject to the restrictions outlined in 04-01-01 Source Reduction: Toxics.	MADEP, RIDEM, EPA	See 04-01-01 Source Reduction: Toxics, Rec. II.G.
I.A.3.	MADEP, RIDEM, and EPA should jointly conduct water quality monitoring and modeling for the Blackstone River, and use that modeling as a basis for establishing a total maximum daily load (TMDL) for each pollutant and for preparing a waste load allocation of metals and nutrients (including BOD) for point source dischargers to the Blackstone River system.	MADEP, RIDEM, EPA	See Rec. IV.B. and C. [See EPA Region I and RIDEM "Preliminary Agreements," Section 715-05-06.]

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I.A.4.	All WWTFs in the Blackstone River watershed should evaluate the appropriateness of their disinfection practices, as described in 04-02-04 Resource Protection: Public Health.	WWTFs	See 04-02-04 Resource Protection: Public Health.
I.A.5.	EPA, RIDEM, and MADEP should review pretreatment requirements for WWTFs in the Blackstone River watershed. a. The agencies should evaluate whether pretreatment programs should be instituted at WWTFs which do not currently have programs, requiring new pretreatment programs where warranted, and evaluate the effectiveness (including local limits evaluations) where programs are currently in place. b. A local limits evaluation should be conducted for the pretreatment program of the UBWPAD.	EPA, RIDEM, MADEP, UBWPAD	UBWPAD has contracted for local limits evaluation. See 04-01-01 Source Reduction: Toxics re: industrial pretreatment.
I.A.6.	EPA, the State of Rhode Island and the Commonwealth of Massachusetts should emphasize pollution prevention and source reduction as the preferred means of reducing toxics loadings to the Blackstone River. Specific strategies for the Blackstone River watershed include: a. EPA, the State of Rhode Island and the Commonwealth of Massachusetts should continue to provide financial support to the Rhode Island Hazardous Waste Reduction Program (HWRP) and the Blackstone Project. The two programs should coordinate their activities in the Blackstone River watershed to the maximum extent possible. b. The State of Rhode Island and the Commonwealth of Massachusetts should establish procedures for coordinated permitting and inspections across all disposal media for dischargers to the Blackstone River or its tributaries. The long-term goal, (as outlined in 04-01-01 Source Reduction: Toxics), should be to test and establish procedures for issuing facility-based permits, *i.e.*, each participating industrial user should receive a single permit covering discharges, releases and off-site waste transfers to all media rather than separate permits for discharges to air, land, and water.	EPA, State of R.I., Comm. of Mass.	See 04-01-01 Source Reduction: Toxics. [See EPA Region I "Preliminary Agreement," Section 715-05-06 re: source reduction and facility-based permitting.
I.A.7. ✓	**EPA, RIDEM, and the Narragansett Bay Commission (NBC) should take every step possible to ensure that the facilities planning, design, and construction of CSO abatement measures for the NBC CSO discharges to the Blackstone River are completed on schedule.**	EPA, RIDEM, NBC	**See 04-01-04 Source Control: Combined Sewer Overflows.**

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I.A.8.	EPA and MADEP should evaluate the effectiveness of the Worcester CSO abatement project by examining the data gathered through the monitoring program conducted by the City of Worcester.	EPA, MADEP, City of Worcester	EPA has agreed to conduct this evaluation. See 04-01-04 Source Control: Combined Sewer Overflows.
I.A.9.	MADEP and the City of Worcester should periodically sample the Mill Brook Conduit to identify and eliminate illegal sanitary or industrial connections to that conduit. The portion of the conduit north of Salisbury Pond should be monitored to identify and eliminate illegal discharges in that portion. After elimination of illegal discharges in the northern section of the conduit, the entire length should be monitored to determine if any illegal discharges remain.	MADEP, City of Worcester	
I.A.10.	MADEP and RIDEM should periodically conduct shoreline surveys of the Blackstone River and its tributaries during dry weather periods, to identify and eliminate illegal industrial or sanitary discharges to the river. The states should take advantage of data gathered by citizens groups such as the River Rescue program or the Blackstone River Watershed Association to help identify problem areas or potential sources that require more detailed data gathering and regulatory action.	MADEP, RIDEM	
I.B.	Nonpoint source abatement		
I.B.1.	MADEP, RIDEM, EPA, and other interested parties should conduct a synoptic wet weather water quality survey for the Blackstone River, as outlined in Recommendation IV.B., to identify the location and magnitude of nonpoint source inputs.	MADEP, RIDEM, EPA, others	[See EPA Region I "Preliminary Agreement," Section 715-05-06 re: section 104(b)(3) funding.]
I.B.2.	EPA, MADEP, and the City of Worcester should expedite the development of stormwater permits for Worcester, that will produce effective reductions in runoff related loadings to the Blackstone River and its tributaries.	EPA, MADEP, City of Worcester	
I.B.3.	MADEP and RIDEM should develop and implement a feasible and comprehensive sediment remediation plan for the entire length of the Blackstone River as outlined under Recommendation II.	MADEP, RIDEM	

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I.B.4.	MADEP and RIDEM should develop and implement a pilot program for identifying and reducing loadings from landfills and other nonpoint sources. A potential location for the pilot program would be the former City of Worcester landfill, which is located adjacent to the UBWPAD treatment plant. The leachate, which flows into the former UBWPAD discharge channel, is suspected of containing high levels of metals. Sampling of the landfill runoff will help determine the need for reducing nonpoint source loadings to the Blackstone River.	MADEP, RIDEM	
I.C.	Water quality classifications		
I.C.1.	The State of Rhode Island should upgrade the classification of the Blackstone River and its tributaries which are currently listed as Class C waters, to Class B or a Class B-subcategory. *[Note: A Class-B partial use subcategory can be established when intermittent discharges (i.e., CSOs) cause occasional short-term use impairments. Such designations recognize that CSO abatement measures, other than sewer separation, are designed for a specific capacity, and a finite probability remains that discharge would occur that could result in non-attainment of designated uses.]*	State of R.I.	
I.D.	Regulation of water withdrawals		
I.D.1.	The Federal Energy Regulatory Commission (FERC), the U.S. Fish and Wildlife Service (USFWS), RIDEM, CRMC, and MADEP should ensure that any new or reissued permit for the development of a hydroelectric power project on the Blackstone River or its tributaries does not allow any storage or withdrawal of flow from the river. Diversions of flow from the river should be of the minimum length necessary for the generation of power and should not harm any significant physical, cultural, or biological resources in the river. a. All new or reissued hydropower permits issued by FERC should be for "run-of-the-river" projects, with specific minimum flow requirements that are protective of water quality and physical habitat. b. The State and the Commonwealth should insure through the water quality certification process that any hydropower project does not adversely affect the river's resources. c. The installation of flow gages by the permit applicant should also be required as a condition of the state water quality certification for new FERC permits.	FERC, USFWS, RIDEM, CRMC, MADEP	[See RIDEM "Preliminary Agreement," Section 715-05-06 re: review of new and reissued hydroelectric power project permits.]

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I.D.2.	FERC, RIDEM, CRMC, and MADEP should enforce the requirements contained in current hydropower permits through the following actions: a. RIDEM and MADEP should continue to review the requirements included in FERC permits for facilities in their respective states, and the associated state water quality certifications, to determine the minimum flow and diversion stipulations included. b. RIDEM and MADEP should continue to periodically assess fluctuations in streamflow at the U.S. Geological Survey (USGS) gage in Woonsocket, to determine when illegal storage or discharge operations may be occurring. i. RIDEM and MADEP should also evaluate the feasibility of supplementing the USGS gage by supporting additional USGS gages at Northbridge and Millville, and/or by installing low-cost real-time reporting flow gages at several locations along the Blackstone River to provide immediate notice of flow fluctuations. ii. RIDEM and MADEP should also require the installation of flow gages by the permit applicant, as a condition of the state water quality certification for new FERC permits. [See Recommendation I.D.1.c.] c. RIDEM and MADEP should report hydropower activities that are contrary to permit stipulations to FERC for appropriate action. If FERC does not take action, RIDEM, MADEP, EPA, and USFWS should consider legal action to require FERC to take disciplinary action.	FERC, RIDEM, CRMC, MADEP, USFWS, EPA, USGS	See Rec. I.D.1. [See RIDEM "Preliminary Agreement," Section 715-05-06.]
I.D.3.	The USFWS, RIDEM, CRMC, and MADEM should negotiate cooperative agreements with current hydropower dam owners having no minimum flow release requirements to ensure adequate minimum flow is maintained at all times.	USFWS, RIDEM, CRMC, MADEM, dam owners	
I.D.4.	MADEM, RIDEM, and CRMC should carefully evaluate proposals for interbasin water supply withdrawals or consumptive water uses from the Blackstone River watershed, to consider both the water quality and habitat impacts of withdrawals from the Blackstone. There should be a specific prohibition on consumptive water withdrawals from the Blackstone River and its tributaries until an interstate agreement is reached on minimum threshold flows necessary to maintain or improve water quality and fish and wildlife habitat.	MADEM, RIDEM, CRMC, BRVNHCC	BRVNHCC has proposed a moratorium on water withdrawals from the Blackstone.

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I.D.5.	Comprehensive plans prepared for the Blackstone River watershed that address the issue of regulation of water withdrawals or the maintenance of instream water quality should be submitted by the sponsoring agency to the FERC for recognition. Plans that should be submitted to FERC for recognition include the Cultural Heritage and Land Management Plan for the Blackstone River Valley National Heritage Corridor, the Blackstone Region Water Resources Management Plan of the State of Rhode Island, the Blackstone River Basin Plan developed by MADEM, the CZMA Section 6217 Coastal Nonpoint Pollution Control Program (CNPCP), and the Narragansett Bay *Comprehensive Conservation and Management Plan* (*CCMP*).	BRVNHCC, MADEP, NBP, FERC, CRMC, others	
I.D.6.	The United States Congress should amend the Federal Power Act to require that all hydropower projects, regardless of when initiated, require FERC licenses. RIDEM and MADEP should also include stipulations in water quality certifications granted for FERC licenses that allow for the reopening of the certification if the hydropower operation is found to be inconsistent with the Clean Water Act.	United States Congress, RIDEM, MADEP	

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II.	The State of Rhode Island and the Commonwealth of Massachusetts shall remediate the adverse impacts from contaminated sediments in the Blackstone River and its tributaries on the biota and water quality of the Blackstone River and Narragansett Bay.		
II.A.	MADEP and RIDEM should establish a "demonstration" sediment remediation project along the Blackstone River, to evaluate the feasibility of remediation of highly contaminated sediments. In 1990, Massachusetts and Rhode Island applied to the National Oceanic and Atmospheric Administration (NOAA) for a Coastal Zone Management Act (CZMA) Section 309 interstate grant. The original proposal called for work on the Taunton River and Mount Hope Bay, and funds to design and implement a sediment control pilot project for the Blackstone River. Due to funding limitations, the Blackstone portion of the grant request was removed. 1. The State and the Commonwealth should actively pursue further Section 309 grants or other funding which may be made available (*e.g., Coastal America Initiative*) to conduct a pilot program. 2. The pilot program should be conducted at a contaminated site which appears to have manageable solution(s) and is unlikely to be recontaminated by sediment resuspension from other sources. Demonstrated success by a pilot project is needed to generate widespread support for a comprehensive sediment control plan for the entire Blackstone River. 3. The Assessment and Remediation of Contaminated Sediments (ARCS) Program established by the Great Lakes National Program Office, an integrated program for the development and testing of assessment and remedial action alternatives for contaminated sediments, may provide an appropriate model for action.	MADEP, RIDEM, CRMC	The CZMA Section 309 grants are no longer available.
II.B.	MADEP should continue to proceed with the "bioengineering" streambank protection demonstration project planned for the Blackstone River. A proposal was developed by the Massachusetts Association of Conservation Districts to conduct a demonstration bioengineering streambank protection project at several sites along the Blackstone River. [Although the direct purpose of the project is to provide streambank protection, it is believed that prevention of streambank erosion in certain areas will also serve to limit sediment resuspension. If the demonstration proves successful in limiting sediment resuspension, MADEP should consider expanding the project to additional sites.]	MADEP	This proposal has been approved for funding by MADEP through an EPA Section 319 grant.

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II.C.	MADEM and RIDEM should actively investigate the ownership of failed or unstable dams along the Blackstone River and its tributaries within their respective states, and require repair of those dams by their owners if their repair is believed likely to avert sediment resuspension or other adverse environmental impacts. Dam repair should be used only as a short-term solution until a long-term sediment remediation plan is developed, see Recommendation II.E. MADEM, through its Office of Dam Safety, and RIDEM, through its Freshwater Wetlands Division, Dams Office, in conjunction with CRMC, should establish a program to: 1. Inventory existing dams on the Blackstone River and its tributaries. 2. Establish the ownership of all existing dams. 3. Examine prior inspection records for or inspect all dams to determine the likelihood of dam failure. 4. Require the owners of unsafe dams to implement repairs, if repair is considered necessary to prevent the resuspension of identified contaminated sediments or other adverse environmental impacts from a dam failure. RIDEM's current program covers all four actions, but from a safety, rather than water quality, standpoint. As part of any repair, the owner should be required to provide for fish passage and to meet the minimum flow requirements to be established under Recommendation I.D.4.	MADEM, RIDEM, CRMC	
II.D.	The United States Congress should authorize the U.S. Army Corps of Engineers (USACOE) and the U.S. Fish and Wildlife Service (USFWS) to assess all the dams on the Blackstone River and its tributaries, and make recommendations to Congress as to appropriate actions that would protect and improve the water quality of the river. Any proposed actions should also enhance efforts to restore anadromous fisheries to the river.	United States Congress	

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II.E.	An agreement should be negotiated between the owners of Fisherville Dam and the Massachusetts Department of Fisheries and Wildlife (MADFW), to repair the dam and restore a permanent impoundment and marshes behind the dam. 1. As part of the restoration plan, all alternative sediment remediation measures should be evaluated, and an analysis conducted to identify the potential for bioaccumulation of toxic materials if the dam were to be restored. 2. As part of any repair, the owner should be required to provide for fish passage and to meet the minimum flow requirements to be established under Recommendation I.D.4.	Dam owner, MADFW	
II.F.	MADEP and RIDEM should evaluate all available data to develop and implement a feasible and comprehensive sediment remediation plan for the entire length of the Blackstone River. The plan should identify locations where remediation should (or should not) be undertaken, and identify whether in-place or removal remediation measures are appropriate at each location. 1. In developing a comprehensive sediment control plan for the Blackstone River, the recommendations in McGinn (1981) should provide a starting point. 2. Specific recommendations should be reconsidered based on new sediment contamination data currently being analyzed (King, University of Rhode Island: unpublished report), and the results of demonstration projects (Recommendations II.A. and II.B.). 3. The control plan should identify preferred solutions and potential funding sources for carrying out the proposed remediation.	MADEP, RIDEM	See Rec. I.B.3.
III.	The State of Rhode Island and the Commonwealth of Massachusetts shall maintain and restore fish and wildlife habitat and aesthetic and recreational uses of the Blackstone River and its watershed.		
III.A.	A comprehensive program to improve the water quality of the Blackstone River and its tributaries, in order to provide for the maintenance and restoration of habitat and aesthetic and recreational uses, should be implemented.		See Rec. I.

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III.B.	A program to maintain flows in the Blackstone River needed for the maintenance and restoration of habitat and aesthetic and recreational uses, should be implemented.		See Rec. I.D.
III.C.	The USFWS, MADEP, and RIDEM should require that all new or reissued FERC permits for hydropower operations in the Blackstone River watershed require stipulations for the provision of fish passage at the permit location.	USFWS, MADFW, RIDEM, CRMC, FERC, BRVNHCC	[See RIDEM "Preliminary Agreement," Section 715-05-06.]
III.D.	The USFWS, MADFW, and RIDEM should negotiate for the provision of fish passage at hydropower operations in the Blackstone River watershed which have existing FERC permits, as those river segments approach the capability of supporting anadromous fisheries. In order to leave sufficient time to negotiate agreements and identify funding, USFWS, MADFW, and RIDEM should begin to negotiate agreements prior to individual stream segments actually achieving the needed water quality.	USFWS, RIDEM, CRMC, MADFW	[See RIDEM "Preliminary Agreement," Section 715-05-06.]
III.E. ✓	**Communities in the Blackstone River watershed should establish programs for the protection of valuable resource areas. It is important that communities now establish the growth management framework by which they will manage development pressures which could adversely impact valuable resources (*e.g.*, wetlands, open space, habitats), as well as directly affecting the water quality of the Blackstone River.** **1. An integrated program of land use planning, such as the land use strategy of the BRVNHCC, including a comprehensive program of acquisition and conservation restriction of land to be preserved as open space, is vital to the protection of key resources.** **2. Community programs, including Local Comprehensive Plans developed by communities under the Rhode Island Comprehensive Planning and Land Use Regulation Act, should contain elements on open space and natural resources.** **3. The communities should utilize, participate in, and build upon the planned acquisition of land for the establishment of a Blackstone River Greenway by the BRVNHCC, the State of Rhode Island and the Commonwealth of Massachusetts.**	**BRVNHCC, municipalities**	**R.I. and Mass. town planners are helping the Metacomet Land Trust to purchase a portion of the Blackstone Gorge.**
III.F.	The Blackstone River and Canal Commission (BRCC) should continue its cooperative approach toward ensuring that development projects are consistent with the goals for the Blackstone River and Canal.	BRCC	

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IV.	The State of Rhode Island, the Commonwealth of Massachusetts, EPA, and other interested organizations shall develop and implement a program to increase understanding of the environmental quality of the Blackstone River watershed.		
IV.A.	MADEP, RIDEM, EPA, and other interested parties should conduct a synoptic *dry weather* water quality survey for the Blackstone River.	MADEP, RIDEM, EPA, others	See Rec. I.A.3. Dry weather survey completed summer 1991.
IV.B.	MADEP, RIDEM, EPA, and other interested parties should conduct a synoptic *wet weather* water quality survey for the Blackstone River. The proposal submitted by RIDEM under the 104(b)(3) program would fund sufficient data gathering for use in a wet weather wasteload allocation. 1. To the extent possible, the agencies should take advantage of the sampling capabilities of the River Rescue Program or other citizens monitoring groups to maximize the potential data coverage of the survey. 2. The following activities are recommended: effluent sampling for WWTFs and CSOs, instream water quality sampling, flow monitoring, effluent toxicity testing, instream toxicity testing, and sediment trap placement (transport analysis).	MADEP, RIDEM, EPA, others	See Rec. I.A.3. and I.B.1. [See EPA Region I and RIDEM "Preliminary Agreements," Section 715-05-06.]

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BLACKSTONE RIVER

CODE	POLICY	AGENCIES	STATUS
IV.C.	MADEP, RIDEM, and EPA should conduct water quality modeling for the Blackstone River, to identify the relative importance of toxics and nutrient loadings from point source discharges, runoff, and sediment resuspension. 1. An appropriate water quality model (*e.g.*, QUAL2E), whether a new model or extension of an existing state model, would allow for a stronger effort in those areas expected to achieve the greatest return, *e.g.*, the development of dry weather wasteload allocations for the Blackstone River, with subsequent wet weather analyses, if necessary. 2. Water quality modeling will also allow for a post-audit of the decision to implement advanced treatment at the Upper Blackstone Water Pollution Abatement District (UBWPAD).	MADEP, RIDEM, EPA	See Rec. I.A.3. EPA has committed to preparing a dry weather model for metals and DO, which would allow a post-audit of the UBWPAD AWT facility.
IV.D.	The Massachusetts Turnpike Authority (MTA) and Massachusetts Department of Public Works (MADPW) should prepare an Environmental Impact Statement (EIS) that evaluates all potential environmental impacts from the proposed Massachusetts Turnpike interchange with Routes 20 and 146. The EIS should be conducted through the National Environmental Policy Act (NEPA) and Massachusetts Environmental Policy Act (MEPA) processes. State and Federal agency reviews of the project should emphasize the importance of establishing a riparian greenway along the Blackstone.	MTA, MADPW, State and Federal agencies	
IV.E.	The EPA, in conjunction with the Narragansett Bay Project (NBP), should develop a comprehensive library, bibliography and database of studies and reports describing the Blackstone River watershed. 1. Extensive research has been conducted over the years studying the Blackstone River area. As part of its Blackstone River Initiative, and following up on the initial efforts conducted by the NBP's Blackstone River Round Tables, the EPA should make as many of these materials available as possible at a single location. 2. A bibliography should also be published by EPA, listing all available documents and their location, if not kept at a single repository (many reports may be out of print). 3. These documents should be indexed in the Narragansett Bay Data System (NBDS) as the documents are acquired and catalogued by EPA, and important data should be incorporated into the database.	EPA, NBP	

✓ - **High Priority Action**

RECOMMENDED POLICIES AND ACTIONS
BLACKSTONE RIVER

CODE	POLICY	AGENCIES	STATUS
IV.F.	The EPA, in conjunction with the State of Rhode Island, the Commonwealth of Massachusetts, and other interested parties, should establish a public information program geared toward outlining the need for cooperation in cleaning up the Blackstone River. The use of facilities developed as part of the Blackstone River Valley National Heritage Corridor, the Blackstone River Heritage State Park in Massachusetts, and the Blackstone River State Park in Rhode Island should be strongly considered for portions of this program.	EPA, State of R.I., Comm. of Mass., BRVNHCC	
V.	The State of Rhode Island, the Commonwealth of Massachusetts, EPA, and other interested organizations shall develop a collaborative interstate approach to protecting the Blackstone River.		
V.A.	The New England Interstate Water Pollution Control Commission (NEIWPCC), in conjunction with the EPA, the State of Rhode Island, and the Commonwealth of Massachusetts, should establish a permanent Blackstone River Task Force to address interstate pollution problems in the basin. 1. Membership, at a minimum, should include EPA Region I (through its Blackstone River Initiative), NBP, RIDEM, MADEP, MADEM, BRVNHCC, USFWS, USACOE, and other interested parties identified through the Blackstone River Round Tables or through other means. 2. The Task Force should be focussed on identifying and carrying out solutions to manageable interstate issues affecting the Blackstone River. Potential topics to be addressed by the Task Force include: a. Permit issues--criteria, pretreatment programs, consistency between states, etc. b. Water withdrawals and water management. c. Sediment remediation. d. Habitat protection and restoration. e. Data and technology transfer (prior studies). f. Funding sources (Federal, regional, state, local, or private).	NEIWPCC, EPA, NBP, RIDEM, MADEP, MADEM, BRVNHCC, USFWS, USACOE, others	[See RIDEM "Preliminary Agreement," Section 715-05-06.]

✓ - High Priority Action

RECOMMENDED POLICIES AND ACTIONS
BLACKSTONE RIVER

CODE	POLICY	AGENCIES	STATUS
V.B.	The State of Rhode Island and the Commonwealth of Massachusetts should include one another on the automatic review list for all permit reviews or other major actions within the Blackstone River watershed. The EPA should include both the State and the Commonwealth on all such review lists for permits under its jurisdiction. 1. Due to the true interstate nature of problems on the Blackstone River, each state should automatically coordinate all proposals and reviews for programs potentially affecting both states. Such programs include NPDES/RIPDES discharge permits (including development of site-specific criteria), water withdrawal permits, major habitat or wildlife restoration efforts, and sediment remediation plans. 2. EPA should also ensure that any permit limits for any discharger likely to impact interstate waters are appropriate to meet water quality standards in both states.	State of R.I., Comm. of Mass., EPA	
V.C.	MADEP, RIDEM, EPA, and other interested parties should continue to cooperate in conducting synoptic water quality surveys and other field and modeling efforts for the Blackstone River.	MADEP, RIDEM, EPA, others	
V.D.	The State of Rhode Island, the Commonwealth of Massachusetts, as well as communities within the Corridor, should support the environmental conservation goals and objectives of the Cultural Heritage and Land Management Plan for the Blackstone River Valley National Heritage Corridor. The environmental conservation objectives of the Plan are to improve the water quality of the Blackstone River; identify natural sites that are threatened, in need of action or assistance, and/or important to the completion or enhancement of state heritage parks; protect open space within the Corridor through the development of greenways along the river; and support state, local, private and individual efforts to enhance the environment.	State of R.I., Comm. of Mass., communities	
V.E.	The BRVNHCC, in conjunction with the National Park Service, EPA, and other federal agencies, should establish a consistency review program to ensure that federal activities are consistent with the goals and objectives of the Cultural Heritage and Land Management Plan for the Blackstone River Valley National Heritage Corridor.	BRVNHCC, NPS, EPA, other federal agencies	BRVNHCC has agreed to explore its role in facilitating discussions between state and federal agencies.

✓ - High Priority Action

RECOMMENDED POLICIES AND ACTIONS
BLACKSTONE RIVER

CODE	POLICY	AGENCIES	STATUS
V.F.	The United States Congress should provide expanded authority for Federal agencies to assist with remedial efforts on the Blackstone River, recognizing that the Blackstone River and Narragansett Bay have been designated as *nationally significant* waterbodies.	United States Congress	

✓ - High Priority Action

Estimated Cost of Implementation—Blackstone River

Table 715-04(13) summarizes the estimated costs associated with implementing the recommendations in this chapter. Capital costs account for over 90 percent of the total cost of $13,395,750. Most of the actions are interstate and interagency in nature, with RIDEM and MADEP as the primary implementing agencies.

Element IA (Point Source Abatement) includes the following actions costed under 04-01-01 Source Reduction: Toxics—the issuing of revised NPDES/RIPDES permits (with effluent limit criteria for toxics and nutrients) to WWTFs in the Blackstone River watershed, a waste load allocation for metals and nutrients, and procedures for coordinated permitting across all disposal media. The major cost reported in this element is a total of $250,000 over the five-year period for dry weather shoreline surveys of the Blackstone and its tributaries.

Element II (Contaminated Sediments) includes $428,000 for planning studies related to the development and implementation of a comprehensive sediment remediation plan for the entire length of the river. This activity will have post-1997 capital costs of approximately $144,000,000. The major cost reported in this element is an amount of nearly $12 million in capital costs to be used for a demonstration sediment remediation project. Element IV (Environmental Knowledge) contains ongoing annual costs for a coordinated public information effort to be conducted by state and federal agencies. Recommendations listed here for a synoptic wet weather water quality survey and for water quality modeling for the length of the river are costed under 04-01-01 Source Reduction: Toxics. Element V (Interstate Cooperation) has as its major cost the establishment of an interagency and interstate Blackstone River Task Force which will address interstate pollution problems.

For further details regarding the *CCMP* cost estimation process and funding strategies, refer to the *Narragansett Bay CCMP Cost Estimation and Funding Report* (Apogee Research Inc./NBP, 1992).

Table 715-04(13)

ESTIMATED COST OF IMPLEMENTATION
BLACKSTONE RIVER

COST ESTIMATES BY ELEMENT

	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
IA-Point Source Abatement	90,625	8,750	65,625	8,750	60,000	0	60,000	0	60,000	0	336,250	17,500
IB-NPS Abatement	100,000	114,000	0	0	0	0	0	0	0	0	100,000	114,000
IC-WQ Classifications	0	0	0	0	0	0	0	0	0	0	0	0
ID-Water Withdrawals	50,000	0	10,000	0	50,000	0	20,000	0	20,000	0	150,000	0
II-Contaminated Sediments	30,000	0	0	0	210,000	12,128,000	10,000	0	10,000	0	260,000	12,128,000
III-River Habitat and Uses	10,000	0	10,000	0	10,000	0	10,000	0	10,000	0	50,000	0
IV-Environmental Knowledge	65,000	12,000	10,000	12,000	10,000	12,000	10,000	12,000	10,000	12,000	105,000	60,000
V-Interstate Cooperation	15,000	0	15,000	0	15,000	0	15,000	0	15,000	0	75,000	0
TOTALS	360,625	134,750	110,625	20,750	355,000	12,140,000	125,000	12,000	125,000	12,000	1,076,250	12,319,500
TOTAL BY YEAR		495,375		131,375		12,495,000		137,000		137,000		13,395,750

COST ESTIMATES BY AGENCY

	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
RIDEM	107,500	6,000	50,000	6,000	175,000	6,070,000	60,000	6,000	60,000	6,000	452,500	6,094,000
MADEP	209,375	128,750	51,875	14,750	175,000	6,070,000	60,000	6,000	60,000	6,000	556,250	6,225,500
MADEM	5,000	0	5,000	0	5,000	0	5,000	0	5,000	0	25,000	0
MADFW	30,000	0	0	0	0	0	0	0	0	0	30,000	0
Municipalities*	8,750	0	3,750	0	0	0	0	0	0	0	12,500	0
TOTALS	360,625	134,750	110,625	20,750	355,000	12,140,000	125,000	12,000	125,000	12,000	1,076,250	12,319,500
TOTAL BY YEAR		495,375		131,375		12,495,000		137,000		137,000		13,395,750

* Ultimate implementation costs will vary for each municipality depending on its particular environmental and institutional conditions. In addition, the estimated municipal implementation costs do not include ultimate program and capital costs that may result from completion of underlying planning activities, or costs that are expected to be completely recoverable from user fees.

04-03-03 Greenwich Bay [RESERVED]

04-03-04 Management of Marine and Riverine Sediments [RESERVED]

715-05 IMPLEMENTATION

Section 320 of the federal Clean Water Act requires implementation of the Narragansett Bay *Comprehensive Conservation and Management Plan* (*CCMP*) following the Plan's approval by the U.S. Environmental Protection Agency (EPA) and the Governor of Rhode Island. In order to prepare for eventual implementation, EPA's National Estuary Program (NEP) requirements focussed on establishing a consensus about all phases of *CCMP* development in order to foster inter-agency and public agreements about management actions to "restore and protect" Narragansett Bay. NEP participants, including the Narragansett Bay Project (NBP), are also required to identify possible sources of funding to finance approved *CCMP* actions, and to develop a long-term monitoring program in order to evaluate the success of implementation actions taken pursuant to the *CCMP*.

Based on this mandate, the NBP governing committees emphasized implementation of the *CCMP* throughout the planning process. For example, the NBP's scientific investigations frequently resulted in early resolution of identified problems—in some cases simply by exposing the existence of a problem, in others, by providing adequate information to support governmental actions. The NBP's public participation efforts also resulted in implementation of many actions where areas of agreement and public support became obvious during the planning process. In addition, the NBP Management Committee supported the Project in successfully competing for EPA *action plan* funds to begin early implementation of toxics source reduction and nonpoint source-related land management initiatives. As a result, implementation of some portions of the *CCMP* began as the *CCMP* was being developed.

This section of the *CCMP*, however, focuses on future institutional and financial actions that are recommended in order to successfully administer and implement the *CCMP* over a five year planning horizon. The following major issues are addressed:

1. Integration and coordination of the implementing federal, state, and local authorities with jurisdiction over management of Narragansett Bay;

2. Administration and oversight of the *CCMP*, including provisions for amending, enforcing, and monitoring the progress of the *CCMP*;

3. Financing the *CCMP*, including cost estimation and identification of existing and potential revenue sources;

4. Evaluation of federal and federally-assisted programs for consistency with the goals and objectives of the *CCMP*;

5. Unfinished agenda.

Some of the NBP's early efforts to implement corrective actions are described in Chapter 01-04-01 Process of Plan Development: Research and Early Implementation Projects. The implementation status of *CCMP* recommendations is recorded in the recommendation matrices in each *CCMP* chapter where implementation efforts have been initiated or completed since the *CCMP* was drafted. In addition, Section 715-05-06 contains "Preliminary Agreements to Implement the Narragansett Bay *CCMP*". These agreements were executed by several federal and state implementing authorities in order to provide the basis for first year efforts to implement the *CCMP*.

05-01 Bay Governance [RESERVED]

05-02 CCMP Implementation and Governance

The Narragansett Bay *Comprehensive Conservation and Management Plan* (*CCMP*) is the result of a collaborative effort between federal, state, and local government, academia, and the private sector. This effort depended upon the Narragansett Bay Project's governing committees to provide an effective forum for reaching agreement about resource management strategies and priorities. In the future, *CCMP* implementation will also require coordinated action from the many federal, state, and local agencies with jurisdiction in the Bay watershed. One key question, therefore, is what form of *CCMP* oversight authority is appropriate or necessary to coordinate implementation of the *CCMP*, evaluate progress of *CCMP* implementation, or to revise the *CCMP* based on new information and priorities (Karp and Korch, 1991:ii).

05-02-01 Institutional Oversight

Objective for CCMP Institutional Oversight

The U.S. Environmental Protection Agency (EPA), the State of Rhode Island, and the Commonwealth of Massachusetts should develop appropriate institutional structures to coordinate implementation of the *Comprehensive Conservation and Management Plan* (*CCMP*), and to oversee and monitor the effectiveness of actions taken pursuant to the *CCMP*.

Introduction

The federal Clean Water Act (33 U.S.C. 1330(b)(5) and (6)) directs participants in the National Estuary Program (NEP) to "develop plans for the coordinated implementation of the plan by the States as well as Federal and local agencies participating in the conference; [and to] monitor the effectiveness of actions taken pursuant to the plan..." As a result of recommendations presented in Parts 715-04 and 715-05 of the *CCMP*, virtually every resource management and environmental regulatory authority with jurisdiction in the Narragansett Bay watershed will be expected to take either individual or joint action to protect some aspect of the Bay ecosystem following approval of the *CCMP*.

Over thirteen federal agencies presently have direct programmatic jurisdiction over some aspect of water quality protection or resource management within the Narragansett Bay basin. Some of the major federal agencies include the U.S. Environmental Protection Agency (EPA), National Oceanic and Atmospheric Administration (NOAA), U.S. Army Corps of Engineers (USACOE), U.S. Coast Guard, U.S. Department of Agriculture Soil Conservation Service (USDA SCS), U.S. Fish and Wildlife Service (USFWS), and the U.S. Food and Drug Administration (FDA). On the state level, the Rhode Island Department of Environmental Management (RIDEM), the Rhode Island Coastal Resources Management Council (CRMC), the Rhode Island Department of Administration's Division of Planning (RIDOP), the Rhode Island Department

of Health (RIDOH), and the Rhode Island Department of Transportation (RIDOT), as well as numerous regional and municipal governmental authorities, also have major planning or regulatory responsibilities affecting water quality. The array of state, regional, and local institutions with responsibility for environmental planning and management is equally complex in the 60 percent of the watershed located within the Commonwealth of Massachusetts (Karp and Korch, 1991:1).

Many of these agencies and organizations were represented on the Narragansett Bay Project's (NBP) advisory and decision-making committees during the development of the *CCMP* between 1985 and 1991. The Project's committee structure ensured that diverse governmental perspectives on estuarine management were considered in arriving at a consensus on priorities and strategies for protecting and restoring Narragansett Bay. These committees also provided a forum for Bay constituencies and user groups to contribute to the decision-making process.

The NBP Executive Committee has proposed a process to begin incorporation of the *CCMP* into *Rhode Island State Guide Plan* and *The State of Rhode Island Coastal Resources Management Program* (Figure 715-05(1)). This is just the beginning, however, since incorporation of the *CCMP* into operations of other agencies, oversight of implementation, and development of an ongoing evaluation of effectiveness must be addressed as well (Karp and Korch, 1991).

Statement of the Problem

Implementation of the *CCMP* will not occur automatically. Although the consensus developed through the NBP Management Committee process in producing the *CCMP* may indicate broad support for recommendations included in the Plan, the implementation schedules proposed in the Plan are not legally binding. Therefore, *CCMP* implementation, without any formal method of oversight, will largely depend upon the willingness and ability of the implementing authorities to unilaterally undertake these initiatives according to the proposed implementation schedules.

In addition, as indicated above, jurisdictional responsibility for environmental protection within the Narragansett Bay basin is complex. One NBP study identified more than 40 ongoing routine environmental monitoring programs in the Bay watershed. These programs are conducted by nine federal or state agencies, four universities, and assorted cities and towns (Michelman, 1990). In the Blackstone River basin, 39 separate government programs or agencies have been identified as exercising jurisdiction over some aspect of environmental protection (Karp and Korch, 1991:2). As a result, unless some formal oversight mechanism is established, assuring implementation of the *CCMP* will be difficult to the extent that implementation depends upon coordinated action by multiple agencies with overlapping authority.

Finally, there are a number of ongoing responsibilities related to administration of the *CCMP* that will require close interstate and interagency cooperation and cannot logically be assigned to a single agency. Some of these ongoing responsibilities include:

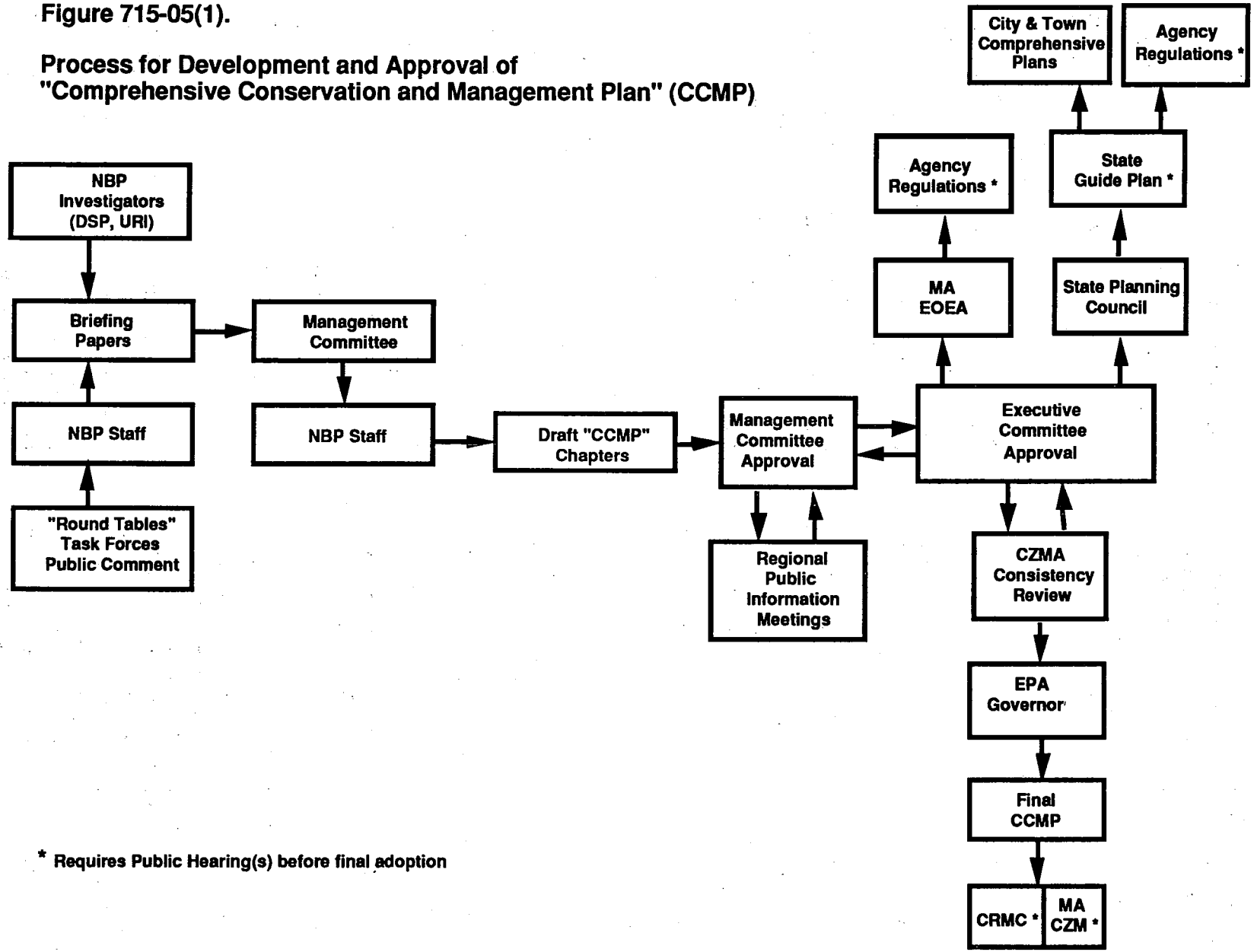
- Negotiating interstate and interagency memoranda of agreements.
- Overseeing the progress of *CCMP* implementation and issuing a biennial report on progress.
- Revising the *CCMP*, as necessary, based on new scientific, policy and/or economic information (Karp and Korch, 1991:6).

Analysis

Recommendations contained in the *CCMP* are likely to affect federal, state and local agencies, industrial and commercial interests, and citizens of both Rhode Island and Massachusetts. Therefore, the need for interstate and interagency coordination and consensus-building will continue after the Narragansett Bay *CCMP* is adopted. There

Figure 715-05(1).

Process for Development and Approval of "Comprehensive Conservation and Management Plan" (CCMP)



* Requires Public Hearing(s) before final adoption

are, however, many ways that responsibility for implementing and evaluating the effectiveness of *CCMP* recommendations could be structured.

Responsibility for *CCMP* implementation and oversight could, for example, be completely distributed among existing agencies operating in the watershed based on formal or informal agency agreements to implement the Plan. Alternatively, *CCMP* planning and oversight functions could be completely centralized within, or coordinated by, a single watershed authority. Other combinations of dispersed versus centralized authority also exist (Karp and Korch, 1991:16). [Note: As of June 1992, eight agencies (EPA Region I, the EPA Environmental Research Laboratory – Narragansett (EPA ERLN), USDA SCS, U.S. Geological Survey (USGS), RIDEM, RIDOP, CRMC, and RIDOH) have executed preliminary agreements to implement portions of the *CCMP*. [See 715-05-06 Implementation: Preliminary Implementation Agreements.]

Other members of the EPA-sponsored NEP have established or expect to establish independent program offices with authority and staff to provide ongoing planning and coordination assistance with respect to *CCMP* implementation. None of the other programs have distributed responsibility for *CCMP* implementation and ongoing planning needs among several different agencies. However, all of the estuary programs maintain external advisory committees or interstate councils to oversee the progress of implementation and direct future planning efforts (Karp and Korch, 1991:16).

Establishing a separate organization to act on behalf of Narragansett Bay does not seem feasible at this time for several reasons. As noted above, many existing governmental authorities presently exercise subject matter and/or geographic jurisdiction within the Narragansett Bay basin. Therefore, an additional bureaucracy with planning and/or regulatory authority would be likely to complicate Bay governance further. In addition, there is insufficient funding to support the creation of a new authority (Karp and Korch, 1991:iii).

Although a separate Narragansett Bay planning authority does not seem feasible at the present time, the NBP Executive and Management Committees have historically provided an important public forum for representing the diversity of interests in Narragansett Bay. The committee structure also provided a useful mechanism for reaching agreements about the scope and priority of corrective actions needed to protect and restore Narragansett Bay. Therefore, as in other estuary programs, the existence of a small governing committee representing the implementing authorities represents a good model for assuring continued interstate and interagency cooperation and periodic re-evaluation of *CCMP* priorities. In addition, since many of the organizations that participated in the development of the *CCMP* view themselves as "stakeholders" in the outcome of the planning process, a separate committee representing Bay constituencies and Bay users should be maintained to provide a continuing forum for overseeing the implementation process.

Recommended Policies and Actions and *Estimated Cost of Implementation* are presented in the following pages.

RECOMMENDED POLICIES AND ACTIONS
INSTITUTIONAL OVERSIGHT

CODE	POLICY	AGENCIES	STATUS
I.A. ✓	**A Narragansett Bay *CCMP* Implementation Committee should be established by the outgoing Narragansett Bay Project (NBP) Executive Committee. The Executive Committee should recommend appointments to the *CCMP* Implementation Committee to be ratified by the Governors of Rhode Island and Massachusetts.** **A. The *CCMP* Implementation Committee should include five to eight members to represent the major federal, state and local government implementing authorities in Rhode Island and Massachusetts.**	**NBP Executive Committee**	**EPA Region I, RIDEM, CRMC, and RIDOP have agreed to serve on the *CCMP* Implementation Committee.**
I.B.	The primary functions of the Narragansett Bay *CCMP* Implementation Committee should include: 1. Evaluating the need for a "Narragansett Bay Environmental Compact" that establishes political agreements about the goals and schedule for *CCMP* implementation. 2. Overseeing the progress of *CCMP* implementation, including receiving periodic reports on the progress of implementation and the health of the Bay. 3. Facilitating the adoption of relevant portions of the *CCMP* into agency policies, plans and regulations, and negotiation of memoranda of agreements between relevant agencies, as necessary. 4. Coordinating agency requests for external funding, as necessary, to implement the *CCMP*. 5. Participating in the review of proposed federal activities for consistency with the *CCMP*. 6. Reviewing proposed revisions to the *CCMP* based on recommendations by the Narragansett Bay Policy Committee.	Narragansett Bay *CCMP* Implementation Committee	
II.A. ✓	**A Narragansett Bay Policy Committee should be created to broaden public participation in *CCMP* implementation, oversight, and any proposed policy changes to the *CCMP*. The NBP Management Committee should recommend appointments to the Policy Committee to be ratified by the Governors of Rhode Island and Massachusetts. The Narragansett Bay Policy Committee should include representatives from federal, state and local government, environmental advocacy and land conservancy groups, industry and business trade organizations, and other relevant public interest groups.**	**NBP Management Committee**	

✓ - **High Priority Action**

RECOMMENDED POLICIES AND ACTIONS
INSTITUTIONAL OVERSIGHT

CODE	POLICY	AGENCIES	STATUS
II.B.	The primary functions of the Narragansett Bay Policy Committee should include: 1. Overseeing the progress of *CCMP* implementation. 2. Providing a permanent forum for the public to provide comments on policy matters related to the health and governance of Narragansett Bay. 3. Recommending revisions to the *CCMP* based on new scientific findings, technological advances, or changes in physiographic, political, or economic conditions. 4. Overseeing public review and formal adoption of amendments to the *CCMP*. 5. Advising elected officials, relevant commissions, and organizations about the status of *CCMP* implementation, including identification of issues requiring formal interstate agreement.	Narragansett Bay *CCMP* Policy Committee	
III.A. ✓	**A centralized Narragansett Bay planning section should be maintained in order to support Narragansett Bay *CCMP* Implementation and Policy Committee activities leading to implementation of *CCMP* recommendations. The section should be housed within the RIDEM. However, on the advice of the *CCMP* Implementation Committee, planning section staff may be assigned by the Director to other implementing authorities, as necessary, to assist with planning and implementation activities related to the *CCMP*. The section should be transferred to the Office of Policy and Planning upon creation of the Rhode Island Department of the Environment (RIDOE).**	**EPA, RIDEM, CRMC, other federal and state implementing authorities**	**The FY92 workplan will fund a core planning staff within RIDEM, CRMC and other agencies, as determined by the Narragansett Bay *CCMP* Implementation Committee.**

✓ - **High Priority Action**

RECOMMENDED POLICIES AND ACTIONS
INSTITUTIONAL OVERSIGHT

CODE	POLICY	AGENCIES	STATUS
III.B.	The primary functions of a Narragansett Bay planning section should include: 1. Providing staff support to the Narragansett Bay *CCMP* Implementation and Policy Committees. 2. Supporting implementation of the *CCMP* where possible, *e.g.* , by preparing draft agency regulations for implementing authorities; preparing draft enabling legislation; negotiating and drafting interagency agreements; evaluating economic impact of *CCMP* recommendations, and developing implementation schedules. 3. Evaluating the progress of *CCMP* implementation by implementing authorities. 4. Reviewing proposed federal and state activities for consistency with the *CCMP*. 5. Evaluating the success of *CCMP* implementation based on long-term monitoring data regarding ecological status of Narragansett Bay and the Bay watershed. 6. Proposing and drafting amendments to the *CCMP* based on the results of the long-term monitoring project and other available scientific, policy, and economic information. 7. Administering ongoing research, long-term monitoring activities, and maintaining the Narragansett Bay Data System (NBDS). 8. Administering and/or coordinating public outreach activities related to *CCMP* implementation and any proposed *CCMP* changes. 9. Representing the planning section on technical work groups and interagency committees involved with developing Bay policy, and acting as a resource for Bay-related technical information.	Narragansett Bay Planning Section	
IV.	The Narragansett Bay *CCMP* Implementation and Policy Committees should re-examine the advisability of establishing a separate watershed planning organization in two years, based on an evaluation of the effectiveness of the *CCMP* governance structure that is eventually adopted by the Narragansett Bay Management Conference.	Narragansett Bay *CCMP* Implementation and Policy Committees	

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Estimated Cost of Implementation—CCMP Implementation and Governance

Table 715-05(1) summarizes the estimated costs associated with implementing the recommendations contained in 05-02-01 (Institutional Oversight), 05-02-02 (Consistency Review), and 05-02-04 (Long-Term Monitoring) of this chapter.

Element 01 (Institutional Oversight) projects a total five-year cost of $1,350,000 to support the activities of the Narragansett Bay Implementation and Policy Committees, and to maintain a Narragansett Bay planning section. Some level of federal funding is expected over the entire period to partially support *CCMP* implementation.

Element 02 (Consistency Review) presents the costs associated with increasing agency participation in recommended consistency review processes. The total cost of this element ($186,250) includes costs for increased state agency participation in existing federal consistency reviews, increased coordination between Rhode Island and Massachusetts coastal zone management agencies (in terms of reviewing proposed coastal zone activities that may have interstate impacts), and coordination of Rhode Island state and local agency responses to proposed major development projects with potential to cause significant environmental impacts.

Elements 04-I, 04-II, 04-III, and 04-IV present costs associated with Bay monitoring, and associated coordination and data management activities. Element 04-I (Monitor: Implementation) estimates an annual cost of $250,000 for implementation of the *Narragansett Bay Long Term Monitoring Plan*, including data management support. Element 04-II (Monitor: Coordination) projects a total cost of $500,000 between 1992 and 1997 to support and promote the utilization of citizen-collected monitoring data in Rhode Island and Massachusetts. Costs associated with Element 04-III (Monitor: Regulatory) are included in costs for 04-01-01 Source Reduction: Toxics. Element 04-IV (Monitor: Data Analysis) estimates municipal costs for submitting discharge monitoring and compliance data, and state costs for requiring technical reviews of all publicly-funded research.

For further details regarding the *CCMP* cost estimation process and funding strategies, refer to the *Narragansett Bay CCMP Cost Estimation and Funding Report* (Apogee Research Inc./NBP, 1992).

Table 715-05(1)

ESTIMATED COST OF IMPLEMENTATION
CCMP IMPLEMENTATION AND GOVERNANCE

COST ESTIMATES BY ELEMENT	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
01-Institutional Oversight	255,000	15,000	255,000	15,000	255,000	15,000	255,000	15,000	255,000	15,000	1,275,000	75,000
02-Consistency Review	56,250	0	25,000	0	35,000	0	35,000	0	35,000	0	186,250	0
04-I–Monitor; Implementation	0	250,000	0	250,000	0	250,000	0	250,000	0	250,000	0	1,250,000
04-II–Monitor; Coordination	127,500	0	100,000	0	100,000	0	100,000	0	100,000	0	527,500	0
04-III–Monitor; Regulatory	0	0	0	0	0	0	0	0	0	0	0	0
04-IV–Monitor; Data Analysis	10,000	0	10,000	0	10,000	0	10,000	0	10,000	0	50,000	0
TOTALS	448,750	265,000	390,000	265,000	400,000	265,000	400,000	265,000	400,000	265,000	2,038,750	1,325,000
TOTAL BY YEAR		713,750		655,000		665,000		665,000		665,000		3,363,750

COST ESTIMATES BY AGENCY	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
RIDEM	308,750	265,000	295,000	265,000	295,000	265,000	295,000	265,000	295,000	265,000	1,488,750	1,325,000
RI CRMC	27,500	0	10,000	0	15,000	0	15,000	0	15,000	0	82,500	0
RIDOP	5,000	0	5,000	0	5,000	0	5,000	0	5,000	0	25,000	0
RIDOH	5,000	0	5,000	0	5,000	0	5,000	0	5,000	0	25,000	0
MADEP	73,750	0	60,000	0	60,000	0	60,000	0	60,000	0	313,750	0
MACZM	5,000	0	5,000	0	10,000	0	10,000	0	10,000	0	40,000	0
MADPH	5,000	0	5,000	0	5,000	0	5,000	0	5,000	0	25,000	0
MA EOEA	13,750	0	0	0	0	0	0	0	0	0	13,750	0
Municipalities*	5,000	0	5,000	0	5,000	0	5,000	0	5,000	0	25,000	0
TOTALS	448,750	265,000	390,000	265,000	400,000	265,000	400,000	265,000	400,000	265,000	2,038,750	1,325,000
TOTAL BY YEAR		713,750		655,000		665,000		665,000		665,000		3,363,750

* Ultimate implementation costs will vary for each municipality depending on its particular environmental and institutional conditions. In addition, the estimated municipal implementation costs do not include ultimate program and capital costs that may result from completion of underlying planning activities, or costs that are expected to be completely recoverable from user fees.

05-02-02 Consistency Review

Objective for CCMP Consistency Review

The State of Rhode Island and the Commonwealth of Massachusetts should establish effective procedures, consistent with their existing authority, to ensure that future governmental actions in the Narragansett Bay basin are consistent with the policies and recommendations of the Narragansett Bay *Comprehensive Conservation and Management Plan* to the maximum extent possible.

Introduction

Successful implementation of the *Comprehensive Conservation and Management Plan* (*CCMP*) will depend in part upon assuring that federal, state, and local actions in the Narragansett Bay basin are consistent with *CCMP* policies and recommendations for protecting Narragansett Bay. Some examples of proposed governmental actions that should potentially be reviewed for consistency with the *CCMP* include dredging and ocean disposal proposals, proposed wastewater treatment facility discharge permits, proposed hydropower projects, stormwater runoff abatement projects, the sale of surplus federal property in the coastal zone by the General Services Administration or other federal agencies, and applications for federal funding that could affect *CCMP* implementation (Connecticut Department of Environmental Protection, 1990).

Several procedural mechanisms currently exist to enable the states to review proposed governmental actions that could affect Narragansett Bay. However, the existing consistency review procedures are administered by a variety of agencies in both states, pursuant to different scopes and types of review. Therefore, the ability of the State of Rhode Island and the Commonwealth of Massachusetts to review future governmental actions for consistency with the *CCMP* is reviewed below.

Federal Consistency

The National Environmental Policy Act (NEPA), Section 307 of the Coastal Zone Management Act (CZMA), Presidential Executive Order (E.O.) 12372, and Sections 319 and 320 of the Clean Water Act (CWA) provide independent legal authority for Rhode Island and Massachusetts to review proposed federal activities for consistency with established state policies. This authority to perform *federal consistency reviews* also exists pursuant to the Blackstone River Valley National Heritage Corridor, the Fish and Wildlife Coordination Act, and CWA Section 401 water quality certifications for federal licensees or permittees that discharge into waters of the United States (Nickolai and Remington, 1991). Sections 313 (Federal Facilities Pollution Control) and 404 (Permits for Dredged of Fill Material) of the CWA, which waive the sovereign immunity of federal agencies when their activities or projects affect navigable waters under state jurisdiction, represent additional sources of authority to invoke "consistency" with state law (such as enforceable policies under state coastal management programs or policies of a *CCMP* enforceable via state coastal programs). The effect of the waiver of sovereign immunity is that federal agencies must comply with both the substantive and procedural requirements of state law (*i.e.*, apply for a state permit) (Archer, 1989).

The state's federal consistency review authority typically applies to both direct and indirect (federally funded) federal activities. However, the scope of the state's authority to alter or veto a proposed federal action depends upon the state's specific legal basis for the review. With respect to the *CCMP*, the state's most relevant and effective basis for assuring federal consistency with policies stated in the *CCMP* derive from Section 307 of the CZMA and E.O. 12372. NEPA, which is administered by the Council on Environmental Quality (CEQ), also represents a potentially effective mechanism of requiring federal activities to be consistent with federal, state, and local policies if the proposed activity may "significantly affect the quality of the human environment."

Since Section 307 of the CZMA, E.O. 12372, and NEPA represent the most powerful legal bases for Rhode Island and Massachusetts to review direct and indirect federal actions in the Narragansett Bay basin for consistency with the *CCMP*, these federal consistency review provisions are described below. [See 715-05-04 Federal Consistency Report with respect to the report required by Section 320 of the federal CWA.]

Section 307 Federal Consistency Review

The National Oceanic and Atmospheric Administration (NOAA) has promulgated regulations pursuant to Section 307 of the CZMA requiring federal activities to be consistent "to the maximum extent practicable" with "the *enforceable, mandatory policies* of the [coastal] management program..." Coastal management provisions that "are in the nature of *recommendations*", however, need only be given "*adequate consideration*" by federal agencies. (Emphasis added.) (15 CFR 930.39[c]; 15 CFR 930.64[b]; Nickolai and Remington, 1991:5).

NOAA's rules also authorize state coastal zone management agencies to establish a "Section 307 List" of federal agency activities within or outside the state's coastal zone affecting or likely to affect any land or water use or natural resource of the coastal zone (15 CFR 930.35, as modified by the 1990 Amendments to CZMA, section 307(c)(1)(A)). A "listed" federal agency or program must notify the state coastal agency of proposed federal agency activities affecting the state's coastal zone, and must submit a determination of consistency with the state's coastal zone management program. The state coastal agency then issues a finding of concurrence or non-concurrence with the Federal agency's consistency determination. The state coastal agency may also review "unlisted" federal agency activities (15 CFR 930.35(b)) for consistency with its coastal program. It is important to note that the "listing" option available to the state in no way lessens the obligation on federal agencies to inform the state coastal agency regarding all federal agency activities affecting or potentially affecting the coastal zone (land and water uses and natural resources).

The listing requirement is *mandatory* with respect to any federally-licensed or permitted activities that the coastal zone management agency wishes to review for consistency with its state coastal management program (Nickolai and Remington, 1991:4-5). The NOAA rules also direct state coastal zone management agencies to monitor unlisted federal license or permit activities by means of the inter-governmental review process mandated by E.O. 12372 or the NEPA for possible inconsistencies with state policies. The *Rhode Island Coastal Resources Management Program* (*RICRMP*) provides a general categorical listing of federal agency activities and federally-licensed or permitted activities requiring consistency determinations and certifications in compliance with the NOAA regulations (*The State of Rhode Island Coastal Resources Management Program*, 1978). Further, the *RICRMP* reserves the right to review the consistency of unlisted federally-licensed or permitted activities applicable to uses and/or developments that may affect the State's coastal zone, its people, or resources.

Rhode Island's coastal zone management agency, the CRMC, primarily relies on its permitting authority to ensure that proposed state, local and private actions are consistent with the *RICRMP* and Special Area Management (SAM) Plans. In addition, to ensure that federal agency actions are consistent, the CRMC receives notice of federal agency and federally-permitted activities that may not necessarily require a CRMC permit or "assent" in three ways:

1. By mutual agreement with the U.S. Army Corps of Engineers (USACOE), applicants for most Corps permits are encouraged to file simultaneously for a CRMC permit, and *vice versa*. This arrangement is intended to keep Corps and Council permits consistent with each other, and to provide quick notification of pending activities to either agency.

2. By receiving notices of proposed direct and indirect federal activities that

are subject to E.O. 12372 intergovernmental review from the RIDOP and reviewing the proposed activity under the Section 307 federal consistency review process as appropriate.

3. Through formal notification and/or the submission of a federal consistency determination by a federal agency or consistency certification by an applicant for a federal permit for activities that are both listed and unlisted.

The CRMC reviews all of these federal activities and federal license and permits using the enforceable policies contained in the *RICRMP*. It should be noted that when the CRMC reviews federal activities through the E.O. 12372 process, it does not exempt these activities from the requirement to provide separate federal consistency determinations with respect to their federal agency activities under section 307 of the CZMA.

The Massachusetts Coastal Zone Management office (MACZM) does not have the authority to issue permits and, instead, has adopted 13 regulatory policies and 14 nonregulatory policies to protect the coastal zone. These policies are implemented through the Section 307 authority and the Massachusetts Environmental Protection Act (MEPA).

Section 307 consistency reviews by MACZM proceed independently of the MEPA review process. An example of this is the review of U.S. Environmental Protection Agency (EPA) permits issued under the National Pollutant Discharge Elimination System (NPDES) requirements of the federal CWA. The EPA submits all draft permits to MACZM for review, and will not issue final permits without MACZM concurrence that the activities covered under them are consistent with the Commonwealth's coastal program, unless consistency concurrence has been waived.

Public notice of MACZM's consistency reviews is provided in the publication *Environmental Monitor,* which solicits responses from interested persons. Negative responses result in negotiations with the applicant to resolve identified inconsistencies. Additionally, no consistency decision is made until all state permits or other authorizations are filed with the MACZM office (Nickolai and Remington, 1991:11).

Executive Order 12372 Federal Consistency Review

E.O. 12372, issued under the Demonstration Cities and Metropolitan Government Act and the Intergovernmental Cooperation Act, establishes a procedure that allows state and local governments to review proposed federal actions. Both direct federal actions and indirect, federally assisted projects potentially qualify for review. The potential federal activities that are subject to review can be further expanded by utilizing authority granted under Section 319 of the 1987 Water Quality Act (P.L. 100-4). The state's designated "single point of contact" under the E.O. 12372 review process speaks on behalf of *all* state policies (Nickolai and Remington, 1991). However, unlike Section 307 of the CZMA, which requires federal agency activities and federally-licensed or permitted activities affecting land and water uses and natural resources of the coastal zone to be consistent with enforceable state coastal management policies, federal agencies subject to E.O. 12372 are required only to "accommodate or explain" identified inconsistencies with state policies, *i.e.*, there is no obligation by any federal agency under E.O. 12372 to alter a proposed activity based on the intergovernmental review (Buzzards Bay Project, 1991:1). The CRMC may require consistency determinations and certifications on the authority of Section 307 of the CZMA, separate and apart from the authority of E.O. 12372. Thus, there is a strong incentive to coordinate the E.O. 12372 review process and the CRMC's Section 307 federal consistency review authority to ensure the greatest possible consistency of federal government activities with Rhode Island's state policies.

Rhode Island established its E.O. 12372 review process in 1983. The Chief of the RIDOP is designated as Rhode Island's "single point of contact" for the purpose of the intergovernmental review process. The process

established under E.O. 12372 includes reviews of the following federal activities:

1. Categorical grant programs (approximately 300).

2. Direct federal actions and environmental impact statements (EIS) required pursuant to NEPA.

3. USACOE permit applications.

[A more detailed listing of federal programs subject to intergovernmental review under E.O. 12372 is presented in Tables 715-05(7) and 715-05(8).]

Upon receiving notification of any of the aforementioned activities, the RIDOP, as the official State "Clearinghouse", solicits and coordinates comments from appropriate state and local agencies. A response as to whether the proposal is consistent with state and local plans is then forwarded to the sponsoring federal agency and meetings are scheduled with all relevant parties, as necessary, to attempt to reconcile identified inconsistencies. If the proposed federal activity conflicts with the enforceable policies of the *RICRMP*, the CRMC can pursue further review of these activities under the Section 307 federal consistency review process. The Massachusetts Executive Office of Communities and Development (MAEOCD) conducts a similar review, using the *Massachusetts Intergovernmental Review Monitor*— a monthly newsletter listing applicants, projects, and funding agencies—to notify interested parties (Nickolai and Remington, 1991).

NEPA Environmental Impact Review

The President's Council on Environmental Quality (CEQ), pursuant to the NEPA, requires each federal agency to draft rules identifying agency actions that:

1. Normally require the preparation of an EIS because the agency action will "significantly affect the quality of the human environment";

2. Normally require the preparation of an Environmental Assessment (EA) to determine whether an EIS should be prepared; or

3. Normally do not require either an EIS or an EA (40 CFR 1507.3[b]).

Actions that require the preparation of an EA or an EIS are subject to review and comment from federal, state, and local agencies with environmental regulatory or rule-making authority, as well as from the general public. EISs are also subject to review under E.O. 12372. Disagreements between federal agencies regarding conclusions included in an EIS or EA may be referred to the CEQ and, ultimately, the President for resolution. Consistency determinations and certifications may also be required for any federal agency activity or federally-licensed or permitted activity affecting or potentially affecting the land and water uses and natural resources of the state's coastal zone, as noted above (Nickolai and Remington, 1991:18-19).

The NEPA is intended to provide opportunities for public oversight of federal projects, at least regarding environmental impacts. However, federal agencies can effectively use the CEQ rules to limit review of their actions by narrowly defining those activities that are subject to preparation of an EIS or an EA. This creates a dual burden for objectors since the agency's rule on eligible activities, as well as the activities themselves, potentially have to be challenged (Nickolai and Remington, 1991).

State Consistency Review

Rhode Island and Massachusetts also have procedures for reviewing proposed state and local actions for consistency with established state policies. The Rhode Island Division of Planning (RIDOP), for example, is charged with preparing, maintaining, and implementing the *Rhode Island State Guide Plan*, and with recommending and encouraging implementation of the plan to governmental agencies and the public (R.I.G.L. 42-11-10). Designated state and local plans or actions must be consistent with the *Rhode Island State Guide Plan.*

Massachusetts has established a state Environmental Policy Act process that requires any proposed direct governmental action, and any project requiring state approvals or receiving state financial assistance to file an *Environmental Impact Review* that is subject to public review and comment, unless the expected environmental impact is expected to be insignificant (Nickolai and Remington, 1991:34). Both states also have direct and delegated authority to regulate a wide array of public and private activities that could affect environmental quality in conformance with federal and state law.

The *CCMP* embodies the results of intensive research into all aspects of water quality. Its statutory purpose is to restore and protect the health and ecological integrity of this estuary and its resources. *CCMP* goals, therefore, often convey new visions and attempt to stretch imaginations, representing ideal targets, not immediately achievable objectives. Policies, representing steps in achieving *CCMP* goals, must allow enough latitude in time, space, and detail to be realistic. The *CCMP* cannot be fixed immutably for any extended period of time; monitoring progress and revising the plan in response to changing conditions are integral parts of the planning process.

Carrying out a plan of the scope and complexity of the *CCMP* requires special attention when evaluating consistency of the plans and projects of state agencies, federal and local governments, and the private sector. Some considerations that enter into this process include: differences in scope and scale; responsibilities and purposes of different levels of government or of agencies at any level; authority and capacity; costs and ability to pay; and competing demands for resources. The critical test in evaluating consistency is agreement on results or end products. Plans or programs that meet this test may be found to be consistent or to conform if they:

1) seek to achieve the same or compatible goals;

2) recommend the same or comparable policies;

3) establish the same or equivalent standards or criteria; and

4) propose methods of implementation that will effectively address the goals, policies, or recommendations, although they may differ from those put forth in the *CCMP*.

These are not devices for compromising *CCMP* goals, policies, or recommendations, but are means of recognizing and dealing with the diverse subjects and conditions that this plan encompasses, and the complex situations that the plan affects. However, plans or programs may not be found to be consistent if they:

1) express a direct conflict or divergent purposes in goals, policies, or recommendations;

2) use incompatible data or forecasts to justify different goals, policies, or recommendations or different standards and criteria; or

3) fail to include or recognize the goals, policies, or recommendations of the *CCMP* when it is appropriate and feasible to do so.

When inconsistency is found between a local comprehensive plan and the *CCMP* (or other element of the *State Guide Plan*), the state review process provides ways to reach resolution. In some cases, the city or town may be willing to change the identified part of its draft plan. In other cases, the *CCMP* may be outdated or the local plan may otherwise have presented a compelling position requiring that the *CCMP* be amended. If agreement cannot be negotiated, the Comprehensive Planning Act provides an appeal procedure.

Analysis

The Narragansett Bay *CCMP* emphasizes interagency coordination and the use or expansion of existing regulatory authority to

assure that appropriate actions are taken pursuant to the *CCMP*. However, effective implementation of the *CCMP* will depend on a variety of mechanisms for ensuring the consistency of governmental (and non-governmental) actions with the *CCMP*. The consistency review procedures presently available in both states, therefore, represent one of several mechanisms for overseeing compliance with *CCMP* policies and recommendations.

Upon the *CCMP*'s adoption as an element of *Rhode Island State Guide Plan*, the *CCMP* is automatically subject to the E.O. 12372 intergovernmental consistency review process. The *CCMP* will be used as part of the E.O. 12372 process once it has been signed by the Governor and approved by EPA. In addition, once relevant portions of the *CCMP* containing enforceable policies are incorporated into the CRMC's *RICRMP*, Section 307 consistency review authority will apply to those enforceable policies.

According to a Memorandum of Understanding executed between the EPA and NOAA in 1988, and to the extent permitted by federal and state law, "*CCMP*s developed under the NEP" must be submitted "for incorporation into approved State CZM programs after approval by the Governor(s) and the EPA Administrator." (NOAA/EPA, 1988). Therefore, upon the adoption of the *CCMP* by the state of Rhode Island, relevant portions of this plan should be identified for inclusion in the *RICRMP*. This effort will require close cooperation between the RIDOP and the CRMC. It may also require modifying *CCMP* policies such that they are enforceable by the CRMC when they are included in the *RICRMP*. In addition, the CRMC and the RIDOP should also work together to identify any additional enforceable policies contained in the *Rhode Island State Guide Plan*, both now and in the future, that may be suitable for inclusion in the *RICRMP*. This process would ensure that a broader range of policies can be reviewed under the Section 307 federal consistency review process that are presently only subjected to the E.O. 12372 process.

These activities should ensure that the *CCMP*, as well as any *Rhode Island State Guide Plan* policies applicable to the land and water uses and natural resources of the State coastal zone, are incorporated into the *RICRMP*. Of course, the provisions of the CZMA which govern the process for amending a state coastal zone management program (program change) apply, and the CRMC, NOAA, EPA and other state and federal agencies in addition to the public would have the opportunity to participate in the amendment process. (Section 306(e) of the CZMA and implementing regulations) As the federal agency responsible for the administration of the CZMA, NOAA would then determine whether the *RICRMP*, as amended, continues to meet the approvability requirements of the CZMA. Once these additional policies are incorporated into the *RICRMP*, and to the degree that they are "enforceable," the federal consistency provisions of the CZMA would then apply with respect to all federal agency and federally-licensed or permitted activities affecting the coastal zone.

For these policies to be considered "enforceable policies" they must meet the federal government's definition. The federal government defines "enforceable policies" as:

> State policies which are legally binding through constitutional provisions, laws, resolutions, land use plans, ordinances, or judicial or administrative decisions, by which a State exerts control over private and public land and water uses and natural resources in the coastal zone. ((16 USC 1453(6a), as amended))

In Rhode Island, the enforceable policies presently subject to Section 307 federal consistency review authority are those policies found in the *RICRMP* as approved by NOAA that are enforced by the CRMC. Subsequent additions to the CRMC's enforceable policies in the *RICRMP* must go through the program change and approval process administered by NOAA. It should be noted that because of the complexity of the approval processes for both the *CCMP* and the *RICRMP*, federal and

state agencies must participate fully and cooperatively in carrying out the mandates of the National Estuary Program (NEP), the CZMA, and State law. The basic compatibility of these separate authorities should ensure the success of these complex planning processes.

There are, however, several limitations on the use of the existing review procedures that impair Rhode Island's ability to evaluate proposed federal activities for consistency with state policies, including those in the *CCMP*. The Federal Consistency Report (715-05-04) notes that many *but not all* federal activities with possible watershed impacts are currently subject to E.O. 12372 review. Thus, some federal agency activities in Rhode Island may escape this intergovernmental review process. In addition, greater coordination is needed between the CRMC and the RIDOP regarding reviews under the E.O. 12372 process. The CRMC also needs to update its federal consistency section of the 1978 Coastal Resources Management Program to fully utilize its expanded authority that resulted from the 1990 reauthorization amendments to the Coastal Zone Management Act (P.L. 101-508). Finally, the CRMC should consider expanding its existing Section 307 "list" to include federal activities not subject to review under either the E.O. 12372 or Section 319 review process which have the potential to affect land and water uses and natural resources in Rhode Island's coastal zone.

A separate concern exists that is related to the fact that the State of Rhode Island is not being routinely notified of pending actions in neighboring states that may affect Narragansett Bay water quality or natural resources. As a result, Rhode Island is not reviewing activities in neighboring states which might adversely affect the coastal resources of Rhode Island. As the downstream state, Rhode Island should review certain federal activities and development projects as well as federal discharge permits to ensure that they do not affect land and water uses and natural resources of the coastal zone. If a process for routine notification were to be developed, then Rhode Island could develop a formal review process for these federal activities. In the review of these activities, Rhode Island should consider expanding the use of the Section 401 process available under the CWA to address discharges that ultimately flow into waters of Rhode Island. In the review of these activities, Rhode Island should use the Clean Water Act Section 401 Water Quality Certification process to review Massachusetts NPDES permits. If the RIDEM has a substantive objection to a Massachusetts NPDES permit based upon its water quality standards, the RIDEM should object through the Section 401 process. If it becomes necessary, the CRMC should review the NPDES permit that the RIDEM has objected to pursuant to Section 307 of the CZMA.

Many of the limitations on the full use of these different review authorities (E.O 12372, Section 319, and Section 307) that have been identified in this section of the *CCMP* can be minimized with the dedication of staff time, increased notice, and interagency and interstate cooperation. It is in the best interest of Rhode Island to ensure that reviews are conducted on federal activities and development projects that may be in serious conflict with the environmental policies of the State. Full participation and coordination among the reviewing agencies is essential for effective use of both the E.O. 12372 and Section 307 intergovernmental review processes.

Recommended Policies and Actions are presented in the following pages.

RECOMMENDED POLICIES AND ACTIONS
CONSISTENCY REVIEW

CODE	POLICY	AGENCIES	STATUS
I.	Strengthening the Rhode Island Coastal Resources Management Council (CRMC) Section 307 federal consistency review authority and increasing the coordination with the Rhode Island Division of Planning (RIDOP) E.O. 12372 process.		
I.A.	Following the approval of the Narragansett Bay *Comprehensive Conservation and Management Plan (CCMP)*, the CRMC should amend its Section 307 list of federal agency activities and federal license and permit activities to include, among other things, those federal license and permit activities and federal agency activities that are not subjected to the E.O. 12372 intergovernmental review process but which may affect the Rhode Island coastal zone. [Tables 715-05(7) and 715-05(8) list federal assistance programs and direct and regulatory actions by federal agencies that may affect the Rhode Island coastal zone.] 1. The CRMC and the RIDOP should develop a memorandum of understanding (MOU) which formalizes the existing relationship between the CRMC's Section 307 federal consistency review process and the E.O. 12372 process. 2. Pursuant to this MOU, the CRMC should increase, to the maximum extent practicable, its emphasis on reviewing and evaluating federal activities subject to the E.O. 12372 process managed by the RIDOP. 3. Pursuant to this MOU, the CRMC should invoke its Section 307 federal consistency authority to review projects identified under the E.O. 12372 process that may affect Rhode Island's coastal resources. 4. After adopting the proposed MOU, the CRMC and the RIDOP should sponsor a workshop designed to improve the familiarity of appropriate state and federal agencies with the state of Rhode Island's consistency processes. 5. The CRMC, the Rhode Island Department of Environmental Management (RIDEM) Office of Environmental Coordination, and the RIDOP should work together to develop criteria that facilitate the E.O. 12372 review process and screen some of the proposed activities for a more detailed review. 6. To improve its review of energy facilities in Rhode Island, the CRMC should update the 1978 Energy Amendments to the *Rhode Island Coastal Resources Management Program (RICRMP)*. 7. The CRMC should revise the 1978 federal consistency provisions of the *RICRMP* to take into account the 1990 amendments to the Coastal Zone Management Act (CZMA) which expanded consistency review authority.	CRMC, RIDOP, RIDEM	[See CRMC "Preliminary Agreement," Section 715-05-06 re: implementation of consistency review recommendations.]

RECOMMENDED POLICIES AND ACTIONS
CONSISTENCY REVIEW

CODE	POLICY	AGENCIES	STATUS
I.B.	The CRMC should incorporate relevant enforceable policies from the *Rhode Island State Guide Plan*, as agreed to between the CRMC and the RIDOP, into the *RICRMP*. Such policies could then be enforced by the CRMC pursuant to Section 307 of the CZMA.	CRMC, RIDOP	
I.C.	The CRMC should incorporate relevant enforceable policies from the *CCMP* into the *RICRMP* in order to subject them to Section 307 federal consistency authority. 1. In order to determine the relevant enforceable policies that could potentially be adopted as elements of the *RICRMP*, the CRMC should meet with officials from RIDEM, RIDOP and the Narragansett Bay Project Implementation Committee. 2. The U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) should support and provide financial and technical assistance that enables the CRMC, in conjunction with other relevant state agencies, to develop enforceable policies based upon recommended priority actions in the *CCMP* that can be incorporated into the *RICRMP* and subjected to Section 307 federal consistency authority. 3. NOAA should provide greater flexibility in the use of Section 309 program enhancement funding such that *CCMP* priority actions qualify as program enhancement priorities. 4. Whenever appropriate, implementation of *CCMP* priority actions related to nonpoint source pollution should be coordinated with the CRMC's and the RIDEM's development of a federally approved Section 6217 Coastal Nonpoint Source Management Plan such that the implementation of these priority actions results in enforceable policies that are subject to Section 307 authority.	CRMC, RIDEM, RIDOP, Narragansett Bay Implementation Committee, EPA, NOAA	See EPA/NOAA MOA (9/88) which requires the *CCMP* to be submitted for consistency review; and requires state CZM agencies to incorporate relevant "enforceable policies" into state CRMPs.
I.D.	The CRMC and Massachusetts Coastal Zone Management (MACZM) should provide each other with notices and agendas for meetings for reviewing proposed federal actions and, as necessary, meet to coordinate responses when the proposed activities present potential effects to both the Massachusetts and Rhode Island coastal zones. Regulatory agencies throughout the watershed should provide all other agencies in the watershed with review notices.	CRMC, MACZM	

RECOMMENDED POLICIES AND ACTIONS
CONSISTENCY REVIEW

CODE	POLICY	AGENCIES	STATUS
II.	Strengthening the RIDEM's role in the review of federal government activities.		
II.A.	The RIDEM Office of Environmental Coordination should subscribe to the Massachusetts Environmental Protection Act (MEPA) publication, the *Environmental Monitor*, and actively review and evaluate noticed projects for impacts on Rhode Island's environment. The Office should then notify other divisions of RIDEM of these projects so that comments can be prepared and submitted in accordance with MEPA requirements. 1. The Office of Environmental Coordination, or a designated division of RIDEM, should regularly participate in the EPA monthly review of U.S. Army Corps of Engineers (USACOE) permits. 2. The Office of Environmental Coordination should expand its role beyond providing E.O.12372 reviews to include submission comments to the CRMC.	RIDEM	[See RIDEM "Preliminary Agreement," Section 715-05-06 re: subscription to Environmental Monitor, and review of NPDES permits issued to Mass. discharges.]
II.B.	The RIDEM Office of Environmental Coordination and other relevant divisions of the RIDEM should work closely with the CRMC to identify situations where Section 307 federal consistency authority could be invoked to address the RIDEM's concerns and limit adverse environmental impacts to Rhode Island's coastal zone.	RIDEM, CRMC	
II.C.	The RIDEM should explore the possibility of utilizing the Section 401 Water Quality Certification (e.g., 401(a)(2)) to review discharge permits from Massachusetts. 1. If the RIDEM raises substantive objections during the Section 401 review process, these objections should immediately be communicated to the CRMC. 2. If it becomes necessary, and the RIDEM's objections are sufficient to find a Massachusetts NPDES permit inconsistent with the RIDEM's water quality standards, then the CRMC will request a federal consistency certification for this NPDES permit pursuant to Section 307 federal consistency authority.	RIDEM, CRMC, EPA, ACOE	

RECOMMENDED POLICIES AND ACTIONS
CONSISTENCY REVIEW

CODE	POLICY	AGENCIES	STATUS
III.	Other actions which could strengthen consistency reviews in Rhode Island.		
III.A.	To the maximum extent possible, the RIDOP should place increased emphasis on managing the E.O. 12372 review process and performing substantive evaluations of proposed federal activities noticed under E.O. 12372. 1. For major projects and projects with the potential to cause adverse environmental impacts, the RIDOP should continue and perhaps expand its system of meetings with interested agency and other personnel to develop the State's position in the E.O. 12372 review. 2. For major projects and projects with the potential to cause adverse environmental impacts on land and water uses and natural resources of the coastal zone of Rhode Island, the RIDOP should notify the CRMC at the earliest practicable time of the proposed activity and the RIDOP's position under the E.O. 12372 process. [Presumably, this process would be formalized under the MOU proposed in Recommendation I.A.] 3. The RIDOP should publish a summary of projects as they are logged. That summary should be sent regularly to other state agencies and identified interest groups soliciting comments on the proposals. The model for such a summary is provided by Massachusetts Office of Communities and Development's *Intergovernmental Review Monitor*. The time and place of meetings held under Recommendation I.C. (above) should be listed in the *Monitor*. In addition, any federal consistency determinations or consistency certifications submitted to the CRMC pursuant to Section 307 of the CZMA should also be listed.	RIDOP	[See RIDOP "Preliminary Agreement," Section 715-05-06 re: publications of projects under review.]
III.B.	The Rhode Island Land Use Commission [Note: legislative authority for this Commission may expire in 1992.] should review whether a Rhode Island "NEPA", or National Environmental Policy Act, process, or another review process, is necessary to: 1. Provide an opportunity for comments on minimizing environmental impacts arising from projects/activities requiring state government permits; or 2. Provide an opportunity for comments on activities conducted directly or indirectly by state government.	R.I. Land Use Commission or RIDOP State Planning Council	

RECOMMENDED POLICIES AND ACTIONS
CONSISTENCY REVIEW

CODE	POLICY	AGENCIES	STATUS
III.C.	Regulations of the Council on Environmental Quality (CEQ) should be strengthened to clarify rules for the actions of certain federal agencies requiring NEPA review. To achieve this, the Narragansett Bay Project Executive Committee should send a letter to the CEQ recommending that: 1. The CEQ should review the rules of: 1) the Federal Highway Administration; 2) the Federal Energy Regulatory Commission, specifically for hydropower issues; and 3) the U.S. Department of Agriculture, specifically farming policies related to wetlands impacts, and identify these agency's actions which: a. Normally require preparation of an Environmental Impact Statement (EIS). b. Normally do not require either an EIS or an Environmental Assessment. c. Normally require assessments, but which do not necessarily require EISs. 2. The CEQ should provide notice and solicit public comment on the review outlined in Recommendation III.C.1. At the end of the review, the CEQ should publicly identify any agency rules found to be inadequate. Based on Recommendations III.C.1. and III.C.2., the CEQ should further seek to have any federal agency found to have inadequate rules amend its rules to conform with the purpose of NEPA in accordance with the provisions of 40 CFR 1507.3.	Narragansett Bay Implementation Committee, CEQ	

RECOMMENDED POLICIES AND ACTIONS
CONSISTENCY REVIEW

CODE	POLICY	AGENCIES	STATUS
IV.	Strengthening the consistency review process in Massachusetts.		
IV.A.	The Massachusetts Executive Office of Environmental Affairs (MAEOEA) and/or the Massachusetts Environmental Policy Act (MEPA) office should propose the following amendments to the Act and MEPA regulations in order to assure MEPA consideration of proposed activities that could include damage beyond state boundaries. 1. Massachusetts General Laws, Ch.30, Sec. 61 and 301 CMR 11.02 (Definitions) should be amended to read (new language underlined): Damage to the Environment: any destruction, damage or impairment, actual or probable, to any of the natural resources of the Commonwealth <u>or of adjacent states</u> including, but not limited to, air pollution, water pollution, improper sewage disposal, pesticide pollution, excessive noise, improper operation of dumping grounds, impairment and eutrophication of rivers, streams, flood plains, lakes, ponds, or other surface or sub-surface water resources, destruction of seashores, dunes, marine resources, underwater archaeological resources, wetlands, open spaces, natural areas, parks or historic districts or sites. Damage to the environment shall not be construed to include any insignificant damage to or impairment of such resources. 2. Regulations should also be modified to require specific consideration of watershed impacts in information prepared for the Massachusetts Environmental Impact Review (EIR). Specifically, 301 CMR 11.07(5) should be amended to add: <u>(i) identification of the applicable watershed and its water quality. This shall include water quality of downstream areas located within the watershed but which are within the boundaries of states immediately adjacent to the Commonwealth.</u>	MAEOEA	

05-02-03 Public Participation [RESERVED]

05-02-04 Long-Term Monitoring

Objective for Long-Term Monitoring

The State of Rhode Island and the Commonwealth of Massachusetts should implement a permanent, comprehensive long-term monitoring program for Narragansett Bay and the associated watershed to assess the success and environmental consequences of management actions, and to help support future decision-making about the Bay.

Introduction

Section 320 of the federal Clean Water Act (CWA) directs members of the U.S. Environmental Protection Agency (EPA) National Estuary Program (NEP) to "monitor the effectiveness of actions taken pursuant to the [comprehensive conservation and management] plan." In addition, the EPA requires participants in the NEP to continue the monitoring programs for a minimum of five years after adoption of the *Comprehensive Conservation and Management Plan* (*CCMP*), and to provide biennial reports to Congress on the status of the estuary (Penniman *et al.*, 1990:7). The Narragansett Bay Project's (NBP) *Long-Term Monitoring Plan for Narragansett Bay* (Taylor *et al.*, 1991) addresses these objectives, and will contain detailed recommendations for monitoring environmental and demographic trends in the Bay basin. The Narragansett Bay Implementation and Policy Committees (05-02-01 *CCMP* Implementation and Governance: Institutional Oversight) will oversee the progress of *CCMP* implementation, including implementation of the monitoring program.

Between 1985 and 1991, NBP researchers identified issues of environmental concern, and characterized baseline conditions within Narragansett Bay and the Bay basin in order to assess existing and historic anthropogenic impacts. Based on these data the long-term monitoring program was then designed to:

1. Measure the success of specific management actions in protecting and restoring water quality, natural habitats, and living resources in the Bay watershed;

2. Measure long-term changes in key aspects of the functioning of the Bay ecosystem;

3. Assess the major natural and human factors and events influencing these changes, *e.g.*, pollutant loadings, changes in population distribution, and land use;

4. Establish baseline monitoring data sufficient to detect and/or predict major ecological disturbances, such as algal blooms or the collapse of fisheries; and

5. Provide a framework to support on-going Bay research (Penniman *et al.*, 1990).

The long-term monitoring program is intended to provide practical and reliable information to a wide range of users—including planners, resource managers, the scientific community, and the general public. Although emphasis is placed on information needed by planners and resource managers, the monitoring plan recognizes that management decisions also depend on public perceptions and expectations of the Bay. Therefore, the Narragansett Bay long-term monitoring program is also designed to answer general questions such as:

- Is it safe to swim in Narragansett Bay?
- Is it safe to eat seafood from the Bay?
- Are the aesthetics of the Bay improving or deteriorating?
- Are the Bay's living resources improving or deteriorating?
- Are management actions aimed at improving the health of the Bay ecosystem proving effective?

Based on expected uses of the long-term monitoring data, there are three distinct components of the Narragansett Bay monitoring program. The first element of the monitoring program focuses on tracking human activities that directly affect Narra-

gansett Bay. Variables that may be monitored include trends in population distribution, changes in land use type and distribution, pollutant inputs (expressed as loadings by source), and trends in economic exploitation of the Bay (*e.g.*, fisheries landings). The second element focuses on physical, chemical, and biological indicators of the environmental effects of human activities in the Bay basin. This element of the monitoring plan has two goals: measurement of Bay-wide environmental trends, and measurement of specific environmental problems with limited geographic distribution. The third element focuses on Bay-wide trends in habitat and living resource distribution (Penniman *et al.*, 1990:12). The proposed long-term monitoring program will integrate all three classes of Bay-related data in order to enable environmental planners and resource managers to evaluate trends in Bay health relative to governmental and non-governmental actions throughout the entire Bay watershed.

Statement of the Problem

One NBP report (Michelman, 1990) identified over 60 discrete monitoring projects that are presently underway in the Narragansett Bay watershed. Forty or more of these projects represent long-term efforts by various agencies. Most are limited spatially and temporally, and many use unique sampling and/or analytical methods, making comparisons between them difficult (Penniman *et al.*, 1990:8). In addition, few of the ongoing monitoring programs are coordinated with each other in terms of data collection, analysis, or reporting protocols. Consequently, the Narragansett Bay long-term monitoring program emphasizes standardization of existing federal, state, local, and private monitoring programs to the maximum extent possible in order to maximize the data available for analysis of spatial and temporal trends (Penniman *et al.*, 1990:13).

Analysis

The long-term ecological health of Narragansett Bay depends on natural processes and human activities occurring throughout the Bay and the Bay basin. Given the large size of the geographic area under consideration, the diversity of activities that directly and indirectly affect the Bay, and the complexity of environmental processes and problems that should be tracked over time, the success of the Narragansett Bay long-term monitoring program will depend upon coordination of new monitoring initiatives with ongoing monitoring programs.

Environmental and physiographic data compiled during the development of the *CCMP* clearly indicate that many environmental problems facing Narragansett Bay are geographically and/or temporally limited. For example, a more detailed level of monitoring may be necessary in specific areas of concern such as the Providence River, Greenwich Bay, or Mount Hope Bay. In addition, some environmental concerns such as trends in hypoxia and eutrophication are seasonally limited in terms of ecological effect. Consequently, management needs and logistical and financial limitations will dictate that different levels of effort be focused in different areas of the Bay at different times of the year.

Finally, the synthesis and analysis of long-term data must be considered the most important component of this monitoring program. Data compiled as part of the monitoring program should be archived in the Narragansett Bay Data System (NBDS), where it will be accessible to planners, resource managers, researchers, and citizen groups. Geographic trend data, including the NBP-sponsored "Habitat Inventory" (French *et al.*, 1992), should be compatible with the Rhode Island and Massachusetts Geographic Information Systems (GIS) to allow for the preparation of overlay maps and spatial analyses when needed (Penniman *et al.*, 1990:14-15).

Recommended Policies and Actions are presented in the following pages.

RECOMMENDED POLICIES AND ACTIONS
LONG-TERM MONITORING

CODE	POLICY	AGENCIES	STATUS
I.	Implementation of Long-Term Monitoring		
I.A.	The State of Rhode Island and the Commonwealth of Massachusetts should implement a permanent, long-term monitoring program for Narragansett Bay and the associated watershed. The monitoring program should: 1. Assess the success and environmental consequences of management actions; 2. Provide the necessary information to support future environmental management decision-making in the watershed; 3. Incorporate data from existing monitoring programs, to the greatest extent possible; 4. Encourage the use of citizen-collected water quality, natural resource, and compliance monitoring data in the watershed; and 5. Encourage the modification of existing monitoring programs in preference to establishing complete new programs.		
II.	Coordination with Ongoing Monitoring		
II.A.	Ongoing monitoring programs throughout the Narragansett Bay watershed should be considered for integration into the Narragansett Bay long-term monitoring program to the extent that the objectives of the existing programs continue to be met. The Narragansett Bay planning section should pursue interagency agreements with all relevant federal, state, local, and private monitoring authorities in order to coordinate monitoring efforts, minimize unnecessary duplication efforts, and develop a comprehensive understanding of spatial and temporal environmental trends in Narragansett Bay.	Narragansett Bay Planning Section, all agencies supporting long-term monitoring programs	[See EPA/ERL, Narragansett "Preliminary Agreement," Section 715-05-06 re: analytical services in support of a baseline monitoring program.]
II.B.	The EPA and the Narragansett Bay planning section should encourage the use of standard sampling, analytical, and reporting methods by relevant federal, Massachusetts, and Rhode Island agencies as part of the Narragansett Bay long-term monitoring program (*i.e.*, minimum detection limits, quality assurance/quality control procedures, laboratory certification, laboratory intercalibration programs). The EPA's *Monitoring Guidance for the National Estuary Program* (EPA, 1991c) should be used to evaluate agency actions taken to implement the Narragansett Bay *CCMP*.	EPA, Narragansett Bay Planning Section	
II.C.	The State *Oil Spill Contingency Plan* should be modified to include interstate cooperation as well as response to other marine catastrophic events (natural and anthropogenic). The State of Rhode Island and the Commonwealth of Massachusetts should develop and maintain lists of key personnel from federal, Rhode Island, and Massachusetts agencies and municipalities in the Narragansett Bay watershed to contact for monitoring purposes in the event of "catastrophes".	RIDEM, MADEP	NOAA, U.S. Navy, U.S. Coast Guard and RIDEM are currently revising regional and state *Oil Spill Contingency Plans* (1992).

✓ - **High Priority Action**

RECOMMENDED POLICIES AND ACTIONS
LONG-TERM MONITORING

CODE	POLICY	AGENCIES	STATUS
II.D.	The federal and state agencies with responsibility for monitoring should promote and support current efforts to standardize data collection, analysis, reporting, and governmental use of citizen-collected environmental and compliance data.	All environ-mental planning and regulatory agencies	
II.E.	The State of Rhode Island and the Commonwealth of Massachusetts should fund state Citizens Monitoring Program Coordinators in order to promote the routine use of citizen-collected environmental data by state water quality planners.	RIDEM, MADEP	
II.F.	The State of Rhode Island and the Commonwealth of Massachusetts should use citizen-collected data to investigate suspected violations of environmental laws.	RIDEM, CRMC, MADEP	[See RIDEM "Preliminary Agreement," re: use of Citizens Monitoring data in the state Nonpoint Source and State of the State's Waters Assessments.]
II.G.	The EPA, the Commonwealth of Massachusetts, and the States of Rhode Island, New York, and Connecticut should establish joint monitoring stations in the Rhode Island Sound-Long Island Sound region to provide baseline information on the oceanic input of nutrients to Buzzards Bay, Narragansett Bay, and Long Island Sound.	EPA, NOAA, R.I., Mass., N.Y., Conn.	EPA will make data for Long Island Sound Estuary Project available.
II.H.	The EPA, the National Oceanic and Atmospheric Administration (NOAA), the State of Rhode Island, and the Commonwealth of Massachusetts should support a permanent, comprehensive monitoring program to assess the impact of direct wet and dry atmospheric deposition of nutrients and toxics to the Narragansett Bay watershed.	EPA, NOAA, RIDEM, Mass.	The EPA/EMAP will establish an atmospheric monitoring station in or near Narragansett Bay (1992). The RIDEM NBNERR will continue to support the weather station on Prudence Island (1992.)

✓ - **High Priority Action**

RECOMMENDED POLICIES AND ACTIONS
LONG-TERM MONITORING

CODE	POLICY	AGENCIES	STATUS
III.	Regulatory Requirements for Point Source and Receiving Water Monitoring		
III.A.	The EPA, the Rhode Island Department of Environmental Management (RIDEM), and the Massachusetts Department of Environmental Protection (MADEP) should adopt standardized sampling, analytical, and reporting protocols for monitoring by all permitted dischargers in the Narragansett Bay basin in order to allow systematic comparisons of temporal and spatial trends in pollutant loadings. To the fullest extent of their authority, EPA, RIDEM, and MADEP should require use of these protocols as part of all Rhode Island Discharge Elimination System/National Pollutant Discharge Elimination System (RIPDES/NPDES) permit issuances in the Narragansett Bay basin. The standardized monitoring protocols should include: 1. Wastewater treatment facility (WWTF) influent and effluent monitoring of at least the following components: BOD, TSS, toxic pollutants included on the *Narragansett Bay List of Toxics of Concern* (see 04-01-01 Source Reduction: Toxics, Recommendation I.B.1.b.), total and dissolved nitrogen, phosphorus, and fecal coliforms. 2. Comparable sampling and reporting frequencies by all Bay basin WWTFs, including comparable analytical protocols and detection limits for the pollutants measured. All WWTFs should be required to, at least, have a baseline sampling frequency that provides synoptic basin-wide coverage. 3. Routine reporting of monthly influent and effluent pollutant concentrations and loadings, and EPA *Quarterly Non-Compliance Reports* (*QNCR*s) in electronic format (*e.g.*, computer spreadsheet). 4. By December 1992, and annually thereafter, RIDEM and MADEP shall report total annual loadings of metals and organic chemicals measured in the influent and effluent of WWTFs in the Narragansett Bay watershed and evaluate temporal and spatial trends in influent and effluent loadings.	EPA, RIDEM, MADEP	

✓ - High Priority Action

RECOMMENDED POLICIES AND ACTIONS
LONG-TERM MONITORING

CODE	POLICY	AGENCIES	STATUS
III.B.	To the fullest extent allowed by federal and state law, the EPA, RIDEM, and MADEP should require regulated direct dischargers in the Narragansett Bay watershed to monitor the local environmental effects of WWTF, combined sewer overflows (CSO), and significant industrial dischargers within a narrowly defined area of the discharge zone as a condition of the dischargers' RIPDES/NPDES permits. The purpose of "local effects" monitoring is to evaluate compliance with federal and state water quality standards, and to evaluate the environmental benefits of public investments in water pollution control. The "local effects" monitoring should be structured as a joint responsibility between the permittee and permitting authority. To the extent that EPA, RIDEM, and/or MADEP currently lack the regulatory authority to require "local effects" receiving water monitoring as a condition of the NPDES/RIPDES permitting program: 1. The EPA, RIDEM, and MADEP should encourage all permitted dischargers to voluntarily comply with receiving water monitoring requirements and other standardized monitoring protocols described in Recommendations III.A. and III. B. 2. The RIDEM and MADEP should seek explicit statutory authority to require receiving water monitoring, and RIDEM and MADEP should support expansion of the Clean Water Act to provide explicit authority for EPA to require a) receiving water monitoring by permitted dischargers and b) electronic reporting requirements. 3. The EPA, RIDEM, and Massachusetts counterparts should include some level of "local effects" monitoring as an element of the long-term monitoring program.	EPA, RIDEM, MADEP	
III.C.	The State of Rhode Island and the Commonwealth of Massachusetts should establish permitting programs, with monitoring requirements comparable to the RIPDES/NPDES programs, for significant storm drains on a Bay-wide basis. These monitoring requirements should be limited and focussed to gather cost effective, useful information.	RIDEM, MADEP	
III.D.	The EPA should establish enforceable nutrient (*i.e.*, nitrogen and phosphorus) effluent limits for WWTFs based upon removal efficiencies achievable by best achievable technology (BAT) for secondary and tertiary wastewater treatment; and should require WWTF influent and effluent monitoring of nitrogen and phosphorus. [See 04-01-02 Source Reduction: Nutrients for further discussion.]	EPA	

✓ - **High Priority Action**

RECOMMENDED POLICIES AND ACTIONS
LONG-TERM MONITORING

CODE	POLICY	AGENCIES	STATUS
IV.	Data Management and Analysis		
IV.A. ✓	**A permanent natural resource database center should be maintained in Rhode Island and Massachusetts, with adequate staff and equipment provided by each state and other users.**	**R.I., Mass.**	
IV.B.	The EPA Office of General Counsel is strongly urged to reassess the "eligible uses" of Clean Water Act funds for data collection and monitoring.	EPA	
IV.C.	The Narragansett Bay Data System (NBDS) should become a fully functional central data center for the Bay with a comprehensive data index, full accessibility to users, and a mission to seek and obtain all important data sets for Narragansett Bay.	EPA, RIDEM, CRMC, URI	The URI/GSO has committed space and graduate assistant support for the NBDS as part of the future URI Coastal Institute (1992).
IV.D.	The *QNCR* for Narragansett Bay should be translated into non-technical language each quarter for public information purposes.	EPA, RIDEM	
IV.E.	Federal granting agencies, the State of Rhode Island, and the Commonwealth of Massachusetts should require as standard practice, that all publicly-funded research, scientific and policy-related, be subject to technical peer review before acceptance by the agency for public distribution and use.	EPA, NOAA, USDA, USFWS, R.I. and Mass. agencies	
IV.F.	Where governmental authorities have funded the collection of data to support environmental planning, regulation or monitoring, the data (including data summaries, graphics, computer models, user guides, *etc.*,) should be submitted to the NBDS and/or the state GIS, in approved NBDS and/or GIS format, for permanent archival and user access.	EPA, NOAA, USFWS, R.I. and Mass. agencies	

✓ - **High Priority Action**

RECOMMENDED POLICIES AND ACTIONS
LONG-TERM MONITORING

CODE	POLICY	AGENCIES	STATUS
IV.G.	Data collected by government agencies should become available immediately for public access. Data collected by the academic research community should be made publicly accessible in a timely manner, *i.e.*, after the investigator has had an adequate opportunity to publish the results in the refereed literature.	All governmental and academic research monitoring programs	
IV.H.	The EPA, NOAA, RIDEM, the Rhode Island Coastal Resources Management Council (CRMC), MADEP, and Massachusetts Coastal Zone Management (MACZM) should establish a standing Narragansett Bay Scientific Advisory Group composed of selected representatives from federal and state agencies, academic and research communities, and private environmental consulting groups to provide technical advice regarding the development of human health, aquatic life, and water and sediment quality control in the Narragansett Bay watershed.	EPA, NOAA, RIDEM, CRMC, MADEP, MACZM, URI Coastal Institute	

✓ - High Priority Action

05-03 Funding CCMP Implementation

One of the unique attributes of the Narragansett Bay *Comprehensive Conservation and Management Plan* (*CCMP*) is its emphasis on implementation. The Narragansett Bay Project's (NBP) research effort contributed to the objective determination of realistic corrective actions, and the public participation process assured that preliminary agreements were reached on implementation strategies. (See Sections 01-04-01 Process of Plan Development: Research and Early Implementation; and 01-04-02 Process of Plan Development: Public Participation.) However, implementation of the *CCMP* will, in fact, depend largely on assuring that the federal, state, and local implementing authorities have adequate financial resources over the entire period of implementation to effectively implement new programs, and synchronize interstate and interagency actions. Therefore, a three-step process was used to identify feasible funding strategies for implementation of the Narragansett Bay *CCMP* in order to enable Bay decision-makers and implementing authorities to realistically schedule their implementation efforts over the next five years.

The first step involved estimation of the total personnel and capital costs associated with *CCMP* implementation, by state and/or municipal agency, in order to identify the magnitude of the potential financial need. [*Note*: Federal and private sector costs were not estimated. In addition, municipal costs are often reported as the average cost per municipality because of the environmental and institutional variability among the 100 cities and towns in the Narragansett Bay basin.] Second, a variety of revenue options were examined with respect to their suitability for funding *CCMP* implementation. Based upon this information, the NBP Management Committee then recommended a funding strategy to provide the basis for Narragansett Bay implementing authorities to identify specific funding mechanisms.

In order to determine the potential funding requirements of implementing the Plan, the capital and operating costs associated with all *CCMP* recommendations were estimated for the five-year planning period, 1992 to 1997. In addition, major capital expenditures which are currently scheduled to occur beyond the five-year planning period, *e.g.*, combined sewer overflow (CSO) abatement and remediation of contaminated sediments on the Blackstone River, were also estimated based on published engineering reports wherever possible.

Overall, implementation of the *CCMP* is projected to cost state and municipal agencies in Rhode Island and Massachusetts an estimated $629 million, including capital costs occurring post-1997. CSO abatement, which is federally-mandated under the federal Clean Water Act, and the recommended sediment remediation efforts on the Blackstone River will require approximately $590 million, or 94 percent of the total projected CCMP costs—$353 million during FY92 to FY97, and $237 million after FY97. Non-capital (personnel and program) costs represent approximately $30.5 million, or eight percent, of the total projected cost of $392 million for Rhode Island and Massachusetts between FY92 to FY97.

The total projected *CCMP* implementation cost for Rhode Island's state and local agencies between 1992-97 is $283 million. Of this amount, $262.6 million, or 93 percent, represents projected capital costs associated with mandatory CSO abatement, recommended remediation of Blackstone River sediments, state match funds for an FHWA $13 million grant, and reauthorization of the Sewer and Water Supply Failure Fund. The non-capital portion of Rhode Island's estimated implementation cost ($20.2 million) prorates to an average annual cost of $4.0 million over the five year planning horizon—or 0.30 percent of Rhode Island's FY92 budget of $1.36 billion. Based on this figure, the cost to each of the state's 1,003,464 citizens would

be $3.99 per year over the five-year planning period.

The estimated non-capital cost for the Commonwealth of Massachusetts over the five-year planning period is $10.3 million. Assuming these costs were evenly divided between 1992 and 1997, this prorates to an average annual cost of $2.06 million, or 0.014 percent of Massachusetts' proposed FY93 budget of $14.5 billion. Mandatory CSO abatement costs for the five-year period are $92.8 million, or 85 percent of total Massachusetts costs for 1992-97.

The projected costs associated with *CCMP* implementation should be viewed within a broader economic context in several respects, however. First, the procedure used to estimate the cost of *CCMP* implementation assumes that every action recommended in the Plan requires *new* funding. This overestimates the cost of implementation since many recommended actions have been initiated since the *CCMP* planning process began in 1990. In addition, the projected costs do not consider direct economic benefits associated with public investment in protecting Narragansett Bay, or the secondary benefits of stimulating private investment in water quality-dependent business and technology. Nor do the cost estimates consider the economic consequences associated with the region's failure to protect Bay water quality and living resources.

Sections 05-03-01 (*CCMP* Cost Estimation) and 05-03-02 (Identification of Revenue Sources) describe the general methodology used to estimate costs and identify appropriate revenue sources. Section 05-03-03 (Funding Strategy) presents general recommendations with respect to financing implementation of the *CCMP*. Appendix H (Funding Strategy By Implementing Authority) proposes a detailed strategy for linking existing and "new" revenue sources to specific *CCMP*-related agency initiatives.

05-03-01 *CCMP* Cost Estimation

Introduction

Rhode Island's and Massachusetts' *CCMP* implementation costs were estimated for the five years between 1992 and 1997 in order to (a) determine planning level costs that would allow the Narragansett Bay Project (NBP) Management Committee to make decisions regarding the priority and timing of *CCMP* actions, and (b) to determine the magnitude of potential funding requirements over the five year planning horizon for implementation of the *CCMP*. Published estimates of capital costs expected to be incurred by Rhode Island and Massachusetts post-1997 are also reported. It is important to note that these costs were produced strictly for planning purposes and are <u>not</u> appropriate for agency budgeting activities.

Costs were developed for state and local public agencies only. Federal and private sector costs associated with implementing recommendations were not estimated, although all the steps involving federal participation were identified. Costs for local governments were either estimated for the specific recommended action, or a total cost was estimated for all municipalities in the Narragansett Bay basin if the *CCMP* recommendation applied universally. Potential costs to municipalities and the private sector are described in the "Estimated Cost of Implementation" paragraphs located at the end of each *CCMP* chapter. While some of these costs are quantifiable, (*e.g.*, the costs associated with the installation of marina pumpout stations), many recommended actions involve further study or planning. No effort has been made to estimate the cost of actions that could result from future planning activities.

Subject to these limitations on the cost estimation procedure, implementation of the *CCMP* is estimated to cost $629 million. This estimate consists of $598.6 million in capital costs associated with

completion of the federally-mandated combined sewer overflow (CSO) abatement and recommended sediment remediation projects, and $30.5 million in personnel and program costs for state, regional, and local agencies in Rhode Island and Massachusetts between 1992 and 1997. (See Table 715-05(2), Summary of Estimated *CCMP* Costs.)

Background

Cost estimates were developed for the majority of recommendations presented in the *CCMP*. Each individual recommendation was reviewed in order to define the intermediate steps necessary to carry out the proposed action. Estimated personnel and capital costs were then developed for each step and totaled to provide the overall cost of the recommendation. Whenever possible, uniform "categorical" cost estimates (*e.g.*, unit costs for laboratory analysis, unit agency costs to adopt regulations) were used to project program and personnel costs. Where a recommendation or interim step did not lend itself to applying a categorical cost, recommendation-specific costs were developed using published cost information, agency advice, comparable costs from other states and localities, or application of best professional judgement. A more detailed description of the cost estimation process is included in the *CCMP Cost Estimation and Funding Report* (Apogee Research Inc./NBP, 1992).

In estimating programmatic and personnel costs, the use of categorical costs allowed standardization of cost estimates between agencies and between states. For any given recommendation, the application of a categorical cost may over- or underestimate the actual cost of individual steps. When applied over all the similar steps in all of the recommendations, however, these differences are expected to average out. Since these cost estimates are intended to serve as planning estimates to determine the magnitude of funding requirements, rather than as detailed budget estimates, this method is appropriate for developing general cost estimates for a large number of recommendations affecting a diverse array of programs in two states.

Table 715-05(3) provides a summary of categorical costs used to estimate program and personnel costs associated with *CCMP* implementation. A cost range was identified for each type of categorical cost based on discussions with state agency management and division staff, and the discrete implementation steps were ranked from high to low within the range. Using this process, representative average costs were determined for each category. Personnel costs were estimated in terms of "full-time equivalents" (FTEs) and subsequently converted to dollars. One FTE was estimated to correspond to an average cost of $50,000, including benefits and overhead, for public agencies in both Rhode Island and Massachusetts.

The Narragansett Bay *CCMP* also includes several recommendations that will entail significant capital expenditures, including CSO abatement in Mount Hope Bay and the Providence River, and sediment remediation on the Blackstone River. Costs were estimated for each of the authorities responsible for CSO abatement through the use of existing engineering estimates, where possible. Cost estimates for the recommended sediment remediation activities were derived from published reports, and from consultation with professionals who are currently engaged in similar work.

The *CCMP* focuses on costs projected to occur between 1992 and 1997. However, total capital project costs are presented where known since, in many cases, the most significant capital expenditures are expected to be incurred after 1994-97 following completion of the underlying planning and engineering design efforts. In addition, some program costs are individually costed where the recommendation anticipates performance of a discrete action (*e.g.*, preparation of a *SAM Plan*). However, future personnel

or capital expenditures that could potentially result from recommended planning activities are not estimated. Details on specific program costs are described in the summary of estimated costs attached to each chapter of the *CCMP*.

Analysis

Implementation of the *CCMP* is expected to cost Rhode Island and Massachusetts an estimated $392 million between 1992 and 1997, and $629 million including known post-1997 costs. The overall cost estimate consists of $598.6 million in capital costs and $30.5 million in personnel and program costs. Federally-mandated CSO abatement and sediment remediation projects account for 94% of the total estimated cost of *CCMP* implementation. Table 715-05(2), Summary of Estimated *CCMP* Costs, summarizes the total personnel costs and non-personnel costs (capital costs and other non-personnel costs) associated with implementing each *CCMP* chapter. More detailed costs summaries are presented following each *CCMP* chapter.

Implementation of the *CCMP* will require individual and coordinated efforts by many federal, state, and local implementing authorities with jurisdiction in the Narragansett Bay basin. However, Rhode Island is expected to incur approximately two-thirds of the total estimated personnel and non-capital, program costs, while Massachusetts will incur the remaining third. Rhode Island's estimated program and personnel implementation costs are distributed as follows: Rhode Island Department of Environmental Management (RIDEM), 58 percent; municipalities, 15 percent; wastewater treatment facilities (WWTFs), 8 percent; Rhode Island Coastal Resources Management Council (CRMC), 7 percent; and Rhode Island Division of Planning (RIDOP), Rhode Island Department of Transportation (RIDOT), Rhode Island Department of Health (RIDOH), and other state agencies, 12 percent. The distribution of Massachusetts program or personnel costs is as follows: Massachusetts Department of Environmental Protection (MADEP), 60 percent; municipalities, 22 percent; WWTFs, 10 percent; Massachusetts Department of Public Health (MADPH), 3 percent; and other state and regional agencies, 5 percent.

Capital costs are attributed primarily to two activities: federally-mandated CSO abatement and sediment remediation. In Rhode Island, the Narragansett Bay Commission (NBC) is expected to expend approximately $309 million, including post-1997 costs without debt service factored in, to complete CSO abatement projects in the Providence-Seekonk-Blackstone Rivers. (See 05-03-02, Funding *CCMP* Implementation: Identification of Revenue Sources, for debt service information.) In Massachusetts, the Cities of Fall River and Taunton will require approximately $121 million and $4 million, respectively, to complete scheduled CSO abatement projects, including post-1997 costs without debt service factored in.

Total capital costs for sediment remediation are estimated at $156 million, including post-1997 costs. This estimate assumes that Rhode Island and Massachusetts will each contribute approximately $6 million to the cost of a sediment remediation demonstration project on the Blackstone River. After 1997, Rhode Island will require approximately $48 million for full sediment remediation at four sites along the Blackstone River, and Massachusetts will require approximately $96 million to completely remediate eight contaminated sites.

See Summary Matrices, Part 715-06, for detailed information on *CCMP* costs and agency costs [*Summary of Estimated CCMP Costs*, 715-06(2); and *Summary of Estimated CCMP Costs by Implementing Authority*, 715-06(3).]

Table 715-05(2) **SUMMARY OF ESTIMATED CCMP COSTS**

COST ESTIMATES BY SUBJECT	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
Source Reduction: Toxics	1,532,500	755,000	720,000	755,000	918,500	1,801,000	853,500	1,116,000	853,500	1,116,000	4,878,000	5,543,000
Source Reduction: Nutrients	2,500	150,000	29,375	0	30,625	400,000	54,375	0	29,375	0	146,250	550,000
Source Control: Water Management and Wastewater Treatment	20,000	0	20,000	0	46,250	0	45,000	0	20,000	0	151,250	0
Source Control: Combined Sewer Overflows	102,500	15,090,000	60,000	19,672,000	82,500	103,481,000	65,000	116,462,000	70,000	86,222,250	380,000	340,927,250
Source Control: On-Site Sewage Disposal Systems	138,750	5,000,000	5,000	0	130,000	0	85,000	0	92,500	0	451,250	5,000,000
Source Control: Boater Discharges	210,000	107,250	10,000	6,000	57,500	6,180	20,000	6,000	20,000	6,000	317,500	131,430
Source Reduction: Nonpoint Sources	828,750	12,000	400,000	12,000	880,750	97,000	3,172,000	97,000	3,072,000	97,000	8,353,500	315,000
Land Use	257,500	12,000	167,500	12,000	437,500	12,000	330,000	12,000	305,000	12,000	1,497,500	60,000
Protection of Critical Areas	315,000	334,000	165,000	417,000	211,250	250,000	145,000	167,000	145,000	167,000	981,250	1,335,000
Public Health	384,000	354,550	281,500	340,000	521,500	355,000	456,500	340,000	471,500	340,000	2,115,000	1,729,550
Mount Hope Bay	182,500	50,000	15,000	50,000	37,500	250,000	15,000	0	15,000	0	265,000	350,000
Blackstone River	360,625	134,750	110,625	20,750	355,000	12,140,000	125,000	12,000	125,000	12,000	1,076,250	12,319,500
CCMP Implementation and Governance	448,750	265,000	390,000	265,000	400,000	265,000	400,000	265,000	400,000	265,000	2,038,750	1,325,000
TOTALS	4,783,375	22,264,550	2,374,000	21,549,750	4,108,875	119,057,180	5,766,375	118,477,000	5,618,875	88,237,250	22,651,500	369,585,730
TOTAL BY YEAR		27,047,925		23,923,750		123,166,055		124,243,375		93,856,125		392,237,230

TABLE 715-05(3)

CATEGORICAL COST ESTIMATES USED IN CCMP COST ESTIMATION

Category	Activity	Total FTEs or dollar costs
Legislation	Drafting	0.025
Regulation	Development and hearings	0.25
Policy	Development and writing	0.25
Public education	First year	0.5
	Per year after first year	0.1
	Printing costs per year	$6000
Technical assistance	Per year	0.5
Coordination	Per agency	0.1
Permit changes	Water-quality based, or new permits, per facility	0.25
	Revisions to existing permits, per facility	0.1

05-03-02 Identification of Revenue Sources

Introduction

This section examines existing and new revenue sources that could potentially support implementation of the *CCMP*. Criteria used in examining potential funding sources include: (a) eligibility for *CCMP* implementation, (b) revenue generating potential, (c) predictability of the revenue stream, and (d) equity of the cost distribution imposed by taxes, fees, or contributions. This section also evaluates institutional mechanisms for establishing specific funding sources, and reviews the revenue-generating capacity and impacts of alternative revenue schemes.

Background—Existing Revenues

Existing revenue options for *CCMP* implementation take the form of funding from the General Fund and/or from existing bond authorizations. For example, the proposed 1992-93 Rhode Island Department of Environmental Management (RIDEM) budget already includes $200,000 for planning sections. Similarly, the state revolving loan funds (SRF) in Rhode Island and Massachusetts are available to support capital investments in water pollution control. In this section the potential uses and limitations of existing bond authorizations are evaluated, followed by a brief review of potential *CCMP* support from existing or increased general funds.

There are some existing bond authorizations for which the *CCMP* recommendations may qualify or which could possibly be redirected to fund *CCMP* activities. As of October 15, 1991, Rhode Island's total authorized, unissued direct debt was approximately $457.8 million. Approximately $185 million of this total has been identified as being set aside for water quality-related projects. A means of capitalizing on this authorized, unissued debt is to examine two categories: (1) authorizations that already overlap with the *CCMP* recommendations, and (2) authorizations that are related more generally to water quality and that might be reallocated, either temporarily or permanently.

The following table lists the current unissued bond authorizations that potentially overlap with the *CCMP* recommendations:

Receiving Authority	Unissued Bond Authorization
Narragansett Bay Water Commission	$ 22,076,000
Clean Water Act Environmental Trust Fund	$ 7,979,627
Rhode Island Aqua Fund	$ 13,730,000
R.I. Dept. of Environmental Management	$ 10,000,000*
Clean Water Protection Finance Agency	$ 35,000,000
Blackstone Valley District Reallocation	$ 5,300,000
Pawtuxet River WWTFs Reallocation	$ 9,000,000
Total	$ 103,085,627
* Only $10 million of total of $57 million of RIDEM bond authorization is directly applicable.	

This $103 million represents approximately 26 percent of Rhode Island's total estimated capital costs ($392 million). The Narragansett Bay Commission (NBC) "Bay Bonds" and the Rhode Island Clean Water Protection Finance Agency (RICWPFA) bonds make up half of the $103 million.

The new reauthorization process presents an opportunity to capture already authorized, but unissued debt for *CCMP* purposes. As of December 31, 1991, Rhode Island state law requires the General Assembly to reauthorize or retire any bond authorizations that are seven or more years old (P.L. 1988, Ch. 438). Currently, the volume of bond authorizations that are seven or more years old is relatively small and the majority of this volume is for the NBC (which will be primarily used for *CCMP*-related projects, *e.g.* combined sewer overflow (CSO) abatement).

There is also precedent for authorizations to be transferred among state and municipal authorities (*e.g.*, the 1990 reallocation of $15 million from the NBC-administered "Bay Bonds" to the Blackstone Valley District Commission (BVDC) and the wastewater treatment facilities (WWTF) on the Pawtuxet River). This law may provide an opportunity for the *CCMP* recommendations to be considered for reallocated bond authorization in the future. Table 715-05(4) presents a summary of Rhode Island's authorized, unissued debt.

In principle, the states could support *CCMP*-related operating costs from the General Fund. While Massachusetts' operating deficit for FY 1991 is expected to be far lower than the 1990 shortfall of $1.3 billion, it is far from clear that the state's fiscal condition is strong enough to make appropriations a reasonable option. As of January 1992, the State of Rhode Island's tax revenue collections were at seven percent below estimates. The Budget Office expects a $60 to 70 million shortfall for FY 1992 and a $203 million shortfall for FY 1993 (assuming that tax revenues do not fall further below estimates). In light of this fiscal situation, it may be difficult to obtain money from the existing General Fund for *CCMP* implementation.

TABLE 715-05(4): Rhode Island Authorized, Unissued Direct Debt Summary

Authorized, Unissued Debt As Of October 1991	Total Authorized, Unissued	Authorized, Unissued -- 7+ Years Old	Authorized Unissued -- Potential *CCMP* Overlap
State Authorized, Unissued Debt	$457,834,539	$33,962,766*	$103,085,627
Water-Related Authorized, Unissued Debt	$185,534,262	$31,086,557*	$103,085,627

*Includes $22,076,000 for Narragansett Bay Commission. The 1990 amendment to initial authorization may restart the seven-year clock.

New Revenue Options

The introduction of new state fees or taxes could be difficult given current economic and fiscal conditions. Lawmakers in Rhode Island and Massachusetts have been reluctant to impose any measures that resemble new taxes or fees. In FY91, only 7.3 percent of the Massachusetts budget came from fee revenues (Lamphere, 1991:20). In addition, Massachusetts tax revenues dedicated to particular programs or recipients have been declining. Between 1954 and 1984, the proportion of Massachusetts tax revenues that were dedicated fell steadily from 56 percent to 40 percent. In 1992, only 39 percent of tax revenue, expected to equal $3.49 billion, will be dedicated. Therefore, three potential obstacles to financing state environmental programs through the use of state fees or taxes have been identified:

- If a tax or fee is imposed, it may be difficult to ensure that its revenues (or a portion thereof) are dedicated to program costs incurred under *CCMP* implementation;

- State fees are a fairly unusual method of financing at the state level and the chances of establishing state user fees may be slim; and

- Increased municipal reliance on user fees and taxes to offset state budget cuts increases citizen opposition to the state's use of these measures.

As a result, modification of taxes already charged at the local level may gain easier passage through the legislature and may meet with less local opposition. However, this option is also limited because of difficulties in securing local taxing authority, and the unpopularity of new taxes and fees. For example, in Massachusetts, state approval is not required to impose fees or betterments. However, municipally-imposed user fees increased dramatically in order to offset the loss of property tax revenues due to implementation of Proposition 2 1/2.

Background

Rhode Island's estimated personnel costs for *CCMP* implementation between 1992 and 1997 are $20.2 million. Rhode Island's estimated *CCMP* capital costs over this five-year period are also significant: $248 million for CSO abatement; $6 million for sediment remediation along the Blackstone River; $5 million for the proposed re-authorization of the Sewer and Water Supply Failure Fund, and a $3.6 million match required for a FHWA grant.

Massachusetts' state and local governments will share in the cost of implementing *CCMP* recommendations. Of the costs estimated to date, Massachusetts will bear more than $10.3 million in personnel costs and more than $227 million in capital costs, primarily for federally-mandated CSO abatement in Fall River and Taunton, and sediment remediation along the Blackstone River. There are several sources of funds in Massachusetts that can be used to finance capital and operating costs.

To meet these funding needs, fifteen revenue options were selected for further review from an initial list of thirty-three alternatives. The fifteen options were selected based on revenue potential (*i.e.*, a number of options were dropped from further consideration because they would not generate significant revenues), applicability (*i.e.*, the relationship between the revenue option and the sources of problems identified in the *CCMP*), and other benefits (*i.e.*, public relations or educational value). Table 715-05(5) lists options and the estimated annual revenues that would be generated. Each option and the basis of the revenue estimates is described in greater detail.

Analysis—Specific Revenue Options

Wastewater Treatment Rate Surcharge: $300,000 per year (based on a $1 surcharge per user)

Several of the action areas identified in the *CCMP* are directed at correcting problems associated with WWTFs. One potential source of funding for these improvements is an increase in the existing fees. Until recently, wastewater treatment rates in Rhode Island were several percentage points below costs. Recent rate increases have brought rates closer in line with costs.

TABLE 715 - 05(5)

CCMP REVENUE OPTIONS

REVENUE SOURCE	REVENUE POTENTIAL/YEAR			LEVEL APPLIED
Wastewater Treatment Rates	$278,000*			local/state
Stormwater Assessments	$7,000,000	to	$17,000,000	local/state
Water Use Surcharge	$4,380,000**			state
Petroleum Transfer Tax	$700,000	to	$7,000,000	state
Septic Assessments/Permit Fees	$3,500,000	to	$5,900,000	local/state
Feedstock Tax	$234,000	to	$2,340,000	state
Hotel/Motel Tax	$400,000	to	$2,000,000	local/state
Bay Affinity Plates	$395,000			state
Income Tax Bay Check-Off	$179,000			state
Recreational Fee Surcharge	$175,000			state
Marine Fuels Surcharge/Tax	$66,000***			state
Property Tax on Boats	†			local
RIPDES Permit Fees	****			state
Impact Fees	†			local/state
Land Leases	†			state

* from $1.00 surcharge on users

** charge of an additional $0.01 per 100 gallons used

*** charge of $0.01 per gallon sold

**** significant increases in permit fees necessary to sustain self-supporting program

† unknown potential

Nevertheless, it is likely that wastewater treatment rates must be increased to cover all or a portion of the costs of improvements called for in the *CCMP*, including operating costs and debt service on capital investments.

A total of 278,818 users are served by the 16 WWTFs in the Rhode Island, portion of the Narragansett Bay watershed. An estimated 265,558 users are residential (95 percent); 12,792 are commercial (4.5 percent); and 468 are industrial users (0.5 percent). Based on these figures, a $1 user surcharge would bring in approximately $278,818. If commercial and industrial users were charged more than residential customers, additional monies could be generated. For example, a $1 surcharge on residential, $2 surcharge on commercial, and $3 surcharge on industrial users would generate approximately $300,000.

Stormwater Assessments: $7 to $17 million per year

Stormwater assessments are property-based user charges that could be used to finance a variety of stormwater-related projects, from local stormwater detention facilities to some portion of CSO abatement. They are levied on property owners under the principle that developed land, because it is impervious, increases stormwater runoff which causes water quality problems; therefore, property owners can reasonably be charged for the cost of abatement actions. These property owners also benefit economically (through increased land values) and recreationally from a cleaner Bay. There are currently no stormwater assessments in Rhode Island. Instead, communities finance stormwater control activities and projects through their general funds and the property tax.

Stormwater assessments are an attractive source of revenue, particularly for debt repayment. Once the assessments are in place, the revenue stream is predictable and stable. In jurisdictions currently using stormwater assessments, typical single family monthly charges range from $1 to $4. Communities instituting stormwater assessments often establish special districts to collect and expend the revenue (see Special Assessment Districts).

Most existing programs of this type are either city- or county-based. In Rhode Island, it may not be necessary to establish special districts. Towns could collect assessments and use a portion of the revenues for local projects, turning over the remainder to the state to fund larger projects. Community-based fees could also be dedicated to fund community-based projects. In the future, if WWTFs regionalize and/or if wastewater management districts (WWMD) are formed, assessments could be collected at the level at which stormwater is managed.

The estimate of $7 to $17 million per year is based on land use data as applied in a formula involving average percent impervious surface by land category (American Public Works Association, 1991). The range reflects an average single family charge of $1.25 per month to $3 per month. Revenue generated from property other than single family property was estimated by charging $1.25 and $3 per single family equivalent of estimated impervious surface (approximately 0.12 acres impervious).

Water Use Surcharge: $4.38 million per year, assuming one cent per 100 gallons

This option would place a surcharge on residential, commercial, and industrial water use in Rhode Island. The Rhode Island Water Resources Board estimates that Rhode Island uses 120 million gallons a day (equivalent to 43.8 billion gallons per year). A water use surcharge of $0.01 per 100 gallons would generate $4.38 million annually. Assuming an average usage of 100 gallons per person per day, and an average household of 2.64 persons, the impact of the fee is minimal. At this rate, each household would incur charges of about $9.60 per year. Massachusetts daily water use for 1992 is estimated to be approximately 310 million gallons (Solley *et al.*, 1988). If a $0.01 per 100 gallon fee were applied, over $11 million could be collected per year for water quality program needs .

The State of Rhode Island currently charges suppliers a $0.01 per 100 gallon surcharge to finance water supply protection. The State instituted an additional $0.0133 per 100 gallon surcharge to operate the Water Resources Board and to finance efforts to protect reservoirs and well fields from contamination. Suppliers are required to charge consumers the appropriate amount, collect the surcharge along with water fees, and turn the surcharge revenues over to the state. As of the present, the state has not collected any revenue from the latter surcharge; suppliers are challenging the legality of collecting surcharge money for the purposes of funding the Board's operation.

Petroleum Transfer Surcharge: $700,000 to $7 million per year

This option would place a surcharge on wholesale petroleum sales in Rhode Island. In 1987, wholesale petroleum sales totaled $716 million dollars (U.S. Dept. of Commerce, 1987). A 0.1, 0.5, and 1 percent surcharge based on value could generate $716,000, $3.58 million, and $7.2 million, respectively. A wholesale surcharge could be levied at the time of transfer (based on value, or, alternatively, volume) or be levied as an annual tax, based on wholesale sales (or volume of transfers) during the year. The transfer application paperwork could provide the necessary volume information with which to assess the surcharge or tax due.

Currently, the Rhode Island Coastal Resources Management Council (CRMC) charges a $50 application fee per each instance of transferring petroleum products from a tank to a barge at Jamestown Mooring Buoys. In 1989 this fee generated $2,500, representing 50 transfers.

Septic System Assessments/Permits: $3.5 to $5.9 million per year

In Rhode Island, 118,410 households were served by on-site sewage disposal systems (U.S. Dept. of Commerce, 1990). If communities were to charge septic system owners $30 to $50 per year as a septic impact and management fee, the fees could generate between $3.5 and $5.9 million each year.

Spokane County, Washington, assesses parcels served by septic systems $30 per year on the property tax bill (it also assesses a $15 per year surcharge on sewered property). The collected fees fund aquifer monitoring and extension of interceptor sewers. Thurston County, Washington, requires all septic systems in sensitive areas to hold valid operational permits. A typical single family residential permit fee is about $49 per year.

The administration of the fee could vary across communities, as could the charges. In communities that rely entirely on septic systems, assessments could be added on to the monthly water bill or collected annually on local property taxes. Communities that only partially depend on septic systems could consider a permit system, whereby septic owners were required to obtain an annual permit for their system. Rates could be flat (levying a set charge per unit or type of unit) or structured to vary by size (square footage of dwelling, number of toilets, plumbing fixtures, *etc.*), water use, type/age, or proximity to the Bay. A simple rate system, with set fees for residential and non-residential, is generally most easily administered and collected.

In either an assessment or permit system, it is important for the administering authority to identify the services provided by the program. For example, Charlestown is anticipating charging $42 per year to septic system owners. The annual fee covers one-third of the charge for a pumpout every three years and an annual administrative fee ($25). This anticipated annual charge reflects a pumpout charge of $50 and a $75 administrative fee for each three-year period.

Where no municipal or community-based structure exists, it will be necessary to identify a state or local agency, *e.g.*, a municipal WWTF, that can collect the fees, administer the program, and perform the pumpout and inspection services provided under the program. On-site sewage disposal systems (OSDS) are entirely exempt from any Rhode Island fees or taxes to compensate for impacts on ground and surface water and are largely unsupervised once installed.

Enabling legislation exists for the establishment of WWMDs but none are currently operating due to political and financial (start-up costs and staffing) considerations. Instituting a septic system assessment and permit fee program could potentially remove at least one of these obstacles.

Feedstock Tax: $234,000 to $2.3 million per year

Rhode Island currently levies a "hard to dispose of" tax on motor oils, organic solvents, antifreezes, tires, and automobiles. The basis of this tax is the difficulty of disposing of these materials on land. A feedstock tax (levied on raw materials used in manufacturing processes) would charge for the increased burden certain substances not covered under the hard-to-dispose-of tax place on WWTFs, landfills, and other disposal mechanisms. Substances disposed of by residential users include household cleaners, paints, soaps, and toilet goods. Substances disposed of by industrial users include commercial solvents, cleaners, soaps, chemicals, and other toxic compounds. Commercial disposers include hotels, restaurants, hospitals, and office buildings.

In 1987, Rhode Island wholesale sales of chemicals and allied products totaled $234 million. This includes: industrial inorganic chemicals; plastics materials and synthetics; soaps, cleaners, and toilet goods; paints and allied products; industrial organic chemicals; and miscellaneous chemical products (including pesticides, herbicides, and fertilizers). A 0.1 percent surcharge would generate $234,000, a 0.5 percent surcharge would generate $1.17 million, and a 1 percent surcharge on these sales would generate $2.34 million annually (assuming price inelasticity).

Hotel/Motel Tax: $400,000 to $2 million per year

Rhode Island currently levies a 5 percent tax on gross lodgings in lieu of applying a sales tax. This rate was raised from 4 percent in January 1990. In 1989, the 4 percent rate generated $1.6 million in revenues. With a 5 percent rate in effect, the tax would have generated $2 million.

Currently, 27 percent of the collected revenues is allocated to the Department of Economic Development, 47 percent to the Regional Tourism District, 20 percent to the municipality in which it was collected, and the remaining 6 percent to the Roger Williams Reserve. All or part of any additional increment levied could be dedicated to *CCMP* implementation or to other environmental projects in the community in which it is collected.

Due to the recent recession, it is likely that FY90 and FY91 figures are slightly depressed. The current hotel/motel lodging tax rate produces revenues of $2 million annually. Based on 1989 activity levels, each percentage point increase raises an additional $400,000.

The average of all the New England state rates is 6.8 percent; the average state rate not including Rhode Island is 7 percent. Other New England hotel/motel tax rates are as follows: Massachusetts, 5.7 percent; New Hampshire, 8 percent; and Vermont, 7 percent. If Rhode Island increased its rate to 7 percent, a potential $2.8 million could be generated—an increase of $1.2 million over the current 5 percent rate. Rates for other selected eastern seaboard states are: Delaware, 8 percent; New Jersey, 7 percent; New York, 9 percent; and Maryland, 5 percent.

Affinity Auto License Plates: $340,000 per year

Rhode Island could produce and sell special Narragansett Bay plates and restrict the revenues to education on water pollution abatement and protection activities. In other states, this voluntary contribution mechanism provides a broad range of public education benefits due to the high-profile, high-visibility nature of the affinity plates. An environmental affinity plate offering, when accompanied by a media campaign explaining the problems with the Bay and need for the dedicated revenues, the use of the collected funds, and promoting the public's

involvement in the clean-up effort, can generate benefits beyond the revenue collections.

This revenue estimate is based on Maryland's experience which should be relevant to Rhode Island in that both states are relatively small and a large percentage of the populations have an economic or recreational interest in the bays that cut through the middle of each state.

Maryland has 4,781,468 people (U.S. Dept. of Commerce, 1990) and 3,485,416 registered vehicles. The Chesapeake Bay Trust (CBT) has sold 350,000 bay plates as of May 1992, raising $3.5 million (the plates cost $20—$10 to CBT and $10 toward cost of production). Maryland's projected response rate is 7.3 percent based on population and ten percent based on all registered vehicles.

Multiplying Rhode Island's population, 1,003,4646, by 0.073, and again by $10 per plate, yields $732,529 (U.S. Dept. of Commerce, 1990). Using the Rhode Island Department of Transportation estimate of 790,000 registrations for 1991, and applying Maryland's response percentage by registered vehicles, Rhode Island could expect approximately $790,000 over two years from plate sales alone, or $395,000 annually over the two-year sale period.

The State could raise additional monies if it charged an annual registration surcharge. Maryland only charges the one-time affinity plate purchase fee and does not charge an annual bay plate surcharge, although other states have instituted annual surcharges for affinity and vanity plates. A $5 surcharge would raise approximately $395,000 annually. Total revenues from this option could be approximately $395,000 in the first year (half of total plate sales revenues), $592,500 in the second year (the remaining half of total plate sales plus the annual registration surcharge on the plates sold in the first year), and approximately $395,000 thereafter annually in registration surcharges.

Income Tax Check-Off: $180,000 per year

This is a voluntary mechanism to channel revenues to dedicated uses. The above estimate is based on Maryland's experience with a check-off dedicated to environmental programs for the Chesapeake Bay. Other states have check-offs (40 states, 125 check-offs) but only Maryland's bay check-off is bay and water-quality related.
Maryland has a Chesapeake Bay Trust Fund check-off to which Maryland taxpayers may dedicate refunds or may increase their tax bill, dedicating the additional increment to the Fund. This check-off has generated an average of $1 million over the past three years. Dividing the $1 million annual revenue by Maryland's population (4,781,468) times its per capita income ($16,199), a measure of total state income, provides a multiplier of 0.000012911. Multiplying Rhode Island population (1,003,464) times its per capita income ($13,906) times the multiplier results in an estimated check-off revenue of $180,162 annually (U.S. Dept. of Commerce, 1990). The multiplier is the percent of total state personal income contributed to the Bay through the income tax check-off.

Recreational Fee Surcharge or Tax: $175,000 per year

In FY 88, Rhode Island collected over $1.5 million in assorted parking, user and concession fees at state-owned facilities. A fee increase in 1989 was expected to generate an additional $1 million. Applying a seven percent surcharge to these fees or subjecting them to the sales tax could generate approximately $175,000 (the seven percent surcharge was chosen to illustrate the effect of levying a charge equal to the sales tax on these fees).

Marine Fuel Surcharge/Tax: $66,000 per year, assuming one cent per gallon

This estimate is based on the number of registered boats in Rhode Island, 29,305, provided by RIDEM's Division of Boating Safety, and an estimate of average annual fuel per boat consumed per year of 225 gallons. The revenue estimate above indicates the revenue potential per cent levied on each gallon sold. Marine fuels are currently subject to the same taxes as other gasolines. A one cent per gallon surcharge could be levied at the location where the fuel is pumped

and collected by the pumping stations or marinas.

Property Tax on Boats

There has been a trend toward assessing property taxes on boats in other states and, up until 1990, the State of Rhode Island allowed two municipalities—New Shoreham (Block Island) and Westerly to assess property taxes on boats. However, in 1990, the State rescinded municipal authority to levy property taxes on boats. This was done in conjunction with increased boat registration fees that were intended to increase the local share of revenues generated by the new fees. However, boat registration fee revenues available to municipalities have fallen, partly due to provisions that guaranteed a percentage of the revenues to the two municipalities that lost the authority to levy property taxes on boats, and budgetary shortfalls in RIDEM Boating Safety.

Assessing personal property taxes on boats has a logical precedent in the tax system currently applied to automobiles by Rhode Island municipalities. The revenues generated by the tax could be used to assist coastal municipalities in implementing their *Harbor Management Plans*, constructing municipal marine pump-out facilities, and/or providing municipal services to local boating facilities. A property tax on boats based on value rather than length would avoid inequitable situations where two boat owners pay the same fee on 30-foot boats even though one boat is old and of low value while the other is new and represents significant value. Revenue estimates associated with a value-based tax cannot be determined at this time without specific information on existing municipal tax rates.

[Note: The Rhode Island Division of Planning recommended the institution of a boat property tax to a tax study commission in 1992. The recommendation was rejected.]

RIPDES Permit Fee Increases/Surcharge: Unknown potential

Rhode Island currently charges $4,043 for major Rhode Island Pollutant Discharge Elimination System (RIPDES) and $462 for minor RIPDES permits (major and minor are defined by the U.S. Environmental Protection Agency, or EPA). Thirty four major facilities generated $137,462 over five years (permits are for five years), and 120 minor dischargers generated $55,440—a total of $192,902. In several other permit categories, RIDEM issues about ten permits each year at an average cost of $243; the range is $139 to $347. These smaller fees generate approximately $1,390 to $3,470 per year. Permit fees collected in FY91 produced $48,432.

However, costs for the permit program greatly exceed the revenue generated by permit fees. RIPDES permitting costs alone were $623,309 in FY91, while federal permitting costs were $51,725: a total of $675,034. In addition, state pretreatment, enforcement, and planning costs total nearly $1 million. Ideally, the RIPDES permitting system would be self-supporting. However, Rhode Island permit fees would have to be increased appreciably in order to generate a significant increase in current fee revenues. For example, a ten percent increase in current fees would generate approximately $19,000.

A more realistic approach may be to determine a workable increase in fees which would result in less state money being used to support the permitting program; the savings realized could possibly be directed to other toxics-related *CCMP* implementation activities. For example, Rhode Island's permit fees are low relative to other New England permit fees. Although comparisons of state fee structures should be made carefully, a comparison of RIDEM's RIPDES fees to permit fees in some other New England states is illustrative in terms of evaluating the revenue potential associated with potential fee increases.

- Rhode Island: $4,043 for five years - major dischargers; $462 for five years - minor;

- Connecticut: $2,300 per year - major dischargers; initial fees of $1,700 for major industrial, and $850 for major municipal dischargers, plus a one time fee of $1,100 for all major dischargers;

•Maine: $5,400 per year - major industrial discharger with sanitary or cooling discharge, and $11,200 per year for major industrial dischargers with other discharges; $2,400 for amendments and $50 for minor modifications; also $3,650, $1,450, and $450 for five year renewals (by size and without industrial input), and $5,550 with industrial input;

•Vermont: $100 to $10,000, depending on size, without industrial input, and a $0.10 per gallon of design capacity pretreatment fee charged to industrial dischargers to WWTFs; and

•Massachusetts: $100 to $5000 for annual compliance fees; $4,500 initial fee for new major permits, and $2,350 when reissued; initial fee of $2,150 for new minor permits, and final fee of $1,050.

Most New England states charge higher fees *and* more types of fees. Rhode Island has 34 major permit holders (@$4,034) and 120 minor permit holders (@$462). If Rhode Island were to raise its permit fees to $5,000 *per year* and $850 *per year* (using current Massachusetts fees as an example), major permit holders would then pay a total of $170,000 per year and minor permit holders would contribute a total of $102,000 per year. This represents additional revenue of $233,000 annually, or $1,167,000 during the five year period over which $192,902 is currently collected. These fee increases represent a 619 percent increase for major dischargers and a 920 percent increase for minor dischargers.

Impact Fees

Impact fees, or development impact fees, are assessed by six of the local governments in Rhode Island: East Greenwich, North Kingstown, South Kingstown, Cranston, and Woonsocket (RIDOA, 1990b). Impact fees are one mechanism to collect revenues to pay for services and infrastructure required by new development. The burden of this type of fee is generally shared by the developer and the homebuyer; how this cost is distributed depends upon the size and type of the development. For communities where *CCMP* funding needs are related to new growth, impact fees could be a viable source of revenue to support certain kinds of programs, particularly those related to the burden of increased septic systems and sewer hook-ups from new developments. Without specific information regarding the manner in which impact fees would be applied, it is not possible to estimate the amount of revenue that could be derived from this type of mechanism, *i.e.*, revenues would vary widely depending on the size and needs of a municipality.

Land Leases

The State of Rhode Island owns many acres of land (both above water and below) from which the State is currently collecting neither tax nor lease income. If the State were to conduct an inventory of these parcels, and begin collecting lease fees, perhaps a portion of this new revenue could be directed toward meeting *CCMP* funding needs. Revenues from submerged land leases could be a particularly useful source of funds for water-related *CCMP* actions, such as sampling and monitoring. The amount of revenues that could be derived from land leases cannot be determined until an inventory of state property holdings (including size and present use) has been completed.

Institutional Mechanisms

To a large extent, the Narragansett Bay *CCMP* builds on existing programs and agencies at the federal, state, and local level to carry out the recommended actions. More than two dozen state and local agencies and authorities will be responsible for implementing the proposed recommendations. There are several institutional mechanisms that could be used to direct revenues from new or existing sources to *CCMP*-related activities. Four institutional mechanisms are examined here: State Revolving Loan Funds (SRFs), the Massachusetts Industrial Finance Agency (MIFA), Restricted Receipt Accounts (RRAs), and Special Assessment Districts.

The advantage of most of these mechanisms is that they provide a means of "dedicating" revenues from specific sources to specific

uses. Where existing institutions can be relied upon, there is little or no need for legislative action. Finally, these institutions offer economies of scale and other savings that can reduce the cost of financing *CCMP* activities.

Rhode Island Clean Water Protection Finance Agency

When the federal government discontinued the EPA-administered Construction Grants wastewater treatment cost-share program, it authorized the creation of SRFs to provide financial assistance to state and local governments for the construction of WWTFs and other water pollution control activities. Both Rhode Island and Massachusetts operate SRF programs.

Rhode Island operates its SRF through the RICWPFA with a capitalization grant from EPA, which is subject to Title VI requirements, and a state (over-) match provided by voter referendum in 1989. This organization's enabling legislation provides it with considerable flexibility to leverage existing state matching funds, and, therefore, to finance projects which do not meet Clean Water Act Title VI requirements.

The RICWPFA's charter is intentionally broad; it may lend to any municipal, regional, or state entity, including sewer commissions. In addition, while its initial project list focuses on traditional water pollution control projects, Title VI authorizes SRF financing of nonpoint source control and estuarine restoration projects that are identified by the state's Section 319 Nonpoint Source Management Program and/or a state's National Estuary Program. Therefore, source reduction, agricultural runoff abatement, and OSDS replacement initiatives could theoretically be financed with minor amendments to the RICWPFA's enabling legislation. Other types of projects that the agency could consider financing include aquifer protection, and stormwater abatement projects, although there are other state agencies with responsibility for these programs.

The SRFs lend money to borrowers at subsidized interest rates, equal to two-thirds of the borrower's own cost of borrowing. In the current debt market, this means that the total cost to borrowers, including administrative fees, is approximately 4.25 percent to 4.75 percent depending on the borrower's creditworthiness.

The RICWPFA has the potential to assist in funding *CCMP* activities in three major ways. First, a number of CSO projects recommended in the *CMP* are already on the SRF project priority list. Second, $1 million of RICWPFA bonds is earmarked for nonpoint source projects to be administered by RIDEM. Third, the RICWPFA programs could be expanded to include a broader range of *CCMP* activities. For example, although the RICWPFA's primary purpose is to provide debt financing for capital projects, it currently funds some planning and design activities leading to capital construction. Therefore, SRF funds could theoretically be used to prepare municipal stormwater management or OSDS replacement plans where capital construction costs are likely to result associated with stormdrain retrofits or sewering. However, the preferred method for funding public, non-capital planning expenditures would be to set up a separate account within the SRF with the purpose of providing grants, as other state SRFs have done for their estuary programs (*e.g.* Connecticut).

There are a number of benefits of using the RICWPFA as a mechanism for channeling funds to *CCMP* activities. Funding costs are lowered by leveraging funds in two ways. First, federal and state capitalization funds are used as security, thus increasing the lending capacity of the Fund and creating market leverage. Second, loans are recycled into additional loans, thus creating cash flow leverage. Using the RICWPFA also provides a means of protecting funds designated for *CCMP* purposes by insulating funds from legislative raiding. Finally, by combining the bond issuance for a number of borrowers, the cost to the state and to the borrowers of issuing debt is further reduced.

There are, however, limitations to the use of SRFs for funding *CCMP* activities. The Rhode Island SRF is currently able to fund approximately $356 million in water pollution control projects over the next 20 years based on its leveraging authority. However, the cumulative funding need over this same period is $1.1 billion, far outstripping the SRF's current funding potential. Over the 1992-1997 period, projected available funding is $191.2 million, while the projected need is $248.4 million.

There are a number of policy considerations that have a direct impact on the ability to use the CWPFA for funding *CCMP* activities. The agency's funding potential depends upon the level of subsidy provided borrowers and the related leveraging ratio. With the current state and federal funds and the current subsidy of one-third the cost of borrowing, the agency has achieved a 2:1 leverage ratio. If the CWPFA were to apply a different subsidy, *e.g.*, one-half, the leverage ratio would be approximately 1.7:1.

Another factor is the availability of additional revenue to capitalize the CWPFA. If the agency had other earmarked revenue sources, it could increase the size of its loan portfolio. Possible additional funding sources include an annual revenue stream, such as a water use surcharge, additional federal funds, or increased state appropriations. Although Congress has not yet provided all of the funds authorized in the initial legislation, some proposals for reauthorizing the Clean Water Act call for Congress to make up the shortfall. For Rhode Island, this could possibly provide $10 million to the SRF. In addition, there may be new capitalization grants earmarked for CSO projects. This could amount to as much as $30 million in additional funds for Rhode Island.

Massachusetts Water Pollution Abatement Revolving Fund

A similar potential source for capital funding of Massachusetts projects is the Massachusetts Water Pollution Abatement Revolving Fund. This SRF was set up pursuant to the 1987 re-authorization of the Clean Water Act to replace the Construction Grants Program in the financing of water treatment projects. The SRF provides low cost loans to municipalities and regional authorities based on an annual state project priority list. The loans may bear rates ranging from no interest to close to market rates.

The Massachusetts SRF currently has approximately $242 million in available funds. Its first loan will provide $76 million to the Massachusetts Water Resources Authority (MWRA) for the cleanup of Boston Harbor. Binding commitments for another $100 million have been made, of which $25 million will go to New Bedford and $75 million will go to the MWRA. While 1992 federal appropriations have not yet been issued, the state expects to receive approximately $70 million. Together with the 20 percent state match, this will bring remaining funds available as of 1992 to $150 million. Over the entire 1988-1999 period, the State expects to have available about $2 billion (EPA, 1991b).

The Massachusetts SRF program has indicated that it intends to leverage its funds so that it may meet its estimated water quality needs. However, it appears that leveraging will not be feasible in 1992. Current program loan conditions were set by the General Court. In order to make the loans attractive, terms were designed to be generous, with interest rates ranging from four percent down to zero percent. If the capitalization grant is leveraged, there will be a gap between the rate due to bondholders and that forthcoming from loan recipients. The Commonwealth would then have to provide funds to make up this differential in monies available to repay bondholders. The new administration has tried unsuccessfully to lobby for a legislative change to the loan conditions and the Commonwealth budget does not provide sufficient funds to cover the gap. As a result, if the Commonwealth leverages, it will face a financing gap that it will not be able to cover. If the Massachusetts SRF would raise the interest rate charged to municipalities and regional authorities, more projects could be funded and leveraging ability would be enhanced.

According to the 1988 Needs Survey, the Commonwealth of Massachusetts will incur costs of $864 million just to bring into compliance the treatment facilities currently designated as being in significant non-compliance. These needs, however, do not take into account facilities that will fall into disrepair over the coming years, or that need modification to accommodate a growing population. The needs estimates also exclude several areas of water quality standards compliance, many of which will require substantial investments over the coming years to ensure compliance with federal mandates. Non-point source and estuarine control program needs, ground water protection requirements, costs of developing separate storm sewers, the reduction of toxics from point source discharges, and sludge disposal costs are just some of the water quality needs that have been excluded from historical cost estimates.

By the year 2000, estimated needs will be more than double the projected funds. The 1991 Intended Use Plan has tentatively earmarked $322 million for five projects. One of the planned loans would provide $600,000 to Fall River CSO planning. However, this plan was predicated on the state leveraging the capitalization grant by as much as 2:1. As leveraging is unlikely to take place in the near future, the Commonwealth will have to re-evaluate its 1992 lending agenda.

Despite the competition for funds, two factors may work in favor of municipalities seeking financing for their CSO or sediment remediation programs. First, the Intended Use Plan stated the state's intention to focus more closely on Section 319/320 programs, as defined in the Clean Water Act. As Section 320 of the Clean Water Act established the National Estuary Program, the Commonwealth may look favorably on capital projects submitted for loan approval that will be undertaken as part of the *CCMP*. Second, under Massachusetts law, only half of the available funds can be committed to the MWRA. Even if New Bedford accounts for a large portion of the remainder, there will be funds available for other water quality projects.

Massachusetts Industrial Finance Agency

If all or any part of a Massachusetts project fails to be approved for financial assistance by the SRF, the city or town may apply to the MIFA for help in financing all or any part of the project. The MIFA is an independent authority that can provide environmental capital project financing. Unlike the SRFs, MIFA does not provide subsidized rates and operates its loans on a recovery basis. As provided by Massachusetts General Laws, Chapter 29C, Sec. 10(e), this agency can evaluate project proposals and issue taxable or tax-exempt bonds on the open market to finance projects. To date, the agency has financed over 30 environmental capital projects.

MIFA has the authority to insure bonds, thereby lowering the interest payments that towns have to make. It can also pool small debt requirements of several towns and issue the bonds as a package. Additionally, MIFA has established a $100 million letter of credit to aid towns in their short-term borrowing needs. MIFA's ability to issue debt for groups of towns may prove quite useful if the existing economic situation affects local borrowing and pooled debt can be issued at more favorable rates.

Restricted Receipt Accounts

Rhode Island has a number of special taxes and fees that are designated for specific purposes. The revenues from these taxes and fees are deposited initially into the general fund, and are then appropriated to various "restricted receipt accounts." Restricted receipt accounts (RRA) could be an appropriate means of securing and protecting revenues for *CCMP* implementation. There are two ways in which RRAs could be used to channel funds to *CCMP* implementation activities. Existing RRAs could be used as a vehicle to channel funds to Bay-related activities. Alternatively, one or more Bay-specific RRAs could be established.

The primary advantage of using existing RRAs is that they are in place and operational. In some instances, existing funds could be redirected to specific *CCMP* activi-

ties simply through a change in regulation. For other RRAs, a legislative amendment would be required to create a new purpose to which the existing restricted funds may be directed. A disadvantage of redirecting RRAs is that there is a predisposition to use these accounts and their dedicated revenues for the initial purpose of the account and so even monies designated for *CCMP* activities may get diverted. Restricted receipt accounts are also vulnerable to legislative manipulation in that RRA enabling legislation and regulations are easily amended.

A primary advantage of creating a Bay-specific RRA is that it would be more easily secured for *CCMP* activities and would be less prone to pirating for other purposes. However, it might be more difficult to create a new RRA than to add additional activities to existing approved accounts.

RIDEM has 22 restricted revenue accounts that are dedicated to a wide variety of activities. Many of these activities are related to *CCMP* actions and several of the RIDEM divisions identified as implementing authorities for portions of the *CCMP* also administer one or more restricted accounts. For example, one account partially funds the enforcement of boating regulations (potentially related to boater waste recommendations) while another is used for protecting wildlife habitats (potentially related to critical resource recommendations). Table 715-05(6) presents a listing of the 22 accounts, and, where information was available, identifies the source of the receipts, the use for which they are restricted, and FY91 account balances.

The Rhode Island Department of Health (RIDOH) has two accounts that fund activities relevant to *CCMP* recommendations. One is restricted to supporting funding of the state's laboratories. In FY91, this account received $793,268. The other RIDOH account related to *CCMP* actions is an account restricted for the Office of Health Promotion. The account's receipts support three programs, one of which is related to *CCMP* recommendations: health promotion and product development (including proceeds from sale of informational booklets and materials). In FY91, this account collected $95,935. The RIDOH Laboratory RRA appears potentially useful as a vehicle to receive and protect revenues for the variety of *CCMP* recommendations related to sampling and sample analysis. The RIDOH Health Promotion RRA could perhaps be used as a vehicle or source of funds for *CCMP* activities related to seafood health risks and other similar recommendations.

The Rhode Island Division of Planning (RIDOP), which is estimated to incur $593,750 in *CCMP* related costs over the five-year planning period, does not have any restricted accounts, but its Office of Municipal Affairs (which is budgeted separately), does have several. The Office administers financial assistance to cities and towns to assist them in organization, planning, and management, including technical assistance and information services. In FY91, the Office's RRA's received $1.75 million. Because the Rhode Island Department of Administration (RIDOA) and the RIDOP Office of Municipal Affairs already have these RRA's (twelve for the RIDOA, including four for the Office, although the RIDOP itself has none), this precedent may facilitate attempts to establish new RRAs in the RIDOA or for the RIDOP for *CCMP*-related activities.

Special Assessment Districts

Special districts are an alternative to conventional local government when the area of service does not fit into one existing jurisdiction or the governmental unit chooses not to (or cannot) perform the required service. They can also be used when the entity with jurisdiction has neither the tax base nor the debt capacity to fund the service. The Bureau of the Census defines special districts as having three characteristics that make them different from a subordinate agency of the existing municipal government. They must exist as an organized entity, be governmental in nature, and have substantial administrative and fiscal autonomy so that they may be truthfully thought of as a separate government (U.S. Dept. of Commerce, 1984). This definition does not include counties, municipalities, townships, and school districts. Special districts are also known as "public .

TABLE 715-05(6)

REVENUES, EXPENDITURES, AND CARRYOVERS OF RIDEM RESTRICTED RECEIPT ACCOUNTS: FY 91

Account Name	Description	FY 1991 Collections	FY 1991 Expenditures	Carryover (Deficit)
Boating Safety	Fees for registration of boats; funds registration and enforcement activities	$492,611	$515,095	($22,484)
Duck Stamp	Stamp required on hunting license in order to hunt ducks; dedicated to waterfowl habitat improvement	$175,017	$53,543	$121,474
Environmental Response Fund	Superfund activities supported from general obligation bonds, fines, and penalties	$688,468	$2,395,070	($1,706,602)
Fertilizer Test	Fees on the sale of fertilizers; supports fertilizer testing	$135,454	$114,667	$20,787
Fisheries	Restricted account containing receipts from all fishing licenses; proceeds used for protection and propagation of fish ($2 from each lic. to Fish and Gamelands fund).	$283,280	$256,019	$27,261
Galilee Development Fund	State port rental fees; funds capital improvements for ports	$329,076	$671,524	($342,448)
Gameland Acquisition	$2 from sale of each hunting and fishing license; proceeds used to acquire and develop fish and wildlife lands	$116,968	$311,446	($194,478)
Hard-To-Dispose	Fees on oil, tires, batteries, cars; funds cleanup of hard-to-dispose waste	$1,128,826	$1,174,006	$45,180
Litter	Permit fees for carryout restaurants, fees on soft drinks in lieu of deposit; funds local litter control programs	$1,215,207	$1,190,349	$24,858
Mosquito Abatement	Funds municipal mosquito control programs	$82,185	$12,071	$70,114

Municipal Recycling	Tipping fees at state-owned landfill; supports local governments' collection and hauling costs for first three years of participation in mandatory solid waste recycling	$97,500	$150,650	($53,150)
Non-game Wildlife	Income tax check-off; used for protection of non-game wildlife and their habitats	$18,369	$43,369	($25,000)
Pesticide Relief	Fees on pesticide licenses and products; 25% used to make Integrated Pest Management Grants to cities and towns, 75% used for pesticide contamination relief (any excess over $1 million reverts to Gen. Fund)		$281,698	$40,202
Pollution Monitoring	Routine monitoring costs for NPDES permits issued to dischargers, including municipalities, at cost	$105,340	$159,466	($54,126)
Recreational Vehicles	Registration fees for dune buggies and snowmobiles; funds registration program	$5,043	$9,045	$4,002
Roger Williams Reserve	6% of hotel tax; supports the preservation of open spaces, including the acquisition of development rights for farmland, preservation of historical sites, and the acquisition of open space for recreational purposes	$271,491	$380,360	($108,869)
Shellfish/Marine	All funds in excess of $200,000 collected from the sales of all shellfish and marine licenses. Supports protection and propagation of fish, shellfish, and lobsters, fishing port development and construction, staff support and expenses of Marine Fisheries	$235,487	$172,573	$62,914
Water Protection (OSDS), Underground Storage tanks, and Wetlands funds (co-mingled)	OSDS fees, underground storage tanks fees, wetlands Development fees; funds water protection efforts	$835,348	$764,919	$70,429
Water/Air Protection	Proceeds from air, water, and groundwater division fines, and air and water fees; funds water and air protection activities	$489,570	$183,074	$306,496
Wildlife	Fees for hunting licenses; supports protection and propagation of game	$174,507	$169,741	$4,766

corporations" and "authorities." These districts can be especially beneficial when specific technical services must be performed and a closely-related revenue stream is available. Once established, special districts can potentially provide a highly stable level of service. Relevant examples include stormwater management districts and wastewater management districts (refer to *New Revenue Options*).

Impact Analysis

Implementation of the *CCMP* will require the commitment of substantial resources over the next 20 years, including the repayment of debt service for capital projects. The cost of implementing those *CCMP* recommendations for which estimates have been prepared is more than $629 million. Capital costs account for 95 percent of the total estimated costs, the majority of which is directed toward federally-mandated CSO abatement costs. It is likely that much of the capital component will be met through debt service, while personnel and other non-capital costs will be paid for out of dedicated fees and taxes and/or general revenues. It is important to note that capital costs for CSO abatement and sediment remediation will extend far beyond the five-year plan horizon.

Of the $598.6 million in capital costs, approximately $371.1 million will be incurred in Rhode Island, and $227 million in Massachusetts. Of the $30.5 million in personnel costs projected to be spent between 1992 and 1997, roughly $20.2 million falls to Rhode Island, and $10.3 million to Massachusetts.

As noted earlier, RICWPFA provides financing for capital projects such as those anticipated in the *CCMP*. Loans from the RICWPFA are repaid from user fees levied by the local utility on customers. If ratepayers were made to bear the costs of all capital expenditures related to *CCMP* implementation, the rate increase required would be substantial. The case of the NBC is used to illustrate the potential impact of capital expenditures on local sewer rates.

NBC's total projected capital costs for CSO abatement equal $308.6 million. Of this total, the NBC plans to borrow $241.3 million from the RICWPFA at subsidized interest rates. This figure is based on the assumption that a reduction of the total $308.6 million will be achieved through the use of an existing $47.3 million in Bay Bond funds and approximately $20 million in replacement debt. Assuming the market rate for NBC debt is 7.0 percent and the RICWPFA charges two-thirds of this rate, the rate charged NBC by the RICWPFA would be approximately 4.7 percent.

For purposes of this analysis, it was assumed that all debt is issued today in order to calculate the out-year rate increase required once all the debt has actually been issued. It is more likely that debt will be issued over several years, as capital expenditures are made, and that debt service will rise to a peak and then fall as earlier debt is retired. Nevertheless, this analysis reflects the maximum increase in debt service that would be necessary once all debt had been issued. Annual debt service on $241.3 million borrowed at the subsidized rate of 4.7 percent over a 20-year term would be approximately $19 million.

The Rhode Island Public Utilities Commission (PUC) currently allows the NBC to carry a $4.8 million debt service amount. The added debt service resulting from RICWFPA loans (approximately $19 million annually) would necessitate a 396 percent increase in user fees, i.e., the average annual fee for the Bucklin Point service area would increase from $106 to $420 per year, and from $65 to $258 per year for the Fields Point service area. This $258 to $420 cost range is comparable to the range of fees charged by local cable television companies on an annual basis, and is within the range of sewer use fees currently charged by other Rhode Island municipalities. It is also important to note that the cost of CSO abatement is not borne solely by those who use the NBC system; the Federal government provides capitalization grants to RICWPFA and Rhode Island taxpayers contribute to the state

matching funds (20 percent of the Federal capitalization grants). After financing costs, the use of the RICWPFA program reduces the cost of borrowing by about 20 percent.

Rhode Island is also projected to incur approximately $20.2 million in personnel and other non-capital costs over the next five years (1992-1997) at the state and municipal level to implement the *CCMP*. This represents an average annual cost of $4.04 million over the five year period—$2.74 million for personnel (54.8 FTEs) and $1.3 million in other non-capital program costs. If Rhode Island were to meet its non-capital *CCMP* funding needs entirely through general revenues, slightly less than one-third of one percent of current general revenues ($1.36 billion in FY91) would have to be reallocated, or revenue collections would have to be increased by 0.30 percent.

In addition, the $4.04 million estimated average annual cost of personnel and non-capital expenditures represents 0.9 percent of FY91 income tax revenues ($448 million). In order to accommodate this increase, the state percentage of the Federal income tax rate on which the Rhode Island income tax rate is based would have to be increased from 27.5 percent to 27.775 percent. Similarly, $4.04 million represents 0.89 percent of FY91 sales and use tax revenues ($452 million), *i.e.*, the sales and use tax would have to be raised from 7 percent to 7.07 percent to raise these funds.

Because *CCMP* implementation is not scheduled to occur evenly, (*i.e.*, it is unlikely that actual funding needs will be $4.04 million each year from FY93 through FY97), the funding needs in some years will be greater than average and some years they will be less. For example, most of the legislative and regulatory steps recommended by the *CCMP* are scheduled to occur in the first two years, while many of the technical assistance and ongoing coordination activities will occur in later years. These timing issues will affect actual annual funding needs. The average annual funding needs for the state presented below are for illustrative purposes only, and may not reflect actual annual needs.

Impact on State Agencies

Rhode Island's state level *CCMP* estimated funding need for the period FY93 through FY97 is $20.2 million. This represents an average annual cost of $4.04 million—$2.74 million in personnel (54.8 full time equivalents, or FTEs) and $1.3 million in other non-capital costs. This estimate includes all state-level agencies that will incur *CCMP* costs: RIDEM, RIDOH, RIDOT, RIDOP, CRMC, Rhode Island Legislature Land Use Commission, RICWPFA, PUC, Conservation Districts, Rhode Island Governor's Office, Rhode Island Legislature, and University of Rhode Island (URI) and Environmental Data Center at URI. The estimated annual personnel requirement, 54.8 FTEs, represents 0.33 percent of Rhode Island's total FTEs for FY91 (16,684 FTEs).

RIDEM's *CCMP* estimated funding need for the period FY93 through FY97 is $11.65 million. This represents an average annual cost of $2.33 million—$1.38 million in personnel costs (27.6 FTEs) and $0.95 million in other non-capital costs. The average annual funding need of $2.33 million represents 3.9 percent of RIDEM's FY91 budget ($60 million). The estimated 27.6 FTEs required annually represents 4.3 percent of the agency's FY91 total FTEs (638.4), while the estimated annual non-capital funding need of $0.95 million represents 1.6 percent of the agency's FY91 budget.

RIDOT will incur an estimated CCMP funding need of $3,825,000, representing $3.6 million needed as a state match to a FHWA grant of $13 million to be used for nonpoint source abatement projects on the Pawtuxet River in addition to personnel costs of $225,000 (or 4.5 FTEs) over the five-year planning period. Annual personnel costs to RIDOT amount to $45,000 (0.9 FTE). The estimated 0.9 FTE required annually represents 0.015 % of the agency's FY91 total FTEs (594) while the $720,000 required annually for the state match amounts to

0.77 % of the RIDOT total FY91 budget.

CRMC's estimated *CCMP* funding need for the five-year period is $1,295,000, representing average annual personnel costs of $109,000 (2.2 FTEs) and average annual non-personnel costs of $150,000 (total average annual costs are estimated to be $259,000). The FY91 CRMC budget totaled $608,390; of this, personnel costs totaled $510,604 (10.2 FTEs) and operating costs totaled $97,786. The *CCMP*-recommended increase for the five-year period defines annual funding levels that are 21 percent higher for personnel costs and 153 percent higher for non-personnel costs than is provided for in the FY91 CRMC budget.

The RIDOP *CCMP* estimated funding need for the period FY93 through FY97 is $593,750. Of this, $563,750 represents personnel costs. The average annual personnel costs total $112,750 (2.26 FTEs); no additional non-capital *CCMP* costs were identified. This average annual funding need represents 5.8 percent of RIDOP's FY91 personnel budget ($1.97 million, 39.1 FTEs). In FY91, the RIDOP's Office of Municipal Affairs (which has a separate budget) had approximately $1.26 million budgeted for local planning assistance and municipal affairs. RIDOP's estimated annual *CCMP* personnel requirement represents 3.5 percent of the total of these related funds and RIDOP's personnel budget.

RIDOH's *CCMP* estimated funding need for the period FY93 through FY97 is $1.3 million. This represents an average annual cost of $256,200—$161,000 in personnel costs (3.2 FTEs) and $95,200 in other non-capital costs. The average annual funding need of $256,200 represents 0.6 percent (slightly over one half of one percent) of RIDOH's FY91 budget ($42.8 million). The estimated 3.2 FTEs required annually represents 0.8 percent of the agency's FY91 total FTEs (409.5), while the estimated annual non-capital funding need of $95,200 represents 0.22 percent of the agency's FY91 budget.

Local Impacts

The estimated municipal cost of *CCMP* implementation for the period FY93 through FY97 is $6,548,500, exclusive of capital costs. This represents an average annual cost of $1,309,700. If *CCMP* costs were spread equally among the 98 Bay watershed municipalities, each would require approximately $13,364 annually for implementation.

Annual Rhode Island municipal *CCMP* personnel and non-capital costs represent 0.04 percent of the State's FY91 budget ($1.36 billion), *i.e.*, if Rhode Island were to assist the municipalities in meeting these non-capital *CCMP* funding needs, approximately 0.04 percent of current general revenues would have to be redistributed, or revenue collections would have to be increased 0.04 percent. Similarly, the $592,280 estimated annual municipal funding need represents 0.13 percent of FY91 income tax revenues ($448 million); 0.13 percent of FY91 sales and use tax revenues ($452 million); and the estimated annual personnel need (11.6 FTEs) represents 0.07 percent of Rhode Island's total FTEs in FY91 (16,684).

These municipal costs represent only non-capital funding needs. Some municipalities may incur additional costs for *CCMP*-related activities, such as CSO abatement and sediment remediation. Municipalities may also incur additional costs for other *CCMP* recommendations, such as those related to establishing WWMDs and constructing marine pump-out facilities. In many cases, however, the ultimate cost of *CCMP*-recommended municipal actions cannot be known until the initial planning phase is complete. Another factor that makes it difficult to assign specific cost estimates is the varying environmental and fiscal conditions among Bay watershed municipalities. More detailed information regarding municipal and private sector costs is included in the paragraphs that accompany the tables of estimated cost at the end of each chapter. See *CCMP Cost Estimation and Funding Report* (Apogee Research, Inc./NBP, 1992) for more detailed information on revenue options.

05-03-03 CCMP Funding Strategy

Objective for CCMP Funding Strategy

The State of Rhode Island and the Commonwealth of Massachusetts should develop appropriate funding mechanisms for the implementation of the Comprehensive Conservation and Management Plan (*CCMP*).

Introduction

The Narragansett Bay *CCMP* represents a comprehensive approach to protecting and restoring the Bay's resources. The costs of such a program are substantial (total estimated *CCMP* implementation costs—including combined sewer overflow (CSO) abatement—are $629 million) and are likely to increase as planning efforts are completed, additional actions specified, and cost estimates for new actions prepared.

Financing the *CCMP* poses a significant challenge to the federal, state, and local agencies, as well as private companies, responsible for implementing the Plan in Rhode Island and Massachusetts. This section presents a proposed funding strategy to address the funding needs of the *CCMP*, building on existing institutions to the extent possible and developing new revenue sources earmarked for implementing the Narragansett Bay *CCMP*. Given the costs of the Plan and the number of parties responsible for taking various actions, the proposed funding strategy encompasses multiple sources of revenues (both existing and new) and draws upon several institutional mechanisms.

While the costs associated with the *CCMP* will be a substantial investment for the State of Rhode Island and the Commonwealth of Massachusetts, it should be noted that it has been estimated that Narragansett Bay-related economic activity brings in over $2 billion annually (based on 1989 data) in revenues for the region (Rorholm, 1992). Viewed in this light, funds spent on maintaining and restoring the health of the Bay would appear to be a wise investment that will protect the region's prosperity as well as its natural environment. Additionally, certain *CCMP* implementation activities have the potential to create many employment opportunities for residents of the Bay watershed. For example, according to the engineering consulting firm, Camp, Dresser, and McKee, Inc., labor costs account for 70 percent of CSO abatement project costs. Each $10 million in project costs supports 120 person years of employment. Secondary economic impacts can be as high as two and one-half times the amount of labor person years. The $434 million in total CSO abatement projects could theoretically provide the region with over 13,000 person years of employment (with potential payroll wages of over $600 million) over the CSO abatement implementation period.

While the thought of new taxes and fees may be an anathema to many decision-makers, Bay area residents are aware of the need for increased spending to clean and protect Narragansett Bay. Public support for an increase in general taxes to protect the Bay can be seen in the response to the 1991 Narragansett Bay Project Public Opinion Survey (Advantage Research Corporation, 1992). In this survey, 79.2 percent of respondents viewed an increase in income taxes and 63.1 percent viewed increased user fees as appropriate funding sources to support *CCMP* implementation. Given the legislature's reluctance to raise general taxes or to dedicate general revenues, a viable alternative would be the schedule of new or increased charges presented in the following funding strategy.

Implementation Costs

The *CCMP* contains more than 500 recommendations for action. In order to determine the potential funding requirements of implementing the plan, the capital and operating costs of all proposed recommendations were estimated for the five-year planning period, 1992 to 1997. In addition, major capital expenditures that are likely to occur beyond the five-year planning period were also estimated (primarily CSO abatement and sediment remediation). Overall, the implementation of the *CCMP* is projected to cost an estimated $629 million. CSO abatement and sediment remediation on the Blackstone River will require approximately $590 million—$353 million during FY 92 - 97

and $237 million after FY 97. *It should be noted that CSO abatement is mandated by the Federal government and will occur independent of the CCMP.* Personnel and other operational costs are estimated at approximately $30.5 million for FY 92 - 97. Breakdowns of the *CCMP* costs estimated for Rhode Island and Massachusetts during the FY 92 - 97 planning period and after are presented at the end of each chapter.

The average annual personnel and non-capital costs for Rhode Island (for both state and local agencies) are approximately $4.04 million. This amounts to an annual cost to each of the State's 1,003,464 citizens of $3.99 (for the five-year planning period). The average annual costs for personnel and non-capital items for the Commonwealth of Massachusetts over the five-year planning period are approximately $2.06 million. The annual cost to each of the nearly 1 million Massachusetts residents within the Bay watershed would be approximately $2.

If the State of Rhode Island chose to fund *CCMP* personnel and non-capital costs through general revenues, approximately one-third of one percent of current general revenues (which were $1.36 billion in FY 91) would have to be reapportioned, or revenue collections would have to be increased 0.30 percent. A small increase in one of the state's principal sources of general revenues—the income tax or the sales tax—could meet this entire need. Typically, personnel and non-capital expenditures are funded out of general revenues (or, in a few cases, out of special fees and taxes, directed through restricted receipt accounts). An alternative to a profusion of new charges would be to fund the entire program out of general revenues. For comparison sake, the following information describes the impact of two possible approaches to an alternative single-tax option for funding the State of Rhode Island's personnel and non-capital costs for *CCMP* implementation.

Option I: Increase in State Income Tax: Currently, the State of Rhode Island's income tax is levied at 27.5 percent of a resident's Federal income tax bill. For example, a Rhode Island resident might pay an annual Federal income tax bill of $5,000; using the Rhode Island income tax formula, the state tax bill would be $1,375. In order to totally meet the estimated annual Rhode Island *CCMP* implementation personnel and non-capital funding needs (approximately $4.04 million), Rhode Island income tax revenue would have to be increased by one percent of the current level (total annual state income tax revenues for FY 91 were $448 million; $448 million x 1 percent equals $4.48 million). A one percent increase translates into a Federal tax percentage rate of 27.775 percent. Therefore, this resident's Rhode Island income tax bill would increase from $1,375 to $1,388.75, an additional cost of $13.75.

Option II: Increase in State Sales Tax: The State of Rhode Island currently levies a sales tax of 7 percent on goods, excluding clothing and food. Assuming that a resident spends $5,000 annually on taxable items, that resident would pay $350 in sales tax. Rhode Island sales tax revenues for FY 91 were $452 million; that amount would have to increased by one percent in order to meet Rhode Island annual *CCMP* implementation personnel and non-capital costs. In order to raise the additional funds through the sales tax, the sales tax rate would have to be increased to 7.07 percent. This would increase the $350 in sales tax in the above example to $353.50, an addition of $3.50.

New Revenue Sources

While existing revenue sources, budget commitments, and bond authorizations provide an initial source of funds for immediate activities (refer to 05-03-02 Funding *CCMP* Implementation: Identification of Revenue Sources), most agencies have already dedicated their revenue streams and general fund allocations. Therefore, funds will only be available for *CCMP* activities that are congruent with existing planned purposes or that are redirected to *CCMP* purposes. It is clear that new revenues will be needed to meet personnel costs and to repay debt service for capital projects. As mentioned in 05-03 (Funding *CCMP* Implementation), there is public support for increased funding. In the recent Narragansett Bay Project survey,

voters indicated that they would be willing to accept increased fees and taxes, *provided* the money collected was *dedicated* to the Bay. According to the survey results, over 79 percent of Rhode Island respondents were willing to accept personal tax increases and 63 percent indicated that increased user fees were an acceptable means of paying for *CCMP* activities (Advantage Research Corporation, 1992).

Ensuring that new tax or fee revenues go to *CCMP*-related activities appears important to winning public support for these funding sources. Yet, Rhode Island has consistently dedicated the lowest percentage of tax revenue among the fifty states, making it more difficult to meet the condition expressed by survey respondents. To the extent possible, the strategy presented here relies on existing institutional mechanisms, such as the revolving loan funds and restricted receipt accounts, to direct revenues to *CCMP*-related activities.

In developing this strategy, over two dozen revenue options were identified, including increases to existing fees and taxes, or the creation of new charges at the state or local level. Virtually all of the revenue options build on the principle that either the polluter (those who create or contribute to environmental problems) or the beneficiary (those who benefit from program activities) should pay. Refer to 05-03-02 (Funding *CCMP* Implementation: Identification of Revenue Sources) for background material regarding the selected revenue options. Many of these revenue options are suitable for supporting not just one but a number of the recommendations in the *CCMP*. In addition, an individual revenue stream from one of these options could be designed to provide funding for more than one agency; for example, moneys derived from a Narragansett Bay affinity license plate could fund public education programs conducted by different agencies, such as Rhode Island Department of Environmental Management (RIDEM), Rhode Island Coastal Resources Management Council (CRMC), and Rhode Island Department of Health (RIDOH).

Institutional Mechanisms

Several institutional mechanisms offer a means of directing revenues from new or existing sources to *CCMP*-related activities. In particular, the Rhode Island Clean Water Protection Finance Agency (RICWPFA) was created to finance a wide range of water quality related investments, using federal grant monies and state matching funds. The focus to date has been on wastewater treatment facility improvements and sewers, yet the Agency's charter is broader, and encompasses agricultural and stormwater projects as well. The Agency can make loans to municipalities, special districts, and regional and/or state commissions and could make loans to the private sector if its enabling legislation were amended. While the Agency cannot finance operating expenses, it can finance one-time costs, such as planning and feasibility studies. Because the RICWPFA is an independent state-chartered agency, it offers a strong option for "dedicating" revenues.

In Rhode Island, restricted receipt accounts offer another, albeit less secure, means of directing revenues to *CCMP*-specific uses. RIDEM has 22 such accounts, and although no existing account within the RIDOH and the Rhode Island Division of Planning Office of Municipal Affairs appears related to *CCMP* activities, the fact that they have restricted receipt accounts (RRA) may make it easier to secure new ones for activities. One option is to dedicate revenues from a new funding source (such as a marine fuel surcharge or a petroleum tax) to one of these existing accounts, with the intention that the revenues be used specifically for actions recommended in the *CCMP*. Alternatively, a new restricted receipt account could be created, dedicated to carrying out various recommendations or actions, with revenues from new funding sources directed to that account.

Organizational Framework

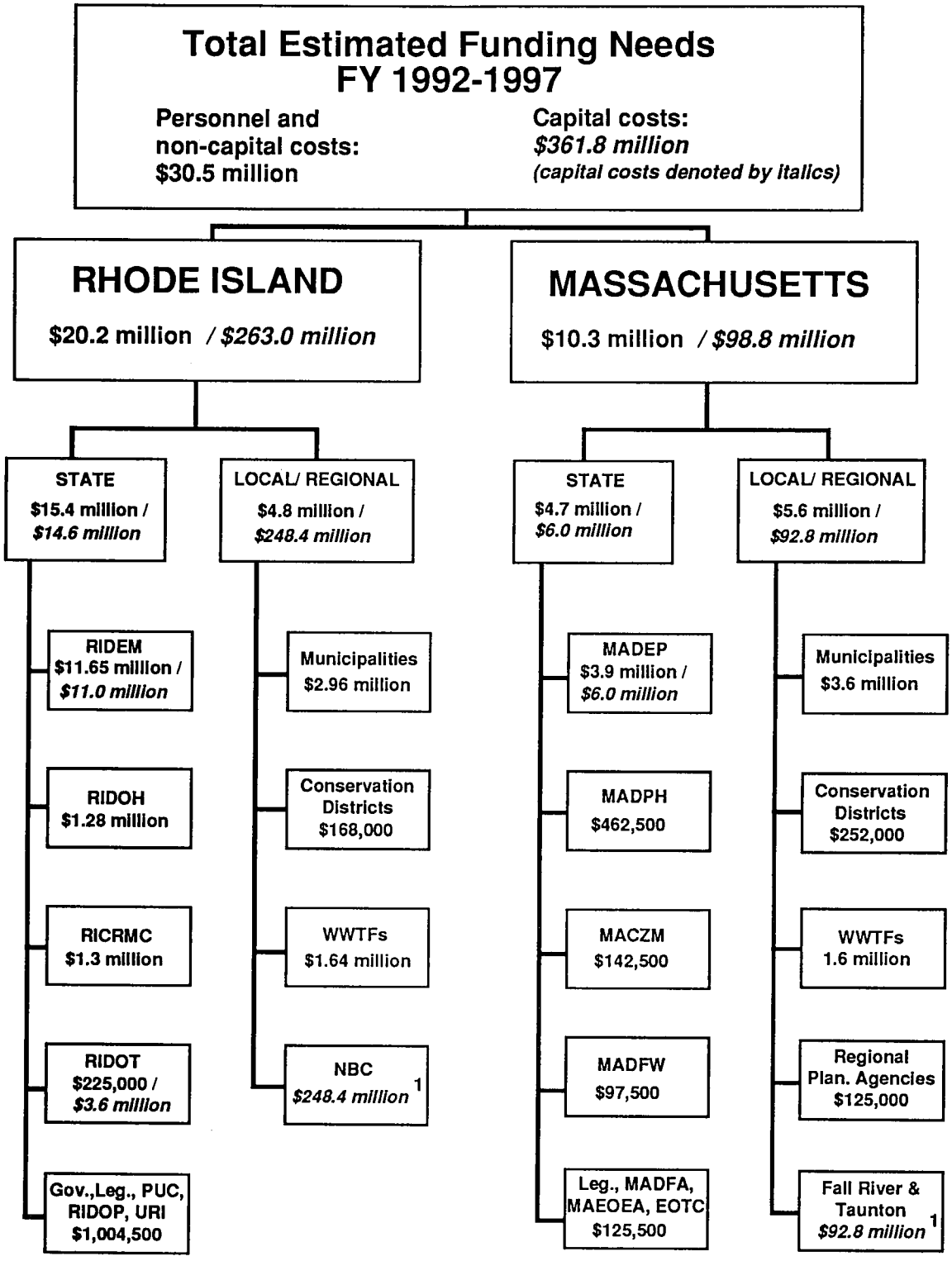
Implementation of the Narragansett Bay *CCMP* will be guided by the proposed Implementation Committee and Policy Committee.

While these bodies will play an important role in overseeing Bay-related activities and funding mechanisms, the primary responsibility for carrying out proposed actions rests with state agencies and local government units (including public utilities). Therefore, the funding strategy is organized by the governmental entities that will ultimately bear the personnel and capital costs associated with the recommended actions. Figure 715-05(2) identifies the personnel/noncapital and capital costs that will be borne by the various state and local implementing agencies over the next five years (this figure does *not* include another $237 million of projected capital costs that will be incurred after 1997, primarily associated with CSO abatement and sediment remediation, although these costs are addressed in the text).

For each implementing agency, the funding strategy identifies one or more sources of revenues that could be used to meet these estimated costs. Revenue options were "assigned" to various entities taking into consideration the type of activity the agency would be undertaking, the relationship of the funding source to those problems and activities, the estimated costs of recommended actions and revenue potential of the funding source, and whether the funding source is more appropriately levied and collected at the state or local level. Refer to Appendix H, *Funding Strategy by Implementing Authority,* for a detailed description of the suggested funding sources for each governmental entity, first presenting a strategy for Rhode Island, followed by one for Massachusetts.

Recommended Policies and Actions are presented in the following pages.

Narragansett Bay CCMP Funding Needs



1. Not including operational costs

Figure 715-05(2)

RECOMMENDED POLICIES AND ACTIONS
FUNDING STRATEGY

CODE	POLICY	AGENCIES	STATUS
I.	The State of Rhode Island should develop appropriate funding mechanisms for *CCMP* implementation.		
I.A.	The State of Rhode Island should take advantage of existing revenue sources and institutions. 1. To the maximum extent permissible under state and federal mandates, the State of Rhode Island and its agencies should make the implementation of *CCMP* recommendations a high priority when allocating funds to achieve environmental protection objectives. 2. Identified *CCMP* priorities should be established as explicit eligibility criteria for distribution of federal and state administered grants and loans, including the Rhode Island Clean Water Protection Finance Agency (RICWPFA) funds and other water quality protection bond funds. Implementing authorities should seek out Federal and state loans and grants, where appropriate, to fund *CCMP*-recommended activities. 3. The State of Rhode Island should fund certain *CCMP* activities and programs through general appropriations in addition to other sources. 4. To help finance personnel and other operational costs, the State of Rhode Island should increase fee and tax rates for existing revenue sources (based on activities that cause Bay pollution) and dedicate the additional revenue to funding specific *CCMP* activities. Specific revenue options include increases in Rhode Island Pollutant Discharge Elimination System (RIPDES) permit fees, the State Hotel/Motel Tax, and the Water Use Surcharge.	RIDEM, CRMC, RIDOP, RICWPFA, Mass. counterparts, federal granting agencies	[See EPA Region 1 "Preliminary Agreement," Section 715-05-06 re: coordination of federal grant funding with state nonpoint source, stormwater, and wetlands management programs and *CCMP* recommendations.]

✓ - **High Priority Action**

RECOMMENDED POLICIES AND ACTIONS
FUNDING STRATEGY

CODE	POLICY	AGENCIES	STATUS
I.B.	The State of Rhode Island should create new revenue sources in the form of taxes, fees, and voluntary measures. 1. To help finance personnel and other operational costs, the State of Rhode Island should establish legislative authority to levy new special taxes and user fees (with provisions that dedicate revenues and account for inflation) on polluters and/or beneficiaries of a clean and healthy Bay to support specifically identified programs. 2. To help finance personnel and other operational costs the State of Rhode Island should institute programs that will raise revenues through voluntary measures. Examples include a Rhode Island state income tax check-off and a Narragansett Bay affinity license plate program. 3. The State of Rhode Island should establish a septic assessment and permit fee program (to be administered at either the State or local level), utilizing either an existing institution or creating a new mechanism to collect and manage the revenues in support of specifically identified *CCMP* programs. 4. In order to provide additional funding and institutional support for implementing actions related to nonpoint source control and stormwater management, the State of Rhode Island should establish a stormwater assessment program, giving first consideration to establishing stormwater assessments state-wide or on a regional basis, utilizing either an existing institution or newly created mechanism to collect and manage the revenues for each in support of specifically identified programs.	R.I. legislature, state agencies, municipalities	

✓ - High Priority Action

RECOMMENDED POLICIES AND ACTIONS
FUNDING STRATEGY

CODE	POLICY	AGENCIES	STATUS
I.C.	The State of Rhode Island should develop appropriate means of funding *CCMP* capital needs. 1. The State of Rhode Island should expand both the scope of projects eligible for State Revolving Fund (SRF) loans (and possible subsidy programs) and the list of eligible RICWPFA loan recipients, and should also expand the SRF's capital base, dedicating new revenue streams to the SRF and issuing new general obligation bonds. a. Amend the RICWPFA's enabling legislation to allow it to provide funding (using new revenue sources) for other State programs in addition to those it is currently authorized to support. Examples of these additional programs would be drinking water programs, the Underground Storage Tank program, and the Aqua Fund. b. Amend the RICWPFA's enabling legislation to expand its ability to loan funds to the private sector. c. Amend the RICWPFA's enabling legislation to create a subsidized program that supports small local financing needs as well as one-time planning costs incurred by all levels of government. 2. The State of Rhode Island should schedule bond referenda in order to assist with financing capital construction costs associated with CSO abatement and sediment remediation on the Blackstone River and should begin planning to support post FY 97 costs including CSO abatement and the estimated $48 million for completion of sediment remediation recommendations.	RIDEM, RICWPFA (SRF), R.I. legislature	
II.	The Commonwealth of Massachusetts should develop appropriate funding mechanisms for *CCMP* implementation.		
II.A.	The Commonwealth of Massachusetts should take advantage of existing revenue sources and institutions. 1. The Commonwealth of Massachusetts should reallocate and/or increase existing revenue sources and direct the funds to specific *CCMP* activities. Examples of these sources are general appropriations, wastewater treatment facility permit fees, boater fees, local boater-related charges, revenue sharing from the state, and other local fees.	Mass. legislature, municipalities, federal granting agencies	

✓ - **High Priority Action**

RECOMMENDED POLICIES AND ACTIONS
FUNDING STRATEGY

CODE	POLICY	AGENCIES	STATUS
II.B.	The Commonwealth of Massachusetts should create new revenue sources in the form of taxes, fees, and voluntary measures. 1. To help finance personnel and other operational costs, the Commonwealth of Massachusetts should establish legislative authority to levy new special taxes and user fees on polluters and/or beneficiaries of a clean and healthy Bay to support specifically identified programs. Specific revenue options include a tax levied on chemical and allied products, septic system-derived fees, land use-based charges, and a surcharge on water usage.	Mass. legislature, state agencies, municipalities	
II.C.1.	The Commonwealth of Massachusetts should develop appropriate means of funding *CCMP* capital needs. The Commonwealth of Massachusetts should increase the amount of capital available for CSO abatement during the FY 92-97 period and should begin planning to meet estimated post FY 97 funding needs. a. The Commonwealth of Massachusetts should increase its state match to the SRF program to a level higher than the required minimum amount thus providing an "overmatch" as the State of Rhode Island has done. b. Loan program interest conditions for the Massachusetts SRF Program should be restructured in order to allow an increase in level of activity, *i.e.*, to start to leverage funds and begin to aggressively pursue its stated objectives; c. The Massachusetts State SRF Program should increase the amount of funds to be directed to the City of Fall River (current allocation $600,000) and the City of Taunton (current allocation $0). d. The Commonwealth of Massachusetts should plan to cover the estimated $125 million necessary to complete CSO abatement recommendations at Fall River and Taunton with specially issued bonds or by including these projects as eligible under broader-purpose bonds.	Mass. legislature, MASRF	
II.C.2.	The Commonwealth of Massachusetts should utilize existing bond authorizations or issue new bonds to fund its share of the bi-state sediment remediation demonstration project scheduled to occur during FY 92-97, and should begin planning to provide the estimated $96 million necessary to remediate eight sites on the Blackstone River scheduled to begin after FY 97 through special or multi-purpose bonds.	Mass. legislature, state agencies, municipalities	

✓ - **High Priority Action**

RECOMMENDED POLICIES AND ACTIONS
FUNDING STRATEGY

CODE	POLICY	AGENCIES	STATUS
III.	The State of Rhode Island and the Commonwealth of Massachusetts should seek increased funding from the U.S. Congress for *CCMP* implementation.		
III.A.	The State of Rhode Island and the Commonwealth of Massachusetts should encourage the U.S. Congress to reinstate the construction grants program and/or increase the amount of capitalization grants available to the state SRFs (to the $8.5 billion level designated in the 1987 Clean Water Act authorization) in order to assist with financing capital projects required by federal law. The State of Rhode Island and the Commonwealth of Massachusetts should encourage the U.S. Congress to provide SRF funding beyond the 1996 timeframe currently in place. The proposed Narragansett Bay Implementation Committee, in conjunction with other National Estuary Programs, state agencies and affected municipalities, should effectively advocate for increases in federal funding.	R.I., Mass., Narragansett Bay Implementation Committee	

✓ - High Priority Action

05-04 Federal Consistency Report

Introduction

Section 320 (b)(7) of the federal Clean Water Act (CWA) directs participants in the National Estuary Program to evaluate the draft Narragansett Bay *Comprehensive Conservation and Management Plan* (*CCMP*) for consistency with existing federal and federally-assisted programs. The "Purpose 7" review, or "Federal Consistency Report", described in the Clean Water Act has been interpreted to require a *one-time*, preliminary assessment of direct and indirect federal program activities in order to:

1. Identify and attempt to resolve possible inconsistencies between *CCMP* goals and objectives, and existing federal or federally assisted programs that could affect adoption or implementation of the *CCMP*; *and*

2. Recommend an ongoing procedure (such as the federal consistency review process established under Section 307 of the Coastal Zone Management Act (CZMA) or the Executive Order (E.O.) 12372 process) for identifying and resolving inconsistencies between the *CCMP* and proposed direct or indirect federal activities that could affect Narragansett Bay following approval of the *CCMP*.

These requirements are addressed below in the context of the *CCMP*'s adoption as an element of the *Rhode Island State Guide Plan*, and incorporation of relevant *CCMP* policies into the Rhode Island and Massachusetts coastal resources management plans.

Existing Policies

As indicated in 01-04-04 Process of Plan Development: *CCMP* Review and Development, the Narragansett Bay Project Executive Committee ratified a bifurcated process for approving and adopting the Narragansett Bay *CCMP*. Following presentation of the draft *CCMP* to the public for review and comment, the revised *CCMP* will be presented to Rhode Island's State Planning Council for adoption as an element of the *Rhode Island State Guide Plan*. The revised *CCMP* will simultaneously be sent to the U.S. Environmental Protection Agency (EPA) and the Governor of Rhode Island for official approval. In addition, pursuant to a Memorandum of Agreement executed between EPA and the National Oceanic and Atmospheric Administration (NOAA) in September 1988, relevant portions of the approved *CCMP* will be submitted to the Rhode Island Coastal Resources Management Council (CRMC) for incorporation into *Rhode Island Coastal Resources Management Program* (*RICRMP*).

Once the *CCMP* is adopted as an element of the *Rhode Island State Guide Plan*, and relevant sections are incorporated into the *RICRMP*, proposed federal and federally assisted projects, as well as many state and local actions, become subject to review for consistency with the *CCMP* pursuant to E.O. 12372, Section 319 of the CWA, Section 307 of the CZMA, the National Environmental Policy Act (NEPA), and existing state NEPA review procedures. These "consistency review" procedures are discussed in more detail in 05-02-02 *CCMP* Implementation and Governance: Consistency Review of the *CCMP*, and summarized below.

In order to trigger the use of the existing consistency review procedures, however, the *CCMP* must, itself, be consistent with the mandates of the underlying state plans and policies. The process for developing the *CCMP* (715-01-04), in large part, assures that the *CCMP* is consistent with existing federal and state environmental policies since the major implementing authorities, including EPA, the Rhode Island Department of Environmental Management (RIDEM), CRMC, Rhode Island Division of Planning (RIDOP), the Massachusetts Department of Environmental Protection (MADEP), and Massachusetts Coastal Zone Management office (MACZM), were represented on the Narragansett Bay Project's Executive and/or Management Committees and, therefore, participated in drafting the *CCMP*. However, a more complete comparison of the draft *CCMP*'s goals and objectives with the *Rhode*

Island State Guide Plan, and Rhode Island's and Massachusetts' coastal resources management plans is presented below in order to identify possible areas of inconsistency that should be remedied in order to facilitate implementation of the *CCMP*.

Rhode Island State Guide Plan

The *Rhode Island State Guide Plan* represents a repository of the State's long range goals, objectives, and strategic plans for managing the "physical, economic and social development of the state" (R.I.G.L. 42-11-10). Specified state agencies, including the CRMC and the Rhode Island Port Authority and Economic Development Corporation, are directed by statute to develop their plans and management programs consistently with the *Rhode Island State Guide Plan*. Other state and local agency activities, including local comprehensive land use plans, are also subject to review for consistency with *Rhode Island State Guide Plan* goals and policies (Nickolai and Remington, 1991:25-26). In addition, the RIDOP, as the designated steward of the *Rhode Island State Guide Plan* and the State's "single point of contact" for the purpose of E.O. 12372, reviews federal and federally assisted activities for consistency with the *Rhode Island State Guide Plan*. The RIDOP also refers appropriate federal activities for the CRMC to review. The CRMC can then separately review these federal activities pursuant to the Section 307 federal consistency review process if they affect any land and water use and natural resource of Rhode Island's coastal zone.

The fundamental objectives of the *Rhode Island State Guide Plan* are stated in *Guide Plan* Element 110, *Goals and Policies*. Goals 4 ("Protection of the Coastal Region") and 8 ("Alleviation of Water Pollution Problems") are directly relevant for comparison with the draft *CCMP*.

"Goal 4" sets the following State objectives:

1. Preserve, develop, and where possible restore the resources of the coastal region...

2. Enhance the quality of the marine environment by reducing pollution and protecting endangered marine life.

3. Prevent overdevelopment of the coastal region.

4. Protect against the deterioration of existing development.

5. Reduce conflicts in the coastal region between uses and government jurisdictions.

6. Prevent the filling in of coastal waters and wetlands except where absolutely required for the health and welfare of the people.

7. Extend the jurisdiction of the state over offshore waters to the greatest extent possible.

8. Expand the anadromous fish restoration program (RIDOA/DOP, 1989: 02.110.07-02.110.08).

"Goal 8" recommends the following:

1. Improve the coordination of local water pollution control/ management plans and programs and seek regional solutions to the greatest extent possible.

2. Continue the close coordination of the state's water pollution control planning activities with those concerned with water resource development and land use development.

3. Assure that all proposals for water pollution control/management facilities and systems are fully analyzed and evaluated in terms of their impact on the social, economic, and physical environment.

4. Limit intensive development to areas served by public sewer systems which can provide for the adequate collection and treatment of the liquid wastes generated.

5. Require pre-treatment of sewage by industrial operations, where appropriate.

6. Upgrade treatment in municipal or other treatment plant facilities, where appropriate.

7. Support and encourage efforts to prevent and control spills of oil or contaminants.

8. Encourage research to better determine [sic] potential effects of thermal pollution on the marine environment.

9. Support efforts to maintain and strengthen the state's regulatory activities for water pollution control (RIDOA/DOP, 1989:02.110.09).

While these goals have varying degrees of relevance to the Narragansett Bay watershed, none are inconsistent with the goals set forth in Part 715-03 of the *CCMP*, the recommended actions in Part 715-04, or the implementation strategies recommended in Part 715-05. Therefore, there are no obvious barriers to adopting the *CCMP* as an element of the *Rhode Island State Guide Plan*. In addition, the process for approving the *CCMP* as an element of the *Rhode Island State Guide Plan* (R.I.G.L. 42-11-10(e)) assures that the draft *CCMP* is reviewed for consistency with other State goals and objectives.

Rhode Island Coastal Resources Management Program

Rhode Island's goals for the management of the coastal zone are stated in the Coastal Resources Management Council Act (R.I.G.L. 46-23-1). The Act states that:

> ...it shall be the policy of this state to preserve, protect, develop, and where possible restore the coastal resources of the state for this and succeeding generations through comprehensive and coordinated long-range planning and management designed to produce the maximum benefit for society from such resources; and that preservation and restoration of ecological systems shall be the primary guiding principle upon which environmental alteration of coastal resources will be measured, judged, and regulated.

To implement its enabling legislation and achieve its federal program approval in 1978, the CRMC adopted the *RICRMP* which underwent major revisions in 1983. The amendments to the *RICRMP* in 1983 adopted different enforceable policies for varying regions of Rhode Island based upon six categories of water type: Type 1 Conservation Areas; Type 2 Low-Intensity Use; Type 3 High-Intensity Boating; Type 4 Multipurpose Waters; Type 5 Commercial and Recreational Harbors; and Type 6 Industrial Waterfronts and Commercial Navigation Channels. These program changes created different enforceable policies for these areas which attempt to balance the needs of conservation with those of development. For example, the policies governing the use and development of Type 1 Conservation Areas with respect to natural resource protection, as stated in the *RICRMP*, include:

1. The Council's goal is to preserve and protect Type 1 waters from activities and uses that have the potential to degrade scenic, wildlife, and plant habitat values, or which may adversely impact water quality and the diversity of natural shoreline types.

2. The mooring of houseboats and floating businesses, the construction of recreational boating facilities, filling below mean high water, point discharge of substances other than runoff water, and the placement of industrial or commercial structures or operations (excluding fishing and aquaculture) are all prohibited in Type 1 waters.

3. In Type 1 waters, activities and alterations including dredging, dredged materials disposal, structural shoreline protection, and grading and excavation on abutting

shoreline features are all prohibited unless the primary purpose of the activity is to preserve or enhance the area as a conservation area and/or a natural buffer against storms.

4. Since runoff can be a major source of pollutants for developed areas, new or enlarged point discharges of runoff shall be permitted in Type 1 waters only when it is demonstrated that no reasonable alternative exists and that no significant adverse impact to the receiving waters will result. The cumulative impacts of runoff are of particular concern in Type 1 waters.

These particular policies correspond closely with *CCMP* goals, objectives, and recommendations regarding protection and restoration of water quality, natural resources, and appropriate uses of Narragansett Bay and its tributary waters. However, the policies for other waters such as Type 3 High Intensity Boating and Type 6 Industrial Waterfronts and Commercial Navigation Channels do not correspond as closely. Thus, some modification of recommended actions and policies contained in the *CCMP* may have to occur, or at least be accompanied by a description of how these are to be implemented, if these policies are to be incorporated into the CRMC's regulatory program and get approved by NOAA.

The CRMC has also adopted a series of *Special Area Management (SAM) Plans*. These *Plans* contain added policies to protect and manage valuable coastal resources of Rhode Island. Many of the policies and regulatory procedures contained in the *SAM Plans* also correspond to goals and policies in the *CCMP* as well as the process used to create the *CCMP*. For example, the desired "multilayered process of communication and personal interaction" referred to as a goal in the Providence Harbor *SAM Plan* is extremely similar to the process of consensus-building among the Bay constituencies represented on the Narragansett Bay Project Executive and Management Committees.

In summary, the *CCMP* appears to be consistent with the policies stated in *RICRMP*. However, the *CCMP* may, in some instances, recommend specific policies that are more protective of water quality, living marine resources and aquatic habitats than the "Policies", "Prerequisites", "Prohibitions" and "Standards" contained in the *RICRMP*. In these instances, modifications to the Coastal Resources Management Council policies would be necessary if these recommendations are to become incorporated in the CRMC's *RICRMP* as approved by NOAA.

Massachusetts Coastal Zone Management Plan

The Massachusetts Coastal Zone Management office (MACZM) has adopted 13 regulatory policies and 14 nonregulatory policies to protect the coastal zone. Since MACZM does not exercise any direct permitting authority, these policies are implemented through the State's Section 307 federal consistency review authority and the Massachusetts Environmental Protection Act (MEPA). The MACZM has adopted the following regulatory policies that are directly relevant to the draft Narragansett Bay *CCMP*:

Policy 1—Protect ecological significant resource areas (salt marshes, shellfish beds, dunes, beaches, barrier beaches, and salt ponds) for their contributions to marine productivity and value as natural habitats and storm buffers.

Policy 2—Protect complexes of marine resource areas of unique productivity (Areas for Preservation or Restoration/Areas of Critical Environmental Concern; ensure that activities in or impacting on such complexes are designed and carried out to minimize adverse effects on marine productivity, habitat values, water quality, and storm buffering of the entire complex.

Policy 3—Support attainment of the national water quality goals for all waters of the coastal zone through

coordination with existing water quality planning and management agencies. Ensure that all activities endorsed by [Mass.] CZM and its policies are consistent with federal and state effluent limitations and water quality standards.

Policy 10—All development must conform to existing applicable state and federal requirements governing sub-surface waste discharges, source of air and water pollution, and protection of inland wetlands (Buzzards Bay Project, 1991:5).

These policies are consistent with recommended goals, objectives and actions in the Narragansett Bay *CCMP* regarding pollution control, resource protection, and protection of areas of special concern.

Ongoing Consistency Review Procedure

Direct federal actions and indirect, federally assisted activities are subject to state review and comment pursuant to several federally mandated "consistency review" mechanisms. (See 715-05-02.) The general purpose of these federal grants of authority is to provide the states with a mechanism for commenting on the appropriateness of a proposed governmental activity with respect to established state goals and policies. As a result, certain federal, state and local actions will become subject to review for their consistency with the Narragansett Bay *CCMP* upon the *CCMP*'s adoption as an element of *Rhode Island State Guide Plan*, and incorporation of relevant portions of the *CCMP* containing "enforceable policies" into the Rhode Island and Massachusetts coastal zone management plans.

The recommended procedures for performing the ongoing consistency review are described in detail in 05-02-01 *CCMP* Implementation and Governance: Institutional Oversight and 05-02-02 *CCMP* Implementation and Governance: Consistency Review of the *CCMP*. Briefly, it is proposed that the RIDOP will monitor federal activities using the E.O. 12372 process and forward appropriate activities to RIDEM's Office of Environmental Coordination and the CRMC for review and comment. For major federal activities or in instances of disagreement between state agencies during the E.O. 12372 review, all interested parties will be brought together to clarify their positions and formulate a recommendation expressing essential points of each. The CRMC can further pursue Section 307 federal consistency reviews for any of the activities referred to it by RIDOP under the E.O. 12372 process. To strengthen the existing review process for federal activities, the CCMP recommends several actions be taken: (1) a memorandum of understanding (MOU) between RIDOP and CRMC should be formulated which formalizes the existing review process and helps improve the effectiveness of the E.O. 12372 process; (2) the CRMC will amend its existing Section 307 list to include the activities that are unavailable for review under the E.O. 12372 process or under the Section 319 process; (3) the CRMC will amend the federal consistency portion of the 1978 *RICRMP* to address the 1990 amendments to the CZMA; and (4) the CRMC will work with appropriate state and federal agencies to adopt relevant portions of the CCMP into the *RICRMP* thus expanding the scope of the Section 307 review process to cover these policies (for more detail see Chapter 05-02-02 of the *CCMP*).

Resolution of identified inconsistencies will depend upon whether E.O. 12372 or Section 307 of the CZMA provides the legal basis for the consistency review. *CCMP* Implementation and Governance: Consistency Review (05-02-02) describes the strengths and limitations of each procedure.

Analysis

As indicated above, effective implementation of the Narragansett Bay *CCMP* will partially depend upon the ability of Rhode Island and Massachusetts to evaluate proposed governmental actions for consistency with the *CCMP*. In addition, in order to effectively use the available consistency review procedures, the *CCMP* must be integrated into existing state plans, and the existing consistency review procedures must be strength-

ened and coordinated to achieve the best possible protection from federal agency actions which may be inconsistent with state policies. This section, therefore, addresses potential areas of concern with respect to incorporating the *CCMP* into existing state plans, and using existing state authority to ensure consistency.

General

The Narragansett Bay *CCMP* recommends actions to protect and restore Bay water quality, the health of its living resources, and water quality dependent uses of the Bay. Since the health of Narragansett Bay depends to a large extent on activities occurring throughout the Bay watershed, the *CCMP* addresses resource management issues in both Rhode Island and Massachusetts portions of the Bay basin. Therefore, implementation of the *CCMP* depends upon the geographic and subject matter jurisdiction of the primary implementing authorities and the effectiveness of existing consistency review procedures.

In Rhode Island, the *Rhode Island State Guide Plan* and the *RICRMP* represent the most effective vehicles for assuring that future governmental actions are consistent with *CCMP* policies. Since the *Rhode Island State Guide Plan* represents the repository of state goals, policies, and strategic plans for the entire state, adoption of the *CCMP* as an element of the *Rhode Island State Guide Plan* will assure that the E.O. 12372 review process will apply with respect to assuring consistency with the *CCMP* in the entire Rhode Island portion of the Bay basin. Although the CRMC's permitting jurisdiction is limited to the Rhode Island coastal zone, its ability to invoke its CZMA Section 307 consistency review authority with respect to federal agency and federally-permitted activities within and outside the coastal zone affecting the land and water uses and natural resources of the coastal zone provides an extremely effective means of assuring that relevant *CCMP* policies are implemented to protect Rhode Island's coastal waters. Therefore, relevant sections of the *CCMP* with "enforceable policies" should be incorporated into the *RICRMP*. A state NEPA process would be another vehicle for detecting and addressing federal (or state or local) activities that appeared to be inconsistent with the *CCMP*.

Rhode Island State Guide Plan

There are no obvious impediments to adopting the *CCMP* as an element of the *Rhode Island State Guide Plan*. Therefore, subject to the State Planning Council's approval of the *CCMP*, E.O. 12372 will apply to the entire Plan. The E.O. 12372 list of federal activities subject to review should be expanded in order to ensure that all relevant federal activities are subject to review. This expansion should include all activities eligible for review under the E.O. 12372 process as well as those eligible under the Section 319 review authority.

Rhode Island Coastal Resources Management Program

There are no legal impediments to adopting relevant sections of the *CCMP* into the *RICRMP*. Under the terms of the Memorandum of Agreement executed between EPA and NOAA in September 1988, relevant portions of the approved *CCMP must* be submitted to the CRMC for incorporation into *RICRMP*. The *CCMP* goals, objectives, and recommendations are, for the most part, consistent with "Policies" stated in the *RICRMP*. The major consistency problems that may arise are when the recommended policies and actions adopted in the *CCMP* are more protective of water quality and natural resources than the "Prerequisites", "Prohibitions" and/or "Standards" contained in the *RICRMP*. For these more restrictive policies to be adopted into the *RICRMP*, they must be acceptable program changes and be approved by NOAA. Within this process, these policies must be consistent with the CRMC's federal and state legislative mandates.

Once the *CCMP* is incorporated into the *Rhode Island State Guide Plan* and the *RICRMP*, there are two separate avenues for assuring that the Section 307 CZMA consistency review process will apply to the relevant enforceable policies contained in

the *CCMP* and the *RICRMP*. First, the CZMA Section 307 consistency review process applies to all policies incorporated into the *RICRMP*. The agreement between NOAA and the EPA that *CCMP*s will be submitted for incorporation into approved state coastal zone management programs should ensure that all relevant enforceable policies contained in the *CCMP* ultimately become included in the *RICRMP* and thus subject to Section 307 review. Second, the RIDOP's E.O. 12372 reviews will refer appropriate activities for the CRMC's review. When appropriate, the CRMC can subject these activities to the more powerful Section 307 federal consistency review process. Because many of the *CCMP*'s policies are similar to the CRMC's preexisting enforceable policies, the CRMC can use its existing policies to review federal activities for consistency with the *CCMP*'s policies to the extent permissible under federal law. It should be noted that the only policies against which the CRMC can review federal activities and federal licenses and permits are the enforceable policies contained in the *RICRMP* as approved by NOAA.

NOAA's regulations, promulgated pursuant to Section 307 of the CZMA, *require* federal activities to be consistent (not in conflict) with "the enforceable, mandatory policies of the [coastal] management program..." However, coastal management provisions that "are in the nature of recommendations" need only be given "adequate consideration" by federal agencies (15 CFR 930.39[c]; 15 CFR 930.64[b]; Nickolai and Remington, 1991:5). Although *CCMP* policies and recommendations clearly qualify under one of these standards, the problem is distinguishing "enforceable policies" from "recommendations".

The 1990 reauthorization of the CZMA defines "*enforceable policies*" as:

> State policies which are legally binding through constitutional provisions, laws, resolutions, land use plans, ordinances, or judicial or administrative decisions, by which a State exerts control over private and public land and water uses and natural resources in the coastal zone (16 USC 1453(6a), as amended).

In order to apply Section 307 federal consistency authority to the policies contained in the *CCMP*, they must be incorporated into the *RICRMP*, as approved by NOAA, and meet the definition of enforceability as described above. However, Section 307(f) of the CZMA does state that the requirements of the Clean Water Act are the water pollution control requirements of the coastal zone management programs. Thus, at such time as the RIDEM adopts any water quality standards required by the Clean Water Act, these standards would be considered enforceable policies of the CRMC under Section 307 without having to be incorporated into the CRMP and go through a formal program change process under NOAA.

Thus, for the CRMC to apply its Section 307 federal consistency authority to other *CCMP* policies, appropriate sections of the *CCMP* which contain policies that have the potential to be enforceable must be identified. At that point, they must undergo the process of program change and be approved not only by the CRMC, but also by NOAA. To further expand the use of the Section 307 review process, implementation of recommended priority actions in the *CCMP* should be designed such that implementation of these actions results in enforceable policies that can then be adopted as part of NOAA's approved *RICRMP* for Rhode Island.

Massachusetts Coastal Zone Management Plan

Sixty percent of the Bay watershed lies in Massachusetts. Therefore, in order to effectively protect and restore Narragansett Bay, it is important that Massachusetts uses its consistency review authority to review proposed federal and federally-assisted actions in the Massachusetts portion of the basin that could potentially affect Narragansett Bay.

The Commonwealth has established E.O. 12372, Section 307, and MEPA consistency review processes. In addition, the *CCMP* appears to be consistent with the MACZM's

regulatory and non-regulatory policies. Therefore, the most significant improvements to the Commonwealth's available consistency review authority with respect to the *CCMP* include (1) providing notice of proposed federal, federally-assisted and state actions in the Massachusetts' portion of the basin to appropriate Rhode Island authorities for review and comment; and (2) expanding the list of federal and federally-assisted activities subject to E.O. 12372 and Section 307 review, as necessary, to include the federal program activities listed in Tables 715-05(7) and (8), below.

Ongoing Consistency Review Procedure

The following criteria were used to identify the federal programs and activities that should be subject to consistency review by the RIDOP and the Massachusetts Executive Office of Communities and Development (MAEOCD) under E.O.12372, and the coastal zone management agencies pursuant to their Section 307 authority:

1. Federal program activities are currently subject to consistency review by virtue of state authority established pursuant to E.O. 12372, CWA Section 319, or CZMA Section 307.

2. Activities performed or supported under the federal programs listed in the 1991 Catalog of Federal Domestic Assistance programs and EPA's compendium, *Federal Financial Assistance Programs: Targeting Programs Applicable to Coastal Management* (EPA, 1989b), *could* result in a direct environmental impact to Narragansett Bay or the Bay watershed, or the activities *could* set in motion a chain of events leading to an impact .

Based upon these criteria, an inventory of federal programs that are, or should be, subject to ongoing review for consistency with the *CCMP* is presented in Tables 715-05(7) ("Federal Financial Assistance Programs") and 715-05(8) ("Direct Federal Activities"). Note that the programs and activities listed in Tables 715-05(7) and (8) have been recommended for ongoing review because of their *potential* to affect Narragansett Bay, *i.e.*, these programs and activities are not, *a priori*, in conflict with the *CCMP*.

Each program in Table 715-05(7) is entered by Federal Domestic Assistance number (FDA #), program title, program type (*e.g.*, formula grant, project grant, direct payments for specified use), and federal agency. Table 715-05(7) also identifies each federal domestic assistance program that is *presently* subject to intergovernmental review by the RIDOP ("E.O. 12372"), and RIDEM's Nonpoint Source Program ("N/P") pursuant to E.O. 12372. Federal programs which should be reviewed for consistency with the *CCMP* pursuant to E.O. 12372 procedures, are designated "*CCMP*." The last column in the table, "307 Alert," represents federal programs that should be officially "listed" for federal consistency review by both the CRMC and MACZM pursuant to Section 307 of the CZMA .

Table 715-05(8) lists some direct federal actions and regulatory activities, by agency, that should also be reviewed for consistency with the *CCMP*. Direct actions subject to consistency review include acquisition, development and disposal of federal property. Examples of regulatory actions subject to review include EPA's issuance of discharge permits to Massachusetts dischargers tributary to Narragansett Bay, and the U.S. Army Corps of Engineers' (USACOE) issuance of permits for dredged material disposal in navigable waters.

To the extent the activities listed on Table 515-05(8) are not eligible for review under E.O. 12372, they should be "listed" for review by the coastal zone management agencies of both Rhode Island and Massachusetts. In addition, CRMC and MACZM should develop appropriate procedures to notify each other of pending federal actions that could affect the waters or natural resources of the neighboring state. In addition, the CRMC, RIDOP, the Narragansett Bay Planning Section, and the Narragansett Bay Implementation Com-

mittee should make every effort to develop criteria and identify appropriate standards and policies which facilitate the RIDOP's review of activities under the E.O. 12372 process with the *CCMP*.

TABLE 715-05(7): FEDERAL ASSISTANCE PROGRAMS SUBJECT TO FEDERAL CONSISTENCY REVIEW

Key to Abbreviations

Column Headings

FDA #:
Federal Domestic Assistance number.

Fed. Agency:
Federal agency responsible for program, down to division/office level.

E.O. 12372:
Federal programs presently subject to intergovernmental review pursuant to E.O. 12372 by the Rhode Island Division of Planning.

N/ P:
Federal programs subject to review by the RIDEM for consistency with *Rhode Island's Nonpoint Source Management Plan* (R.I. Department of Environmental Management, Office of Environmental Coordination, December 1988).

***CCMP*:**
Federal programs not presently reviewed under E.O. 12372 or the Nonpoint Source Management Program which should be reviewed for consistency with the *Narragansett Bay CCMP*.

307 Alert:
Federal programs which should be "listed" for federal consistency review under Section 307 of the Coastal Zone Management Act by the Rhode Island Coastal Resources Management Council and Massachusetts Coastal Zone Management office.

Agencies

Department of Agriculture

ASCS:	Agricultural Stabilization and Conservation Service.
FmHA:	Farmers Home Administration.
REA:	Rural Electrification Administration.
SCS:	Soil Conservation Service.

Department of Commerce

EDA:	Economic Development Administration.
NOAA:	National Oceanic and Atmospheric Administration.
NTIA:	National Telecommunications and Information Administration.

Department of Defense

COE:	U.S. Army Corps of Engineers.
OASD:	Office of the Assistant Secretary.

Department of Health and Human Services

PHS:	Public Health Service.

Department of Housing and Urban Development

FHC:	Federal Housing Commissioner.
CPD:	Community Planning and Development.
PIH:	Public and Indian Housing.

Department of the Interior

BIA:	Bureau of Indian Affairs.
FWS:	Fish and Wildlife Service.
USGS:	U.S. Geological Survey.
NPS:	National Park Service.

Department of Transportation

FAA:	Federal Aviation Administration.
FHWA:	Federal Highway Administration.
FRA:	Federal Railroad Administration.
UMTA:	Urban Mass Transportation Administration.
USCG:	U.S. Coast Guard.

Environmental Protection Agency

Water:	Office of Water.
Adm.:	Office of Administration.
OPTS:	Office of Pesticides and Toxic Substances.
OSWER:	Office of Solid Waste and Emergency Response.
OPPE:	Office of Policy, Planning and Evaluation.

Federal Emergency Management Agency

SLPS:	State and Local Programs and Support.

FDA #	Program Title	Program Type	Federal Agency	E.O. 12372	N/P	CCMP	307 Alert
10.054	Emergency Conservation Program	Direct payments for specified use	Dept. of Agriculture, ASCS		X		
10.062	Water Bank Program	Direct payments for specified use	Dept. of Agriculture, ASCS			X	
10.063	Agricultural Conservation Program	Direct payments for specified use	Dept. of Agriculture, ASCS		X	X	
10.064	Forestry Incentives Program	Direct payments for specified use	Dept. of Agriculture, ASCS		X		
10.068	Rural Clean Water Program	Direct payments for specified use	Dept. of Agriculture, ASCS		X	X	
10.069	Conservation Reserve Program	Direct payments for specified use	Dept. of Agriculture, ASCS		X	X	X
10.414	Resource Conservation and Development Loans	Direct loans	Dept. of Agriculture, FmHA	X	X	X	X
10.416	Soil and Water Loans	Guaranteed/insured loans	Dept. of Agriculture, FmHA	X	X	X	X
10.418	Water and Waste Disposal Systems for Rural Communities	Project grants, direct loans	Dept. of Agriculture, FmHA	X	X	X	X
10.419	Watershed Protection and Flood Prevention Loans	Direct loans	Dept. of Agriculture, FmHA	X	X	X	X
10.422	Business and Industrial Loans	Guaranteed/insured loans	Dept. of Agriculture, FmHA	X			
10.423	Community Facilities Loans	Direct loans	Dept. of Agriculture, FmHA	X			X
10.424	Industrial Development Grants	Project grants	Dept. of Agriculture, FmHA	X			X
10.436	Technical Assistance and Training Grants	Project grants	Dept. of Agriculture, FmHA			X	

Table 715-05(7) FEDERAL ASSISTANCE PROGRAMS SUBJECT TO FEDERAL CONSISTENCY REVIEW

FDA #	Program Title	Program Type	Federal Agency	E.O. 12372	N/P	CCMP	307 Alert
10.440	Emergency Community Water Assistance Grants	Project grants	Dept. of Agriculture, FmHA	X			
10.500	Cooperative Extension Service	Formula grants	Dept. of Agriculture, Extension Svc.		X	X	X
10.664	Cooperative Forestry Assistance	Formula grants, project grants, use of property, facilities, equipment	Dept. of Agriculture, Forestry Svc.	X	X		
10.854	Rural Economic Development Loans and Grants	Project grants, direct loans	Dept. of Agriculture, REA	X			X
10.901	Resource Conservation and Development	Project grants, advisory services and counseling	Dept. of Agriculture, SCS	X	X	X	X
10.904	Watershed Protection and Flood Prevention	Project grants, advisory services and couseling	Dept. of Agriculture, SCS	X	X	X	X
10.906	River Basin Surveys and Investigations	Provision of special services	Dept. of Agriculture, SCS	X	X	X	
11.300	Grants for Public Works and Development Facilities	Project grants	Dept. of Commerce, EDA	X	X	X	X
11.301	Business Development Assistance	Guaranteed/insured loans	Dept. of Commerce, EDA				
11.302	Support for Planning Organizations	Project grants	Dept. of Commerce, EDA	X		X	X
11.303	Technical Assistance	Project grants	Dept. of Commerce, EDA	X		X	X
11.304	Public Works Impact Projects	Project grants	Dept. of Commerce, EDA	X	X	X	X
11.305	State and Local Economic Development Planning	Project grants	Dept. of Commerce, EDA	X	X		

Table 715-05(7) FEDERAL ASSISTANCE PROGRAMS SUBJECT TO FEDERAL CONSISTENCY REVIEW

FDA #	Program Title	Program Type	Federal Agency	E.O. 12372	N/P	CCMP	307 Alert
11.307	Sudden and Severe Economic Dislocation and Long-Term Economic Deterioration	Project grants	Dept. of Commerce, EDA	X			X
11.405	Anadromous and Great Lakes Fisheries Conservation	Project grants	Dept. of Commerce, NOAA	X		X	X
11.407	Interjurisdictional Fisheries Act of 1986	Formula grants	Dept. of Commerce, NOAA	X		X	X
11.415	Fishing Vessel Obligation Guarantees	Guaranteed/insured loans	Dept. of Commerce, NOAA				
11.417	Sea Grant Support	Project grants	Dept. of Commerce, NOAA			X	X
11.419	Coastal Zone Management Program Administration Grants	Project grants, formula grants	Dept. of Commerce, NOAA	X	X	X	X
11.420	Coastal Zone Management Estuarine Research Reserves	Project grants	Dept. of Commerce, NOAA	X	X	X	X
11.427	Fisheries Research and Development Grants/Cooperative Agreements	Project grants (cooperative agreements)	Dept. of Commerce, NOAA	X		X	X
11.429	Marine Sanctuary Program	Project grants (cooperative agreements)	Dept. of Commerce, NOAA			X	X
11.550	Public Telecommunications Facilities -- Construction and Planning	Project grants	Dept. of Commerce, NTIA	X			X

Table 715-05(7) FEDERAL ASSISTANCE PROGRAMS SUBJECT TO FEDERAL CONSISTENCY REVIEW

FDA #	Program Title	Program Type	Federal Agency	E.O. 12372	N/P	CCMP	307 Alert
12.100	Aquatic Plant Control	Provision of specialized services, technical information	Dept. of Defense, COE	X		X	X
12.101	Beach Erosion Control Projects	Provision of specialized services	Dept. of Defense, COE	X	X	X	X
12.102	Emergency Rehab of Flood Control Works or Federally Authorized Coastal Protection Works	Provision of specialized services	Dept. of Defense, COE			X	X
12.104	Flood Plain Management Services	Advisory services and counseling, technical information	Dept. of Defense, COE	X	X		X
12.105	Protection of Essential Highways, Highway Bridge Approaches, and Public Works	Provision of specialized services	Dept. of Defense, COE	X	X		X
12.106	Flood Control Projects	Provision of specialized services	Dept. of Defense, COE	X	X	X	X
12.107	Navigation Projects	Provision of specialized services	Dept. of Defense, COE	X		X	X
12.108	Snagging and Clearing for Flood Control	Provision of specialized services	Dept. of Defense, COE	X			X
12.109	Protection, Clearing, and Straightening Channels	Provision of specialized services	Dept. of Defense, COE	X		X	X
12.110	Planning Assistance to States	Provision of specialized services	Dept. of Defense, COE	X			X
12.111	Emergency Advance Measures for Flood Prevention	Provision of specialized services	Dept. of Defense, COE			X	X

Table 715-05(7) **FEDERAL ASSISTANCE PROGRAMS SUBJECT TO FEDERAL CONSISTENCY REVIEW**

FDA #	Program Title	Program Type	Federal Agency	E.O. 12372	N/P	CCMP	307 Alert
12.400	Military Construction, Army National Guard	Project grants	Dept. of Defense, Dept. of Army				X
12.607	Military Base Re-use Studies and Community Planning	Project grants	Dept. of Defense, OASD			X	X
12.610	Joint Military/ Community Comprehensive Land Use Plans	Project grants	Dept. of Defense, OASD	X		X	X
13.291	Surplus Property Utilization	Sale, exchange, or donation of property and goods	Dept. of Health and Human Services, PHS			X	X
14.112	Mortgage Insurance for Construction or Substantial Rehab of Condominium Projects	Guaranteed/ insured loans	Dept. of Housing and Urban Development, FHC	X			
14.116	Mortgage Insurance -- Group Practice Facilities	Guaranteed/insured loans	Dept. of Housing and Urban Development, FHC	X			
14.126	Mortgage Insurance -- Cooperative Projects	Guaranteed/insured loans	Dept. of Housing and Urban Development, FHC	X			
14.127	Mortgage Insurance -- Manufactured Home Parks	Guaranteed/insured loans	Dept. of Housing and Urban Development, FHC	X			
14.128	Mortgage Insurance -- Hospitals	Guaranteed/insured loans	Dept. of Housing and Urban Development, FHC	X			
14.134	Mortgage Insurance -- Rental Housing	Guaranteed/insured loans	Dept. of Housing and Urban Development, FHC	X			

Table 715-05(7) FEDERAL ASSISTANCE PROGRAMS SUBJECT TO FEDERAL CONSISTENCY REVIEW

FDA #	Program Title	Program Type	Federal Agency	E.O. 12372	N/P	CCMP	307 Alert
14.135	Mortgage Insurance -- Rental and Co-operative Housing for Moderate Income Families and Elderly, Market Interest Rate	Guaranteed/insured loans	Dept. of Housing and Urban Development, FHC	X			
14.138	Mortgage Insurance -- Rental Housing for the Elderly	Guaranteed/insured loans	Dept. of Housing and Urban Development, FHC	X			
14.139	Mortgage Insurance -- Rental Housing in Urban Renewal Areas	Guaranteed/insured loans	Dept. of Housing and Urban Development, FHC	X			
14.142	Property Improvement Loan Insurance for All Existing Structures and Building of New Nonresidential Structures	Guaranteed/insured loans	Dept. of Housing and Urban Development, FHC				
14.174	Housing Development Grants	Project grants	Dept. of Housing and Urban Development, FHC	X			X
14.218	Community Development Block Grants/Entitlement Grants	Formula grants	Dept. of Housing and Urban Development, CPD	X			X
14.219	Community Development Block Grants/Small Cities Program	Project grants	Dept. of Housing and Urban Development, CPD			X	
14.220	Section 312 Rehabilitation Loans	Direct loans	Dept. of Housing and Urban Development, CPD			X	

Table 715-05(7) FEDERAL ASSISTANCE PROGRAMS SUBJECT TO FEDERAL CONSISTENCY REVIEW

FDA #	Program Title	Program Type	Federal Agency	E.O. 12372	N/P	CCMP	307 Alert
14.223	Indian Community Development Block Grant Program	Project grants	Dept. of Housing and Urban Development, CPD				
14.228	Community Development Block Grants/State's Program	Formula grants	Dept. of Housing and Urban Development, CPD				X
14.230	Rental Housing Rehabilitation	Formula grants	Dept. of Housing and Urban Development, CPD				X
14.850	Public and Indian Housing	Direct payments for specific use	Dept. of Housing and Urban Development, PIH	X			
14.852	Public and Indian Housing -- Comprehensive Improvement Assistance Program	Direct payments for specific use	Dept. of Housing and Urban Development, PIH	X			
15.124	Indian Loans -- Economic Development	Direct loans, guaranteed/ insured loans, provision of specialized services	Dept. of the Interior, BIA				X
15.145	Indian Grants -- Economic Development	Project grants, direct payments for specific use	Dept. of the Interior, BIA				X
15.600	Anadromous Fish Conservation	Project grants	Dept. of the Interior, FWS	X		X	X
15.605	Sport Fish Restoration	Formula grants	Dept. of the Interior, FWS	X		X	X
15.607	Environmental Contaminants	Provision of specialized services	Dept. of the Interior, FWS			X	X
15.611	Wildlife Restoration	Formula grants	Dept. of the Interior, FWS	X		X	X

Table 715-05(7) FEDERAL ASSISTANCE PROGRAMS SUBJECT TO FEDERAL CONSISTENCY REVIEW

FDA #	Program Title	Program Type	Federal Agency	E.O. 12372	N/P	CCMP	307 Alert
15.612	Endangered Species Conservation	Project grants	Dept. of the Interior, FWS	X		X	X
15.806	National Water Resources Research Program	Project grants	Dept. of the Interior, USGS			X	X
15.904	Historic Preservation Fund -- Grants-in-Aid	Project grants	Dept. of the Interior, NPS	X			X
15.916	Outdoor Recreation -- Acquisition, Development, and Planning	Project grants	Dept. of the Interior, NPS	X	X	X	X
15.918	Disposal of Federal Surplus Real Estate Property for Parks, Recreation, and Historic Monuments	Use of property, facilities, and equipment	Dept. of the Interior, NPS			X	X
20.005	Boating Safety Financial Assistance	Formula grants, project grants	Dept. of Transportation, USCG				X
20.106	Airport Improvement Program	Project grants, advisory services and counseling	Dept. of Transportation, FAA	X			X
20.205	Highway Planning and Construction	Formula grants, project grants	Dept. of Transportation, FHWA	X	X	X	X
20.308	Local Rail Service Assistance	Project grants	Dept. of Transportation, FRA				
20.500	Urban Mass Transportation Capital Improvement Grants	Project grants	Dept. of Transportation, UMTA	X			
20.507	Urban Mass Transportation Capital and Operating Assistance Formula Grants	Formula grants	Dept. of Transportation, UMTA	X			

Table 715-05(7) **FEDERAL ASSISTANCE PROGRAMS SUBJECT TO FEDERAL CONSISTENCY REVIEW**

FDA #	Program Title	Program Type	Federal Agency	E.O. 12372	N/P	CCMP	307 Alert
20.509	Public Transportation for Nonurbanized Areas	Formula grants	Dept. of Transportation, UMTA	X			
20.801	Development and Promotion of Ports and Intermodal Transportation	Project grants (cooperative agreements), advisory services and counseling, technical	Dept. of Transportation, Maritime Adm.	X		X	X
39.002	Disposal of Federal Surplus Real Estate Property	Sale, exchange, or donation of property and goods	General Services Administration		X		X
59.003	Loans for Small Businesses	Direct loans, advisory services and counseling	Small Business Administration				
59.012	Small Business Loans	Guaranteed/insured loans	Small Business Administration				
59.013	State and Local Development Comprehensive Loans	Guaranteed/insured loans	Small Business Administration				
59.041	Certified Development Company Loans	Guaranteed/insured loans	Small Business Administration				
66.418	Construction Grants for Wastewater Treatment Works	Project grants	Environmental Protection Agency, Office of Water	X	X	X	X
66.419	Water Pollution Control -- State and Interstate Program Support	Formula grants	Environmental Protection Agency, Office of Water	X		X	X
66.433	State Underground Water Source Protection	Formula grants	Environmental Protection Agency, Office of Water	X	X	X	

Table 715-05(7) FEDERAL ASSISTANCE PROGRAMS SUBJECT TO FEDERAL CONSISTENCY REVIEW

FDA #	Program Title	Program Type	Federal Agency	E.O. 12372	N/P	CCMP	307 Alert
66.435	Water Pollution Control -- Lake Restoration Cooperative Agreements	Project grants	Environmental Protection Agency, Office of Water	X	X		
66.454	Water Quality Management Planning	Formula grants	Environmental Protection Agency, Office of Water	X		X	X
66.456	National Estuary Program	Project grants	Environmental Protection Agency, Office of Water	X	X		X
66.458	Capitalization Grants for State Revolving Funds	Formula grants	Environmental Protection Agency, Office of Water	X		X	X
66.459	Nonpoint Source Reservation	Formula grants	Environmental Protection Agency, Office of Water	X		X	X
66.460	Nonpoint Source Implementation	Formula grants	Environmental Protection Agency, Office of Water	X		X	X
66.461	Wetlands Protection -- State Development Grants	Project grants	Environmental Protection Agency, Office of Water	X			X
66.600	Environmental Protection Consolidated Grants -- Program Support	Formula grants	Environmental Protection Agency, Adm.	X		X	
66.700	Consolidated Pesticide Compliance Monitoring and Program Cooperative Agreement	Project grants	Environmental Protection Agency, OPTS	X	X	X	

Table 715-05(7) FEDERAL ASSISTANCE PROGRAMS SUBJECT TO FEDERAL CONSISTENCY REVIEW

FDA #	Program Title	Program Type	Federal Agency	E.O. 12372	N/P	CCMP	307 Alert
66.701	Toxic Substance Compliance Monitoring Program	Project grants	Environmental Protection Agency, OPTS	X		X	
66.801	Hazardous Waste Management State Program Support	Formula grants	Environmental Protection Agency, OSWER	X			
66.802	Hazardous Substance Response Trust Fund	Project grants (cooperative agreements)	Environmental Protection Agency, OSWER	X			
66.804	State Underground Storage Tanks Program	Project grants	Environmental Protection Agency, OSWER	X	X		
66.805	Underground Storage Tanks Trust	Project grants	Environmental Protection Agency, OSWER	X			
66.808	Solid Waste Management Assistance	Project grants	Environmental Protection Agency, OSWER	X			
66.900	Pollution Prevention Incentives for States	Project grants	Environmental Protection Agency, OPPE	X		X	
81.048	Priorities and Allocations for Energy Programs and Projects	Provision of specialized services, training	Dept. of Energy				X
81.065	Nuclear Waste Disposal Siting	Project grants, direct payments for specific use	Dept. of Energy			X	X
81.092	Environmental Restoration	Project grants	Dept. of Energy			X	X
81.096	Clean Coal Technology Program	Formula grants	Dept. of Energy				

Table 715-05(7) FEDERAL ASSISTANCE PROGRAMS SUBJECT TO FEDERAL CONSISTENCY REVIEW

FDA #	Program Title	Program Type	Federal Agency	E.O. 12372	N/P	CCMP	307 Alert
83.502	Acquisition of Flood-damaged Structures	Sale, exchange, or donation of property and goods	Federal Emergency Management Agency, SLPS	X			X
83.505	State Disaster Preparedness Grants	Project grants	Federal Emergency Management Agency, SLPS	X			X

Table 715-05(7) FEDERAL ASSISTANCE PROGRAMS SUBJECT TO FEDERAL CONSISTENCY REVIEW

TABLE 715-05(8):

DIRECT AND REGULATORY ACTIONS BY FEDERAL AGENCIES THAT SHOULD BE REVIEWED FOR CONSISTENCY WITH THE NARRAGANSETT BAY *COMPREHENSIVE CONSERVATION AND MANAGEMENT PLAN*

Agency	***Action(s)***
Army Corps of Engineers	*Direct:* Project authorization for dredging, channel works, breakwaters, other navigation works,erosion control structures, beach replenishment, dams; and real property acquisition or disposal. *Regulatory:* Section 404, Clean Water Act, permits for discharge of dredged or fill materials in navigable waters; Section 10, Rivers and Harbors Act, permits for obstruction or alteration in navigable waters; Section 4(f), OCS Lands Act, permits for artificial islands, installations, and other devices permanently or temporarily attached to the seabed of the Outer Continental Shelf; Section 103, Marine Protection, Research, and Sanctuaries Act, ocean dumping permits.
Department of Defense *U.S. Navy*	*Direct:* Location and design of new or enlarged defense installations, or their disposal. *Regulatory:* Defense Environmental Restoration Program.
Department of Energy *Federal Energy Regulatory Commission*	*Regulatory:* Section 7, Natural Gas Act, permits for construction and operation of interstate gas pipelines and storage facilities, and permits for abandonment of natural gas pipeline facilities; Section 4(e), Federal Power Act, permits for construction and operation of power facilities and transmission lines.
Department of the Interior *Minerals Management Service*	*Direct:* Outer Continental Shelf lease sales and OCS exploration and development plans.
National Park Service	*Direct:* Location and design of facilities or real property acquisition or disposal.

Agency	***Action(s)***
Department of Transportation *Coast Guard*	*Direct:* Location and design of new or enlarged *U.S.* Coast Guard stations, bases, or lighthouses, or their disposal, and actions taken for waterfront safety pursuant to the Ports and Waterways Safety Act. *Regulatory:* Section 4, Deepwater Ports Act, licenses for ownership, construction, and operation of deep-water port; Section 9, Rivers and Harbors Act, permits for construction of bridges across navigable waters.
Federal Highway Administration	*Direct:* Contracts for stormwater management projects that accompany federal highway projects.
Environmental Protection Agency	*Direct:* Real property acquisition or disposal. *Regulatory:* Sections 402 and 404, Clean Water Act, NPDES permits and ocean dumping activity; Sections 102-104, Marine Protection, Research, and Sanctuaries Act, ocean dumping permits; waivers from compliance under the Clean Air Act; waivers from compliance with secondary treatment requirements under Clean Water Act.
General Services Administration	*Direct:* Location and design of federal government construction, and real property acquisition or disposal.
Nuclear Regulatory Commission	*Regulatory:* Section 201, Energy Reorganization Act, licenses for construction and operation of nuclear power plants; the production, transfer, import, and export of fissionable materials; and the disposal of radioactive waste.
Amtrak/Conrail	*Direct:* Railroad expansions, new construction, or abandonments.

05-05 Unfinished Agenda

The corrective actions recommended in Parts 715-04 (Issues, Objectives, and Strategies) and 715-05 (Implementation) of the Narragansett Bay *Comprehensive Conservation and Management Plan* (*CCMP*) address many aspects of the priority problems originally identified by the Narragansett Bay Project (NBP) Management Committee in 1985. (See 715-01-02 History of the Project). For example, of the seven original priority problems, aspects of the following "issues of concern" have been addressed in the 1992 edition of the *CCMP*:

- Impacts of toxic pollutants,
- Impacts of nutrients and eutrophication,
- Land-based impacts on water and habitat quality,
- Health and abundance of living resources,
- Health risk to consumers of seafood, and
- Environmental impacts on commercial and recreational uses of Narragansett Bay.

However, during the six years that the *CCMP* was under development (1985 to 1991), some problems were solved and new problems emerged. As a result, the current edition of the *CCMP* addresses a number of issues that were not identified as major problems in 1985. Some of the additional issue areas addressed in the current *CCMP* include: management of on-site sewage disposal systems, control of boater discharges, and management and restoration of Mount Hope Bay and the Blackstone River. In addition, a variety of governance issues that were not specifically anticipated in 1985 relating to the management of water supply, wastewater treatment, and the *CCMP* itself have also been addressed.

The current edition of the *CCMP* does not, however, address several problems that continue to be of concern with respect to the region's ultimate ability to protect and restore Narragansett Bay. For example, the *CCMP* should not be viewed as complete until the NBP Management Committee (or its successor) and the broader Bay community address the following issues:

- Greenwich Bay
- Management of living marine resources,
- Management of marine and riverine sediments,
- Bay governance, and
- Role of public participation in *CCMP* implementation.

Briefing papers on these subjects should be presented for NBP Management Committee consideration, and considered for incorporation into the *CCMP* as soon as possible.

In addition, the *CCMP* planning process, not surprisingly, exposed gaps in the Narragansett Bay research community's understanding of basic estuarine processes. The planning process also raised questions about the resource management community's ability to evaluate and address the incremental, cumulative environmental effects of some pollutants and pollutant sources, as well as its understanding of how to measure the environmental benefits of proposed corrective actions. Since the most controversial elements of the *CCMP* are those where scientific certainty about the sources, environmental consequences, or the solutions is the weakest, a few illustrative examples are presented briefly to emphasize the need for on-going research and policy development.

One example of a major gap in scientific understanding about Narragansett Bay involves freshwater inputs and Bay circulation. Some people in the research community have argued that marine scientists lack basic information about salinity dynamics, which limits their ability to predict estuarine water movement and, therefore, pollutant transport. A related problem concerns the lack of basic information about groundwater transport mechanisms, including

groundwater exchange with the Bay. Another related problem concerns the atmospheric contribution of pollutants, including nitrogen, to the Bay. Uncertainty about physical, chemical and/or biological pollutant transport mechanisms clearly limits the regulatory agencies' ability to predict the relative magnitude and environmental fate of pollutant discharges, as well as their ability to predict the environmental benefits of abating those discharges.

The second example involves the broad problem of understanding the incremental and cumulative impacts of individual nonpoint pollution sources sufficiently well to enable (and persuade) regulators to apply preventive regulatory measures. For example, 37 percent of Rhode Island's population currently depends upon onsite sewage disposal systems (OSDSs), and the dependency is increasing because of the trend toward suburbanization and development of rural areas in the Bay basin. However, regulatory decisions about OSDS siting and separation distances from receiving waters continue to be made on a case-by-case basis without regard to the cumulative environmental impact—based on what is, at best, an intuitive and skeptical understanding of the relationship between OSDS density, buffer distances and ultimate receiving water quality. A concerted effort should be made to adequately fund the research necessary to enable regulators to 1) address the potential cumulative impacts of development *during* the planning process, and 2) justify the use of mitigating measures prior to issuance of permits and approvals.

The NBP Management Committee should also consider the public concern expressed about the lack of a consistent state policy with respect to public access to the shore and the Bay islands. The *CCMP*, which focuses on environmental protection, may not be the appropriate vehicle for developing public access guidelines, especially given Rhode Island's recent efforts to identify and acquire access to the shore. However, the NBP Management Committee (or its successor) should consider adopting a statement that 1) acknowledges that privatization of the shore, exclusionary private use of natural resources, and lack of publicly available marine transportation options effectively deny public access to the Bay, *and* 2) states that major public expenditures on environmental protection (*e.g.*, abatement of combined sewer overflows, restoration of collapsed fisheries, acquisition of critical resource protection areas) are legitimate to the extent that the public is guaranteed appropriate future use and enjoyment of the resources being protected.

Finally, it is important for Bay decisionmakers, implementing authorities, and general users of the *CCMP* to note that the Narragansett Bay *CCMP* has no enduring value unless it is routinely updated based on new scientific, policy-related, and economic information. Particularly given the region's economic climate as the 1992 *CCMP* is being released, the Plan's recommended priorities, cost estimates, and many of the recommendations themselves, will become much less precise and far more subject to change after the first few years of effort in implementing the Plan. As a result, the (proposed) Narragansett Bay Implementation and Policy Committees should routinely review the status of *CCMP* implementation and expect to revise *CCMP* priorities, cost estimates, recommended financing strategies, and recommendations as new information becomes available.

PRELIMINARY AGREEMENTS TO IMPLEMENT THE NARRAGANSETT BAY *COMPREHENSIVE CONSERVATION AND MANAGEMENT PLAN (CCMP)*

LIST OF PRELIMINARY AGREEMENTS TO IMPLEMENT THE NARRAGANSETT BAY *COMPREHENSIVE CONSERVATION AND MANAGEMENT PLAN (CCMP)*

Agency

U.S. Environmental Protection Agency

U.S. Environmental Protection Agency /
Environmental Research Laboratory, Narragansett, R.I.

U.S. Department of Agriculture / Soil Conservation Service

U.S. Geological Survey

R.I. Department of Environmental Management

R.I. Department of Administration / Division of Planning

R.I. Coastal Resources Management Council

R.I. Department of Health

Town of North Smithfield, R.I.

05-06 Preliminary Agreements to Implement the Narragansett Bay *Comprehensive Conservation and Management Plan (CCMP)*

The U.S. Environmental Protection Agency's (EPA) guidance for the National Estuary Program (NEP), issued pursuant to Section 320 of the federal Clean Water Act, emphasizes implementation of the *Comprehensive Conservation and Management Plan* (*CCMP*) as the ultimate goal of the NEP planning process. As a result, the Narragansett Bay Project's (NBP) entire research and planning effort was dedicated to identifying necessary and pragmatic solutions to Narragansett Bay's water quality and resource management problems. However, the Narragansett Bay *CCMP* is not a self-executing document—*i.e.*, adoption of the *CCMP* as an element of the *Rhode Island State Guide Plan*, and/or approval of the *CCMP* by EPA and the Governor of Rhode Island, will neither require nor assure implementation of the recommended actions. (See Section 715-01-04 Process of Plan Development; 715-05-02 *CCMP* Implementation and Governance.) Therefore, the *CCMP* identifies a variety of measures intended to increase the probability of *CCMP* implementation. These measures include:

- Establishment of the Narragansett Bay Implementation and Policy Committees, modeled after the NBP's Executive and Management Committees, to oversee and evaluate the progress of *CCMP* implementation. (See Section 715-05-02 *CCMP* Implementation and Governance.)

- Identification of existing revenue sources (*e.g.*,the State Revolving Funds, the Rhode Island Aqua Fund, and the Rhode Island Hazardous Waste Reduction, Recycling, and Treatment Research Demonstration Act bond fund) to help finance municipal capital improvement projects, and private sector research and development initiatives. (See Section 715-04-01 Source Control - Source Reduction; and 715-04-02 Resource Protection.)

- Identification of economic incentives and disincentives to encourage private sector implementation efforts, including development density bonuses, tax credits, grant and low interest loan revolving funds, use-based fees, and penalties for noncompliance with regulatory requirements. (See Section 715-04-01 Source Control - Source Reduction; 715-04-02 Resource Protection; and 715-05-03 Funding *CCMP* Implementation.)

- Strengthening existing consistency review procedures to assure that federal and federally-assisted activities, as well as relevant state and local actions are reviewed for consistency with the *CCMP*. (See 05-02-02 *CCMP* Implementation and Governance: Consistency Review.)

A variety of initiatives taken during the *CCMP* planning process will also help to assure eventual implementation. For example, the NBP obtained a Rhode Island Aqua Fund grant in 1990 to fund a preliminary basin plan for Greenwich Bay, and worked with federal and state authorities in 1991 to obtain a $13 million "demonstration" grant to finance stormdrain retrofits on Interstate 95 and other coastal highways that discharge runoff to Narragansett Bay. In addition, EPA has indicated that it will consider identified *CCMP* priorities as an eligibility criterion in awarding future grants, and will encourage other federal agencies to do likewise.

Most significantly, however, several federal and state agencies with planning and/or regulatory jurisdiction in the Narragansett Bay basin executed agreements in 1992 to implement various elements of the *CCMP*. (See "Preliminary Agreements to Implement the *CCMP*," attached.) In some cases, the agencies have indicated that the recommended corrective actions are already being implemented, or are scheduled for implementation with existing funds. In many other cases, the agencies have indicated those *CCMP* actions which they consider to be high priority for implementation depending upon the availability of funding. The "Implementation Status" column associated

with the recommendations in each *CCMP* chapter (Parts 715-04 and 715-05) has been annotated to indicate which agency is already implementing, or will undertake to implement, the recommended action. As a result, the agreements executed by the:

- U.S. Environmental Protection Agency, Region I;
- U.S. Environmental Protection Agency Environmental Research Laboratory—Narragansett;
- U.S. Department of Agriculture Soil Conservation Service (Rhode Island and Massachusetts);
- U.S. Geological Survey;
- Rhode Island Department of Environmental Management;
- Rhode Island Department of Administration—Division of Planning;
- Rhode Island Coastal Resources Management Council; and
- Rhode Island Department of Health,

represent a significant commitment of agency resources and expertise to solving some of Narragansett Bay's most pressing problems.

In summary, these agreements, in combination with the "Letters of Support" from the broader Bay community (Appendix G), indicate a genuine willingness and commitment to act. However, the Narragansett Bay Implementation and Policy Committees should make a major effort to obtain similar agreements from other key federal, state, local and private implementing authorities, including Massachusetts authorities responsible for environmental protection and resource management in the Blackstone and Taunton River basins. In addition, the Implementation and Policy Committees should routinely review and update these agreements in order to evaluate the agencies' progress toward implementation, evaluate the need for additional or coordinated funding, and reconsider collective agreements about priorities and strategies for *CCMP* implementation.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
J.F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203-2211

April 9. 1992

Mal Grant
Department of Environmental Management
83 Park Street
Providence, RI 02903

Dear Mr. Grant:

EPA is strongly committed to bringing the planning phase of the Narragansett Bay Project to an end so that we and other agencies can beginning to implement the Comprehensive Conservation and Management Plan (CCMP). We are committing to implement a number of recommendations contained in the CCMP over the next one-two years, and we will work with the Implementation Committee on commitments we will make in the future.

We included our commitments in our earlier comment letter on the CCMP, dated March 2, but the list below is a compilation of Region I and HQ commitments to date. Those commitments that are related to the highest priority actions for immediate implementation are marked with an asterisk. You have received a separate commitment letter from Dr. Norb Jaworski regarding commitments from EPA's Narragansett lab.

1. EPA will develop a pollution prevention package (checklists and guidance) for NPDES permittees. The package will introduce pollution prevention techniques to NPDES dischargers that have not already incorporated waste minimization practices into their processes.

2. EPA HQ's Office of Pollution Prevention and Toxics will assist states by identifying and encouraging the use of less toxic products or chemicals in industrial processes and in domestic applications.

3. We will do a low flow metals waste load allocation for the Blackstone River (down to the Slaters Mill dam). Our primary concern is determining if current metal loads are contributing to toxic sediments in the Blackstone River.

* 4. EPA will increase the frequency of unannounced on-site inspections and compliance monitoring at NWTFs and direct industrial dischargers.

* 5. EPA will review the administration and enforcement of any industrial pretreatment program where the regulated industries are in significant noncompliance with program requirements.

6. Building on prior Pollution Prevention Incentives grant to Rhode Island, EPA HQ's Pollution Prevention program will provide technical assistance to the state on whole facility permitting.

* 7. EPA will provide technical assistance to any local control authorities that expand their pretreatment programs.

8. EPA will fund wet weather water quality surveys of the Blackstone River through the Section 104(b)(3) process. Dry weather surveys have already been completed. EPA will try to secure the funding necessary to conduct water quality modelling so that the relative importance of dry weather and wet weather nutrient loadings can be determined.

9. EPA will work with URI to use dry weather data to complete a model that will simulate the effects of BOD, ammonia and phosphorus on dissolved oxygen in the Blackstone River. The model will be used to develop a waste load allocation for BOD, ammonia and phosphorus dry weather loadings to the river.

* 10. EPA will work with RIDEM and the East Greenwich WWTF to develop an approach for alleviating the low dissolved oxygen concentrations in the bay prior to permit reissuance in 1993.

11. EPA will review updates of state CSO policies to ensure that the policies, as applied, are adequate to ensure compliance with state water quality standards.

* 12. EPA already is imposing receiving water monitoring requirements within a defined area of discharge zone in all CSO-related permits, in order to assess the ultimate success of CSO abatement projects in achieving water quality standards.

* 13. EPA already is reviewing discharge permits issued to CSO dischargers to ensure that the permits are in compliance with all applicable CSO policies, that the permits are sufficiently stringent to attain designated uses of receiving waters, and that appropriate authorities monitor receiving waters to evaluate the success of CSO abatement in meeting water quality standards.

* 14. EPA will ensure that CSO abatement plans developed before the approval of revised state CSO policies should be subject to all requirements of those policies.

* 15. EPA will organize workshops in the Narragansett Bay watershed to thoroughly explain the Buzzards Bay methodology for addressing the management of nitrogen to sensitive embayments. In addition, EPA is sponsoring a workshop in May 1992 that will place in Narragansett, RI. The title of the workshop is "Managing Nitrogen Inputs to Coastal Waters: A Risk Based Approach."

* 16. Using guidance already published by EPA Region I, we will facilitate the designation of no-discharge areas by providing technical assistance to the states in developing their petition(s), and conducting a rapid review and approval process. We have already begun working with state and some local officials from some regions of Narragansett Bay.

17. EPA will facilitate assessments in the Blackstone and Taunton Rivers by encouraging revisions to state nonpoint source management programs that reflect priority watershed and sub-watershed areas. This will be accomplished through the Section 319 Program.

18. EPA will provide technical assistance to cities and towns on evaluating dry weather flows and uncovering illicit discharges. Experience in establishing priorities among various discharges will also be offered.

* 19. Once the states determine base river flows, EPA will incorporate them into our water quality process. These base flows should be evaluated not only to protect existing fish species but to protect all existing uses and to attain and maintain designated uses.

20. If the effluent standards for total residual chlorine that are incorporated into a discharge permits are not achievable under a WWTF's existing disinfection practices, the WWTF will be required to conduct a disinfection analysis to evaluate alternative disinfection measures and select an appropriate measure to comply with chlorine - and fecal coliform - limits.

21. EPA will include a requirement in the new draft permit for the Brayton Point power plant to provide approximately 10 years data interpretation with a statistical comparison when they prepare each new year's annual data compilation. This data interpretation will be under the direct supervision of the Brayton Point Technical Advisory Group, either by the voluntary approach or by a permit requirement.

22. EPA will work with the states to review pretreatment requirements for WWTFs in the Blackstone River watershed.

23. EPA will work with the states to emphasize pollution prevention and source reduction as the preferred means of reducing toxics loadings to the Blackstone River.

24. EPA will evaluate and report on the effectiveness of the Worcester CSO abatement project by examining the data gathered though the monitoring program conducted by the City of Worcester.

25. EPA will develop a dry weather model for metals and DO (BOD, ammonia, phosphorus) for the Blackstone River, which will allow for a post audit of the UBWPAD AWT facility. Wet weather data (metals and conventional pollutants, including nutrients) will be used to estimate annual wet weather loadings to the Blackstone River (and ultimately to Narragansett Bay) and the relative importance of wet weather loadings and dry weather loadings.

26. EPA will ensure that any permit limits for any discharger likely to impact interstate waters are appropriate to meet water quality standards in both states.

27. If the COE undertakes an proposed assessment of long-term dredging options for New England, EPA will provide technical support.

28. EPA will publish a sediment policy in the Federal Register, and will then use this to develop a cross-program sediment strategy. This strategy will address problems such as what to do with in-place contaminated sediments, and remediation options. This strategy is likely to include guidance on testing procedures, remediation options, etc., although individual programs may impose additional requirements. Concurrently, EPA is in the process of developing sediment criteria: approximately four will be published every year for the next several years.

* 29. EPA will participate in the proposed CCMP Implementation Committee and the broadened Policy Committee.

* 30. Under EPA's EMAP program, a monitoring station for measuring wet and dry atmospheric deposition of contaminants will be established on or near Narragansett Bay.

31. EPA will work with the state nonpoint source, stormwater, and wetlands programs to ensure that Federal grant funds are coordinated with the recommendations contained in the CCMP.

* Related to highest priority actions for immediate implementation.

Sincerely,

Ron Manfredonia, Chief
Water Quality Branch

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL RESEARCH LABORATORY
27 TARZWELL DRIVE
NARRAGANSETT, RHODE ISLAND 02882

April 2, 1992

Malcolm J. Grant
Associate Director for Natural Resources
RI Dept. of Environmental Management
22 Hayes St.
Providence, RI 02908

Dear Mr. Grant:

My staff and I have participated throughout the consensus process of creating a Comprehensive Conservation and Management Plan for Rhode Island. We believe that the draft plan fairly represents the consensus achieved in each subject area at meetings over the past years of discussion; codified into priorities at the meeting held this year at Alton Jones Conference Center. We strongly support the process, the draft CCMP, and rapid CCMP implementation.

Contingent upon approval of the CCMP, ERL Narragansett is prepared to provide the following assistance with its implementation:

- ERLN will maintain and make available the Upper Providence River mathematical model.

- We will train DEM employees to use the East Greenwich Bay model and assessment methods.

- Together with RIDEM, NOAA, and URI-GSO ERLN will participate in analyses of 50 samples of organic and inorganic analytes from Narragansett Bay monitoring.

- ERLN and the EPA Office of Water will develop nutrient criteria for estuarine and coastal waters as a high priority subject of our research.

We look forward to your meeting on April 13th, and will continue our discussions there.

Sincerely,

Norbert A. Jaworski,
Director.

cc: C. Karp, NBP
R. Manfredonia, Region I
Senior Management, ERL-N

NAJ/JCP/lpt

United States Department of Agriculture

Soil Conservation Service

60 Quaker Lane
Suite 46
Warwick, RI 02886

451 West Street
Amherst, MA
01002

April 1, 1992

Malcolm J. Grant, Chair
Narragansett Bay Project Management Committee
291 Promenade Street
Providence, RI 02908-5767

Dear Mr. Grant,

We are writing to reiterate the Soil Conservation Service's (SCS) continuing support of the Comprehensive Conservation and Management Plan for Narragansett Bay. We are taking steps now to begin implementation once the plan is approved. The Management Committee meetings have been a good faith effort to fully discuss the issues and reach a workable concensus; this process has provided the opportunity for all to express their point of view, and to understand other points of view.

SCS is presently working with its fellow USDA agencies (Extension Service, Agricultural Stabilization and Conservation Service) and local affiliates (Coservation Districts, Resource Conservation and Development Councils) in Massachusetts and Rhode Island to prepare a joint plan of work for implementing our responsibilities under the CCMP. This plan will be prepared in conformance with Recommendation IV.C of the Nonpoint Source chapter. The enclosed USDA workplan for the current fiscal year outlines the activites we are prepared to undertake between now and September 30, conditional upon the approval of the CCMP. SCS has received some funding to carry out these activities; the Extension Service is discussing funds now with its National Office.

RI SCS has been working with CRMC and RIDEM's Nonpoint Source Coordinator to promote the establishment of a joint Nonpoint Source Management Committee. We are looking forward to working with the proposed Critical Resource Policy Committee; we want to design our future special emphasis projects in cooperation with these committees, to enhance the possibilities of attaining common goals.

SCS is deeply committed to the concept of coordinated effort, across state lines, across agency lines, and reaching out to individuals, in managing the Narragansett Bay Watershed for protection of water quality. Our national vision is of "A productive nation in harmony with a quality environment". We will do everything we can, within the limits of our authorities and funding, to work with all who can help us accomplish the vision.

Sincerely yours,

Anthony T. Doré

Anthony T. Dore
State Conservationist
Rhode Island

Richard A. Gallo

Richard A. Gallo
State Conservationist
Massachusetts

cc: Caroline Karp, Narraganset Bay Project

NARRAGANSETT BAY ESTUARY PROGRAM

NONPOINT SOURCE MANAGEMENT
USDA WORKPLAN - FY'92

PROCEDURE FOR CARRYING OUT THE PLAN

OBJECTIVE 1. Develop a coordinated program approach for dealing with Nonpoint Source (NPS) concerns in Narragansett Bay.

Goal 1. Establish a process for coordinating USDA agencies', Districts', and RC&D Councils' activities

Action Items

1. Discuss Narragansett Bay Project (NBP) NPS recommendations with each individual District and Council for clarification, identification of goals and actions
   (SCS) 11/91-6/92

2. Document District/Council decisions and agency activities in support of the CCMP in an action plan
   (SCS, EXT, ASCS) 11/91-6/92

3. Adopt action plan as Plan of Work, at a multi-agency, multi-state forum
   (SCS, EXT, ASCS) 8/92-9/92

Goal 2. Strengthen cooperation with other state and federal agencies

Action Items

1. Work with Districts, Councils to establish a procedure for continued dialogue with State Nonpoint Source Coordinators
   (SCS) 1/92

2. Explore EPA funding opportunities for USDA Affiliates' involvement in the Estuary Program with EPA Nonpoint Source Coordinator, SCS liaison
   (SCS, EXT, ASCS) 8/92-9/92

3. Represent USDA and affiliates on Narragansett Bay Project Management Committee
   (EXT, SCS) 10/91-9/92

Goal 3. Coordinate a comprehensive NPS information program

Action Items

1. Develop a strategic information plan in consultation with Districts, RC&D Councils, Narragansett Bay Project, and State and EPA NPS Coordinators
   (EXT, SCS) 1/92-9/92

OBJECTIVE 2. Provide consistent guidance to NPS managers.

Goal 1. Establish consistent criteria for selecting "focus" areas

Action Items

1. Promote establishment of state Critical Resource Policy Committee by state agencies
   (SCS, EXT) 3/92-9/92

2. Collect existing criteria and priority lists used in the Narragansett Bay Watershed, and delineate "focus" areas where work by USDA is ongoing
   (SCS) 1/92

3. With State NPS Coordinators, Districts and Councils, evaluate priority lists and work areas in relation to criteria; revise by concensus
   (SCS, EXT, ASCS) 2/92-4/92

4. Select three priority watersheds for concentrated planning and implementation efforts: 1 in Blackstone Basin, 1 in Taunton Basin, 1 in Rhode Island
   (SCS, EXT, ASCS) 4/92

Goal 2. Develop coordinated NPS management programs

Action Items

1. Work with Bristol Co. District to develop "pilot project" proposal for NPS planning and implementation in watershed selected under Obj 2, Goal 1
   (SCS) 11/91-3/92

2. Work with Coastal Zone Management agencies in development of NPS management program
   (SCS) 1/92-9/92

OBJECTIVE 3. Improve the assessment of waterbodies and identification of potential nonpoint sources of pollution.

Goal 1. Participate in the establishment of the Narragansett Bay Data Center by state agencies

Action Items

1. Develop strategy for conversion of MA Soil Survey data to digital form
   (SCS) 10/91-9/92

2. Establish a Narragansett Bay/USDA Research Needs Committee
   (EXT, SCS) 3/92

3. Provide preliminary inventory and evaluation of site-specific information to Data Center
   (SCS, EXT) 8/92-9/92

Goal 2. Provide information on potential agricultural NPS contributions in priority watersheds

Action Items

1. Locate agricultural operations within watersheds selected under Objective 2
   (SCS) 4/92-6/92

2. Review case files and compile information on use of nutrients, pesticides and water, Farm Bill delineations of wetlands and

HEL, soil loss, planned and applied BMPs within selected watersheds
(SCS) 4/92-8/92

3. Assess need for collecting additional information on agricultural operations in the selected watersheds, report to State NPS Coordinators and others as outlined in information plan
(SCS) 8/92-9/92

Goal 3. Collect information on non-agricultural NPS contributions

Action Items

1. Develop process to estimate usage of "non-restricted-use" pesticides in priority watersheds, in coordination with Districts, RIDEM Division of Agriculture
(EXT) 2/92-9/92

2. Assess need and feasibility of establishing citizens' monitoring programs in selected watersheds
(EXT) 5/92-9/92

3. Determine need for storm drain inventories in selected watersheds, assist State NPS Coordinators in inventory design
(SCS) 4/92-9/92

OBJECTIVE 4. Improve the effectiveness of NPS regulatory programs.

Goal 1. Promote adoption of stormwater management regulations

Action Items

1. Determine feasibility of MA state or municipal adoption of stormwater management regulations, prepare strategy for selected alternative
(SCS) 10/91-9/92

2. Discuss status of state stormwater regulations with RIDEM Division of Water Resources, provide assistance as necessary
(SCS) 1/92

Goal 2. Add special provisions to pesticide regulations for pest management within priority watersheds

Action Items

1. Work with state agencies in collection of information on pesticide usage in priority watersheds and special provisions in other jurisdictions
   (EXT) 2/92-9/92

2. Discuss concept of tying approved pest management plans into pesticide regulations with state pesticide agencies, provide draft language as requested
   (EXT, SCS) 2/92-9/92

3. Work with state agencies on establishment of a team to expand "water quality considerations" portion of pesticide applicators' training
   (EXT) 2/92-9/92

4. Train state agency personnel in use of NPURG
   (EXT, SCS) 3/92

5. Review and revise pesticide labels to include water quality considerations, in cooperation with state agencies
   (EXT) 8/92-9/92

Goal 3. Develop state nutrient management programs

Action Items

1. Draft a strategy for nutrient management program development in consultation with appropriate state agencies
   (SCS, EXT) 8/92-9/92

Goal 4. Improve highway-related NPS controls

Action Items

1. Provide technical oversight of District site inspection services provided to state Departments of Transportation
   (SCS) 10/91-9/92

OBJECTIVE 5. Improve the effectiveness of municipal and landuser efforts to implement NPS controls.

Goal 1. Coordinate NPS information efforts with special interest groups

Action Items

1. Develop a system for collecting, disseminating, assessing need for NPS information materials, in consultation with NPS Coordinators
   (EXT) 10/91-9/92

Goal 2. Improve municipal understanding and management of NPS pollutants

Action Items

1. Continue efforts with MA State NPS Coordinator for adoption of statewide soil erosion and sediment control regulations
   (SCS) 10/91-9/92

2. Provide technical support to District promotion of soil erosion and sediment control ordinances to RI municipalities
   (SCS) 10/91-9/92

3. Provide technical oversight of RI District site plan review and inspection services
   (SCS) 10/91-9/92

4. Develop training program for municipal officials, in cooperation with NPS Coordinators and planning agencies
   (EXT, SCS) 4/92-9/92

5. Prepare strategy for establishing MA site plan review and inspection services
   (SCS) 5/92-9/92

6. Provide technical and financial assistance to municipalities for NPS planning and implementation; concentrate efforts on watersheds selected under Objective 2
   (SCS) 10/91-9/92

Goal 3. Improve landuser understanding and management of NPS pollutants

Action Items

1. Provide technical and financial assistance to landusers on the installation of best management practices
   (ASCS, EXT, SCS) 10/91-9/92

2. Explore feasibility of establishing a Sustainable Ag Committee in MA
   (EXT) 11/91-9/92

3. Compile existing "picture-books" of pollution identification guides, determine usefulness
   (EXT, SCS) 2/92-9/92

4. Draft a strategy for reducing soil erosion and improving use of water, nutrients and pesticides by homeowners and agricultural operations within selected watersheds
   (EXT, SCS, ASCS) 6/92-8/92

United States Department of the Interior
GEOLOGICAL SURVEY

Water Resources Division
237 J.O. Pastore Federal Bldg.
Providence, Rhode Island 02903-1720

TAKE PRIDE IN AMERICA

April 2, 1992

Mr. Malcolm J. Grant
Narragansett Bay Project
291 Promenade Street
Providence, RI 02908-5767

Dear Mr. Grant:

The U.S. Geological Survey, Water Resources Division (USGS), has been studying the quantity and quality of water entering Narragansett Bay for many years. We have worked closely with the Narragansett Project, particularly on studies estimating surface-water runoff to the Bay and monitoring water quality on the Blackstone and Pawtuxet Rivers.

The USGS recognizes that many issues regarding Narragansett Bay still must be addressed and have worked with the Narragansett Bay Project in developing the Comprehensive Conservation and Management Plan. Two issues addressed in briefing papers produced by the Narragansett Bay Project are of particular concern to the USGS:

1) the need for expanded water-quality monitoring of tributary rivers to the Bay, including flow measurements, and
2) the need for a comprehensive water-use database which will track water from point of withdrawal to point of discharge.

Recognizing our joint concerns about the Bay, recently the USGS has sought further involvement with the Narragansett Bay Project. Pending the appropriate agreements and funding, the USGS plans to expand the ongoing flow and water-quality monitoring to include a site on the Taunton River. Also, working with the Narragansett Bay Project and with other State agencies, we expect to continue development of a State-wide water-use database.

Sincerely yours,

Virginia de Lima

Virginia de Lima
Subdistrict Chief

*212

State of Rhode Island and Providence Plantations
Department of Environmental Management
Office of the Director
9 Hayes Street
Providence, RI 02908

13 April 1992

To: The Narragansett Bay Project Executive Committee
From: Louise Durfee, Director
Rhode Island Department of Environmental Management

SUBJECT: **Approval and implementation of the Narragansett Bay *Comprehensive Conservation and Management Plan* (CCMP)**

As you know, the Narragansett Bay *Comprehensive Conservation and Management Plan* (CCMP) has been under development since 1985 under the joint sponsorship of the Rhode Island Department of Environmental Management (RIDEM) and the U.S. Environmental Protection Agency (USEPA), with advice provided by the Narragansett Bay Project (NBP) Executive and Management Committees. Over this time, the Department has consistently supported the Project's efforts to develop a consensus around scientifically-based strategies to restore and protect Narragansett Bay and the Bay basin.

For several reasons, the Department considers approval of the CCMP to be essential in order to proceed in an orderly manner with the process of implementation. First, the plan clearly establishes the variety and complexity of the environmental problems facing Narragansett Bay. Second, in most instances, resolution of these problems will require coordinated action by multiple agencies and levels of government. Third, the plan explicitly assumes that the goals of the CCMP will take many years to achieve, and that new approaches to achieve these goals will have to be developed over time as new information becomes available. Therefore, in the Department's opinion, meaningful improvement in the environmental quality of Narragansett Bay will be difficult to achieve without a common foundation for acting. The CCMP provides that foundation. In summary, the Department strongly believes that the CCMP should be revised and ratified by the Management Committee as quickly as possible in order to enable the implementing authorities to proceed with implementation.

In order to reaffirm the Department's commitment to the goals established in the CCMP, the Department hereby states that it will undertake to implement the actions described below contingent upon approval of the CCMP and availability of adequate funding. These actions are indexed to specific CCMP recommendations. Department commitments that address actions identified by the NBP Management Committee as "high priority actions" are highlighted in bold.

I. The Department agrees to undertake the following actions in FY93 to reduce the use, generation and disposal of toxic chemicals to Narragansett Bay and the Bay basin:

- RIDEM will continue to provide staff support to the Rhode Island Pollution Prevention Council, and will continue to participate in the New England Waste Management Officials Association. (Rec. IA1b, p. 4.11)

- **RIDEM-WR agrees to participate in a regional effort to develop a basin-wide Narragansett Bay *List of Toxics of Concern*. (Rec. IB1b, p.4.14)**

- Contingent upon receipt of requested Section 104(b)(3) funding from EPA, RIDEM-WR will work with municipal water pollution control authorities to establish a financially self-sufficient training program for municipal industrial pretreatment staff and industry personnel charged with overseeing industrial wastewater treatment operations, and a certification program for industry personnel. (Rec. IC2, p.4.17)

- **RIDEM will work with the Pollution Prevention Council to recommend feasible economic incentives to encourage and reward private investment in pollution-reduction technologies, and to enable industries to invest in proven pollution control technologies. (Rec. IE2, pp.4.23-4.24)**

- **RIDEM-OEC will continue to work with the URI Department of Chemical Engineering in FY93 to test experimental source reduction and pretreatment techniques in Rhode Island businesses. (Rec. IFf, P.4.26)**

- **RIDEM-WR audits of Industrial Pretreatment Programs will evaluate whether the municipal "control authorities" are taking appropriate measures to ensure that all industrial dischargers that should be subject to Industrial Pretreatment Program are operating pursuant to permits. (Rec. IC, p.4.16-4.17)**

- **RIDEM-WR will continue to refer significant industrial users found to be in significant noncompliance with industrial pretreatment discharge standards to the RIDEM-OEC, as appropriate, for waste reduction assessments. RIDEM-WR also agrees to consider revising the Industrial Pretreatment regulations to explicitly require significant industrial users found to be in significant noncompliance with industrial pretreatment discharge standards (as defined in 40 CFR 403.8 (f)(2)(vii)(A)(B)) to a) publish notices identifying the violation, the penalty, and the measures taken to prevent further violations (Rec. IB3b,c, p. 4.16); and b) undergo a mandatory waste reduction assessment. (Rec. IA4c, p.4.13). The Department's level of effort with respect to revising the regulations will depend upon the availability of funding.**

- **RIDEM-AHM agrees to consider amendments to Rhode Island's Clean Air Act (R.I.G.L. 223-23), Hazardous Waste Management Act (R.I.G.L. 23-19.1), and Department regulations to explicitly require significant industrial users found to be in significant noncompliance with air emissions and hazardous waste disposal requirements to a) publish notices identifying the violation, the penalty, and the measures taken to prevent further**

violations (Rec. IB3b,c, p. 4.16); b) undergo a mandatory waste reduction assessment; and c) to file a waste minimization report. (Rec. IA4c, p.4.13). The Department's level of effort with respect to revising the statutes will depend upon the availability of funding.

- RIDEM-OEC agrees to perform on-site waste reduction assessments of significant industrial users that are referred to the Hazardous Waste Reduction Program by the RIDEM-WR as part of a POTW enforcement action. (Rec. IA4c, p.4.13) In addition, RIDEM-OEC will continue to offer assistance to industries in completing the *Hazardous Waste Reduction Plans*, and will perform waste reduction assessments for companies that voluntarily participate in the Hazardous Waste Reduction Program. (Rec. IFe, p.4.26) The Department's level of effort will depend upon the availability of funding.

- RIDEM-WR agrees to continue to review the administration and enforcement of any industrial pretreatment program where ≥15% of the significant industrial users are in significant noncompliance with their permits. (Rec. IC2e, p.4.18) The Department's level of effort will depend upon the availability of funding.

- RIDEM will support House Bill 8589 in the 1992 legislative session, which will require the Division of Air & Hazardous Materials to promulgate regulations for vehicle emissions testing. (Rec. ID1b, p.4.21)

- RIDEM-NR will continue to update the State's Oil Spill Contingency Plan, including provisions for an emergency scientific response. (Rec. IVC2, p.4.31)

- RIDEM-AG will prepare a summary of pesticide use (including commercial and over-the-counter sources) in FY93, depending upon the availability of funding. (Rec. VA, p.4.31)

II. The Department agrees to undertake the following actions in FY93 to control the discharge of untreated fecal wastes and excess nutrients to Narragansett Bay and the Bay basin:

- RIDEM-ISDS, with assistance from RIDEM-OEC, agree to revise the *Rules and Regulations Establishing Minimum Standards Relating to Location, Design, Construction, and Maintenance of Individual Sewage Disposal Systems* as a high priority in FY93 depending upon receipt of requested Federal funding. (Rec. IA, p.4.89)

- RIDEM-OEC and RIDEM-WQM agree to work with the Rhode Island Division of Planning, the Rhode Island Department of Health and Rhode Island municipalities to actively promote the establishment of wastewater management districts (WWMDs) that provide for the routine inspection and maintenance of on-site sewage disposal systems. (Rec. II, pp.4.92-4.99) The Department's level of effort will depend upon the availability of funding.

- RIDEM-WR will continue to work with municipal WWTFs to assure that boat-generated septage is appropriately treated and disposed. (Rec. IC5, p.4.112)

- RIDEM-WR will work with RIDEM-ENF to develop teaching materials for a harbormasters' course on enforcing marine sanitation device (MSD) requirements. (Rec. ID, p.4.113-4.114)

- RIDEM-WR will work with the relevant coastal communities to petition the USEPA to designate the Great Salt Pond and Jamestown Harbor as official "no discharge" areas. (Rec. IIA, p.4.118)

- RIDEM-WR agrees to evaluate the results of the Providence River eutrophication screening model that is currently under development by the Narragansett Bay Project in order to determine whether additional data collection and/or model development are necessary to determine the need for nutrient removal by point source dischargers to the Providence River. (Rec. IC, pp.4.42-4.43) The Department's level of effort will depend upon the availability of funding.

- As part of implementing advanced wastewater treatment on the Pawtuxet River, RIDEM-WR agrees to ensure that ambient monitoring is conducted to verify that the RIPDES effluent limits for the Warwick, West Warwick and Cranston WWTFs are adequate to meet State water quality standards. (Rec. IE, p.4.43) The Department's level of effort will depend upon the availability of funding.

- RIDEM agrees to participate in two (2) dissolved oxygen surveys of the lower Taunton River and Mount Hope Bay in cooperation with MADEP, depending upon evidence of hypoxia, and available funding and staff. (Rec. IIIC, p.4.47)

III. The Department agrees to undertake the following actions in FY93 to assure that significant progress is made toward abating combined sewer flows to Narragansett Bay:

- RIDEM-WR and RIDEM-WSM will assist the U.S. Geological Survey in compiling Rhode Island water use and wastewater treatment data as part of the USGS water use database project. (Rec. IA, p.4.63)

- RIDEM-WR agrees to consider incorporating a stronger water quality-based approach into the State's CSO policy. (Rec. IB, p.4.78) The Department's level of effort in revising the State's COS policy will depend upon the availability of funding.

- **RIDEM-WR agrees to work with the Narragansett Bay Project and the Narragansett Bay Commission to rank all CSO projects in the Providence River basin based upon pollutant load, geographic area impacted, estimated cost of abatement, estimated environmental and economic benefits of abatement, readiness to proceed and other factors. (Rec. IIIA, p.4.80) The Department's level of effort will depend upon the availability of funding.**

- RIDEM-WR agrees to ensure that receiving water monitoring is conducted in the vicinity of CSO discharges in association with approved CSO abatement projects. (Rec. IA3, p.4.77) The Department's level of effort will depend upon the availability of funding.

- Depending upon the availability of funding, RIDEM agrees to work with the Commonwealth of Massachusetts to bring water quality classifications in interstate portions of Mount Hope Bay into conformance with one another as necessary to facilitate completion of the Fall River CSO abatement project. (I.B.1., p. 4.229)

- Depending upon the availability of funding, RIDEM agrees to work with the Commonwealth of Massachusetts to develop a Shellfish Management Plan for the harvestable shellfish resources of Mount Hope Bay, contingent upon receipt of requested funding. This effort would coincide with the Fall River CSO abatement project. (I.B.2., p. 4.230)

IV. The Department agrees to undertake the following actions in FY93 to begin to regulate detrimental land-based impacts on water quality and critical habitats in the Narragansett Bay basin:

- **The RIDEM-OEC will help to reestablish the Nonpoint Source Management Committee in order to coordinate federal, state and local nonpoint source management initiatives, and to develop consistent statewide and regional nonpoint source management strategies. (Rec. IB, pp.4.133-4.134)**

- **The RIDEM-OEC agrees to jointly chair the Nonpoint Source Management Committee with the CRMC Section 6217 Nonpoint Source Coordinator in order to assist in developing consistent, statewide and regional nonpoint source management strategies. (Rec. IB, pp.4.133-4.134)**

- **The RIDEM-OEC agrees to disseminate public education materials prepared by the *Land Management Project*, and to continue to provide technical assistance to cities and towns regarding the control of nonpoint source pollution to the maximum extent possible with existing funding. (Rec. IVB, p.4.142)**

- RIDEM agrees to update the Narragansett Bay Estuarine Research Reserve Management Plan in FY93. (Rec. IIA3c, pp. 4.189-4.190; Rec. IE, p.4.201)

- **RIDEM agrees to continue to participate on the *Greenspace 2000 Task Force* in order to develop a system of greenways in the State of Rhode Island, and to begin to develop a statewide Critical Resource Protection Policy. (Rec. IB, p.4.183)**

- RIDEM-WR agrees to continue to participate on the Rhode Island Rivers Council in order to develop a statewide policy for protecting, restoring and managing the State's rivers (Rec. IIB, p.4.190)

- Following the State Planning Council's approval of the revised *State Comprehensive Outdoor Recreation Plan* , RIDEM-PD will consider protection of critical resource areas as a criterion in awarding Open Space and Recreational Land Acquisition grants to cities and towns. (Rec. IIE, p.4.193)

- RIDEM-FE will establish a program of economic incentives to encourage property owners to preserve identified 'Forest Legacy' areas in the State via conservation easements, reserved interest deeds and outright acquisition, pending receipt of requested Federal funds. (Rec. IIE3, p.4.193)

V. The Department agrees to undertake the following actions in FY93 to improve protection of public health, and to more effectively manage the use and protection of the Bay and its living resources:

- RIDEM agrees to work with RIDOH to continue public outreach efforts directed to populations that are in "high risk" categories with respect to seafood harvesting in contaminated areas of the Bay basin. (Rec. IA2av, p.4.211; Rec. IIC, p.4.218).

- RIDEM agrees to work with RIDOH to develop risk assessment and risk management protocols governing the consumption of fish and shellfish harvested in Rhode Island waters. (Rec. IIC, p.4.218) The Department's level of effort will depend upon available funding.

- **RIDEM-WR will work with the RI Coastal Resources Management Council to attempt to reconcile RIDEM's water quality and CRMC's water use classifications. (Rec. IA, p.4.107)**

- **RIDEM agrees to work with the CRMC, other state agencies, and the municipalities to develop a preliminary Greenwich Bay basin plan using funds available from the Aqua Fund grant to the Narragansett Bay Project. (Rec. IF2, p.4.44)**

- **RIDEM-FW agrees to develop a Quahog Management Plan for Narragansett Bay as a high priority in FY93 cdepending upon availability of funding. (Rec. IB1, p.4.200; Rec. IB2, p.4.230)**

- RIDEM-FW agrees to continue updating the State's operational plans for restoring and managing native anadromous fisheries in FY93. (Rec.IB4, p.4.200)

- RIDEM-FW agrees to develop criteria for defining the base stream flows that should be maintained to support indigenous fish and wildlife (e.g. August low flows). RIDEM-WR agrees to review all new or revised hydropower permits issued by the Federal Energy Regulatory Commission to assure that base river flows, as defined by RIDEM-FW, are maintained to the maximum extent possible, and that hydropower projects include provisions for fish passage wherever possible. (Rec. IIC, p.4.201-4.202; Rec. ID, p.4.249-4.250) The Department's level of effort will depend upon available funding.

- RIDEM-WR and RIDEM-FW agree to continue to participate on the advisory committee that is currently reviewing the monitoring requirements of the New England Power Brayton Point facility NPDES permit in Mount Hope Bay. (Rec. IID, p.4.202; Rec. IIIA1, p.4.231) The Department's level of effort will depend upon the availability of funding.

VI. The Department agrees to undertake the following actions in FY93 to begin to improve water quality and restore water-quality-dependent uses of the Blackstone River:

- RIDEM-WR agrees to cooperate in water quality monitoring and modeling for the Blackstone River jointly with MADEP and EPA, and use that modeling as a basis for preparing a waste load allocation of metals and nutrients (including BOD) for point source dischargers to the Blackstone River system. (I.A.3., p. 4.246) The Department's level of effort with respect to performing the wasteload allocation will depend upon the availability of funding.

- RIDEM will continue to review all new or reissued permits for the development of hydroelectric power projects on the Blackstone River or its tributaries to ensure that the permit requires a) maintenance of base stream flows, b) provision for fish passage, and c) the installation of flow gages at the permit location. (I.D.1., p. 4.249; I.D.2.b.ii., p. 4.250; III.C., p. 4.255) The Department's level of effort will depend upon the availability of funding.

- RIDEM agrees to conduct a synoptic wet weather water quality survey for the Blackstone River. (I.B.1., p. 4.248; IV.B., p. 4.256) The Department's level of effort will depend upon the availability of requested Section 104(b)(3) Federal funding.

- RIDEM agrees to be a member of a permanent Blackstone River Task Force to address interstate pollution problems in the basin. (V.A., p. 4.258)

VI. The Department agrees to undertake the following actions to assure that the CCMP is implemented based upon on-going agreements among the implementing authorities and the broader Bay community, new information about the status of Narragansett Bay, and progress toward achieving the goals of the CCMP:

- **RIDEM agrees to participate on the proposed Implementation and Policy Committees. (Rec.I, p.5.9; Rec. II, p.5.10)**

- RIDEM agrees to contribute up to $100,000 in FY93 as match on federal grants to support CCMP implementation, contingent upon approval of RIDEM's FY93 budget request.

- RIDEM-OEC agrees to subscribe to Massachusetts' *Environmental Monitor* and to review listed projects that could affect environmental quality in the State of Rhode Island. (Rec. IB, pp. 5.25-5.26) The Department's level of effort with respect to reviewing listed activities depends upon the availablity of funding.

- To the extent possible with existing funding, RIDEM-WR agrees to review and comment on draft NPDES discharge permits issued to major municipal and industrial dischargers in the Massachusetts portion of the Narragansett Bay basin. (Rec. IA3, p.4.12)

- RIDEM agrees to support the Volunteer Monitoring Program Coordinator position through FY93, contingent upon availability of funding. (Rec. IIID, p.4.47)

- RIDEM agrees to incorporate citizen-collected monitoring data into the State's *Nonpoint Source Assessment*, and the *State of the State's Waters Report*. (Rec. IB3, p.4.138)

In summary, I respectfully urge the Department's colleagues on the NBP Executive and Management Committees to recall our shared purpose in convening the Narragansett Bay Project in the first place. As a group, we have had over six years to debate goals and priorities, the technical merits of proposed actions, and the actions themselves. It is extremely important for the credibility of all the agencies and organizations involved in this endeavor that we act expeditiously to adopt the CCMP. As a community, we need to begin to move forward with implementation in order to demonstrate some measurable progress in protecting and restoring Narragansett Bay.

cc. Malcolm J. Grant, Chair, NBP Management Committee
Caroline A. Karp, Project Manager, NBP

STATE OF RHODE ISLAND
Department of Administration
DIVISION OF PLANNING
One Capitol Hill
Providence, RI 02908-5870

MEMORANDUM

To: Mr. Malcolm Grant
Chair, Narragansett Bay Project Management Committee

Subject: Commitment to implement the Comprehensive Conservation and Management Plan (CCMP)

Date: April 8, 1992

As one of the state agencies to whom CCMP recommendations are directed, the Division of Planning is committed to implementing the following portions of the plan.

Section 04-01-03 Source Control: Water Management and Wastewater Treatment

1. The Division of Planning, along with other state agencies, will promote water conservation by actively enforcing the requirements of the Water Supply Management Act of 1991. (Recom. IA, p. 4.63)

Section 04-01-07 Source Reduction: Nonpoint Sources

1. The Division of Planning will participate on the proposed Nonpoint Source Management Committee in order to assist in developing consistent, statewide and regional nonpoint source management strategies. (Recom. IB, pp. 4.133-4.134)

2. The Division of Planning will present statewide nonpoint source management policies to the State Planning Council for adoption into the State Guide Plan, in order to promote consistency and implementation among state and local authorities. (Recom. IC2, p. 4.135)

Section 04-02-01 Land Use

1. The Division of Planning will continue to support the Land Use Commission in drafting new enabling legislation for land development and subdivision review. (Recom. IB, p. 4.156)

2. The Division of Planning will work with the URI Community Planning program and the Rhode Island Section of the American Planning Association to establish training programs for local officials and board members involved with land management. (Recom. II B1, p. 4.159)

3. The Division of Planning will continue efforts to provide technical handbooks, model ordinances, and workshops to help make local planning officials aware of innovative land

management techniques that protect sensitive environmental resources while accommodating growth. (Recom. III C 1, p. 4.167)

4. The Division of Planning will prepare guidance for all municipalities, similar to recommendations in the Scituate Reservoir Watershed Management Plan, regarding a hierarchy of permitted land uses and management techniques in the drainage basins of sensitive waters. (Recom. IV B5B, p. 4.170)

Section 04-02-02 Protection of Critical Areas

1. The Division of Planning will support a proposed committee in development of a critical resource protection policy, beginning with definition of areas, delineation of site-specific areas, and drafting of legislation. (Recoms. IB and C, pp. 4.183-4.184)

2. The Division of Planning will help to provide municipalities with guidelines on managing development in critical resource protection areas. (Recom. ID1A, p.4.185)

3. The Division of Planning will continue to participate on the Rhode Island Rivers Council and support development of a state rivers policy. (Recom. IIB, p. 4.190)

Section 05-02-01 Institutional Oversight

1. The Division of Planning will participate on the proposed CCMP Implementation and Policy Committees. (Recoms. I and II, pp. 5.9-5.10)

Section 05-02-02 Consistency Review

1. The Division of Planning will study methods and feasibility of preparing a periodic summary of projects received for consistency review under Executive Order 12372, to be distributed to other state agencies and interested parties. (Recom. IC3, pp. 5.26-5.27)

These commitments are of course subject to staff and budgetary limitations that may occur in the future, but we have scheduled time for these activities in our upcoming Work Program. We express the commitments in the spirit of promoting the completion and adoption of a CCMP with realistic recommendations, which all of the agencies and groups involved will work toward implementing.

Susan P. Morrison
Chief, Office of Systems Planning

SPM:pag

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

COASTAL RESOURCES MANAGEMENT COUNCIL
Oliver H. Stedman Government Center
Tower Hill Road
Wake Field, R.I. 02879

June 17 , 1992

Mr. Ronald Manfridonia
U.S. EPA Region 1
Water Quality Management Division
J.F.K. Federal Building (WQE)
Boston, MA 02203-2211

Dear Mr. Manfridonia:

The Coastal Resources Management Council (CRMC) is firmly committed to bringing the planning phase of the Narragansett Bay Project (NBP) to an end such that the long process of implementing the Comprehensive Conservation and Management Plan (CCMP) can begin. Included below are various commitments that the CRMC is willing to make over the next one to two years with respect to implementing provisions of the CCMP. These also represent commitments that the CRMC is willing to make to protect Rhode Island's most critical resource, Narragansett Bay, regardless of the fate of the CCMP. In addition, I have included numerous commitments that the CRMC would be willing to make if additional funding and staff were available to undertake these activities.

1) The CRMC will work towards developing shoreline buffer policies for Rhode Island's Coastal Zone. These policies will include minimum buffer distances to improve the management of nonpoint sources of pollution and protect critical habitats. These policies will address NOAA/EPA Section (g) guidance requirements and address concerns and recommendations in the CCMP.

2) The CRMC will continue to hold workshops to educate public officials and the general public about the importance of buffer strips and buffer management.

3) The CRMC will work on developing formal wetlands mitigation policies. These policies will be designed to improve the CRMC's management and protection of critical habitats and resources in Rhode Island's coastal zone.

4) The CRMC will work towards strengthening its existing enforceable policies for coastal wetlands and critical habitats

5) The CRMC will work cooperatively with the DEM Division of Freshwater Wetlands to develop a Memorandum of Understanding (MOU) regarding wetlands regulation in Rhode Island. This MOU should increase the consistency of regulation and improve intergovernmental coordination. The MOU will help to improve Rhode Island's protection of critical resources and habitats.

6) The CRMC will work to develop a coastal zone compliance program. This program will improve the CRMC's management and protection of coastal resources through improved enforcement of the CRMC's coastal policies.

7) The CRMC will provide funding for a research effort on submerged aquatic vegetation (SAV) in the Pawcatuck River, Point Judith Pond, and Ninigret Pond. The results of this research will help the CRMC to assess trends in SAV associated with upland development. It will also help the CRMC to begin to develop enforceable policies to protect SAV in Rhode Island.

8) The CRMC will continue to provide technical assistance to towns developing Harbor Management Plans. The CRMC will continue to place an emphasis on the siting of marine pumpout facilities in harbor management plans such that upon construction of these facilities, the local town will be eligible for an EPA designation as a no discharge zone.

9) The CRMC will continue to publish a newsletter to inform the public about Section 6217 planning activities and implementation of NBP commitments.

10) The CRMC will continue to work with DEM to adopt and implement the new stormwater management policies developed cooperatively last year.

11) The CRMC will work towards adopting and implementing a new dock policy for type 1 waters that has the goal being the ultimate removal and restoration of type 1 water such that they are free of recreational facilities.

12) The CRMC will work towards implementing a new dock compliance program for all waters. This program will enable better enforcement of the CRMC's policies and result in enhanced protection of Rhode Islands critical coastal resources.

13) The CRMC will work with the marinas in Rhode Island to establish marina perimeters. This will improve the CRMC's regulatory review of marina facilities.

14) The CRMC will continue to restrict marina expansion and development of mooring fields in the vicinity of critical marine habitats.

15) The CRMC will continue to work with federal and state agencies to develop consistent policies for the protection of natural resources.

16) The CRMC will work to develop legislation that would create a state consistency process similar to the Section 307 federal consistency process that will ensure that all state agency activities are consistent with the policies contained in CRMC's SAM plans.

17) The CRMC will work to implement the coordinated permit review process outlined in the subdivision enabling legislation as proposed by the Land Use Commission. This legislation will implement many of the CCMP's coordinated permit review recommendations.

18) The CRMC will revise the federal consistency section of the 1978 CRMP to bring it in conformance with the 1990 amendments to the CZMA. In addition, the CRMC will work with the DOP to implement the federal consistency recommendations of the CCMP.

19) The CRMC will participate in the Narragansett Bay Project Implementation Committee and the Narragansett Bay Project Policy Committee.

20) The CRMC will work cooperatively with all state agencies and participate to the greatest extent possible in all work groups and committees developed to implement CCMP recommendations. In addition, the CRMC will provide technical assistance to these groups whenever possible.

However, the CRMC's funding is limited. Most of it is devoted to administering the CRMP. If additional funding was available from either the EPA or from NOAA through the Section 309 grant process, the CRMC would be willing to implement additional CCMP recommendations. These include but are not limited to:

Preparing a Special Area Management Plan for the Sakonnet River that addresses issues consistent with recommendations of the CCMP and findings of the CRMC.

Preparing a Special Area Management Plan for Greenwich Bay that addresses issues consistent with recommendations in the CCMP and the findings of the CRMC.

Preparing a Special Area Management Plan for Mount Hope Bay that addresses issues consistent with the recommendations of the CCMP and the findings of the CRMC.

The CRMC would work with the DEM to develop enforceable policies to further protect habitats of endangered species in Rhode Island's coastal zone.

The CRMC would work to develop enforceable policies to further protect significant critical habitats, e.g. tidal marshes, eel grass beds, and natural rocky intertidal zones.

CRMC would work with other state and federal agencies to develop a long term dredge disposal plan for Narragansett Bay.

Evaluating the CRMC's regulatory process to determine the cumulative and secondary impacts of coastal development. Based on this evaluation, the CRMC would adopt policies to mitigate the negative effects of cumulative and secondary impacts.

In addition, the CRMC will begin to develop a federally approved Section 6217 Coastal Nonpoint Source Pollution Control Program over the next 30 months. In developing this program, the CRMC in conjunction with other state agencies will implement several of the CCMP's recommendations. These include:

21) The CRMC is cosponsoring a Nonpoint Source Pollution Control Conference June 18th, with the DEM, SCS, Sea Grant, and Cooperative Extension Service. This conference is being used a kickoff for the Section 6217 planning process and will bring together state agency representatives and members of the public to discus how to build institutional coordination with respect to nonpoint source pollution control and how to coordinate public out reach and technical assistance to local governments and the general public. The conference will provide an opportunity to discus the structure of the advisory committee(s) to be used for the Section 6217 planning process. The conference will also provide an opportunity to coordinate activities between the CRMC and DEM's Section 319 program.

22) The CRMC will work with the RI DEM to develop a memorandum of understanding (MOU) regarding the relationship of the Section 6217 and the Section 319 programs.

23) The CRMC is willing to participate in the proposed EPA/NOAA threshold review process to establish preliminary agreement on how elements of the Section 6217 (g) guidance will be implemented.

24) The CRMC will review existing state regulations and authorities to determine how well they address EPA/NOAA Section 6217 (g) guidance.

25) The CRMC in conjunction with the DOP and DEM's Section 319 program will examine the state's major land use activities to determine Rhode Island's significant sources of nonpoint source pollution in Rhode Island pursuant to Section 6217 program guidance. During this process, particular attention will be paid to the findings and recommendations of the NBP.

26) The CRMC in conjunction with DEM's Section 319 program will identify the critical areas requiring additional nonpoint source management measures pursuant to Section 6217 guidance documents. During this process particular attention will be paid to the findings and recommendations of the NBP.

27) The CRMC will provide for the public's participation in all phases of the Section 6217 planning process. This will include the provision of public outreach materials and efforts to coordinate existing public outreach activities in Rhode Island. These outreach activities will be consistent with those recommended in the CCMP.

28) The CRMC will have an advisory committee structure to guide the development of the Section 6217 Coastal Nonpoint Source Pollution Control Program.

29) The CRMC will work with other state agencies, the Soil Conservation Service, RC&D, the Conservation Districts, and the University of Rhode Island to improve and coordinate the availability of public outreach materials and technical assistance to local governments and private individuals.

30) The CRMC will provide technical assistance to local governments throughout the planning and implementation of CRMC's Section 6217 Coastal Nonpoint Source Pollution Control Program. This assistance will be consistent with the technical assistance recommended in the CCMP.

31) The CRMC will hold workshops on each major category of pollutants to educate the public and local officials about management actions that can be taken to address and manage these sources of pollutants.

32) The CRMC is willing to work with the DEM's ISDS Division to review their regulations giving consideration to CCMP recommendations, Section 6217 Section (g) guidance, and ways to improve intergovernmental coordination.

33) The CRMC in conjunction with the DEM will work to develop guidance for municipal officials regarding management practices that can be used to implement the provisions of the Section 6217 Program.

However, the funding that is available from NOAA at this time to develop this program is very limited. Therefore, the CRMC will need additional funding from either the EPA (Section 319) or from NOAA to implement many of the CCMP's nonpoint source recommendations as part of the development of a Section 6217 Program. If additional funding was available, the CRMC would be willing to undertake many of the CCMP's nonpoint source pollution control recommendations in conjunction with other state agencies in developing the Section 6217 Program. These include, but are not limited to:

Developing and implementing enforceable policies to protect nutrient sensitive waters in addition to those necessary for Section 6217 Program approval.

Developing a marina pumpout facility siting plan based upon plans prepared under the CRMC Harbor Management Program, CCMP recommendations, and Section 6217 (g) guidance.

Assessing the number of "live-aboards" and house boats in Narragansett Bay.

CRMC is willing to work with all concerned state agencies, the University of Rhode Island and the Maine Trade Association to develop and effective boater waste public education program.

CRMC in conjunction with other appropriate state and local agencies would develop a nutrient management program that extended beyond the requirements of Section 6217.

CRMC will expand its public outreach and local technical assistance activities beyond those required by Section 6217 and attempt to coordinate these services at the state and federal level if additional funding is available.

These represent the commitments that the CRMC is willing to make regarding the implementation of the Narragansett Bay Project CCMP over the next one to two years. Full implementation of these commitments is dependent on the continued availability of present funding and other CRMC program requirements. The CRMC looks forward to working with the members of the NBP Implementation Committee in the future to develop a more cohesive and integrated work plan for the implementation of CCMP priority actions.

Sincerely,

Grover J. Fugate
Executive Director

cc: NBP Executive Committee

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

D E P A R T M E N T O F H E A L T H

22 June 1992

Malcolm J. Grant, Chair
Management Committee
Narragansett Bay Project
291 Promenade Street
Providence, RI 02908

Dear Mr. Grant:

My staff and I at the Department of Health (DOH) have reviewed the draft CCMP to identify recommendations pertaining to the DOH that we have completed, are in the process of implementing, or would implement if additional resources were available. Detailed comments on each of these recommendations are given below.

Section 04-01-01 Source Reduction: Toxics

II.F. Regarding actions to reduce copper and lead concentrations in water supplies, the DOH will continue to enforce the requirements of the Safe Drinking Water Act, as amended in 1986, including the provisions of the lead and copper rule.

Section 04-01-03 Source Control: Water Management and Wastewater Treatment

I.A. The DOH will actively enforce the requirements of the Water Supply Management Act of 1991.

Section 04-01-05 Source Control: On-Site Sewage Disposal Systems:

I.F. An interagency memorandum of agreement to transfer responsibility for ISDS inspections from the DOH to the Department of Environmental Management was signed in September 1990. Under this agreement, DEM has responsibility for regulation of all systems. However, initial inspections of complaints at food establishments which are regulated by the DOH are still performed by the DOH.

Section 04-02-04 Public Health

I.A. 1. The DOH agrees to continue to test bacteriological

samples in surface waters to regulate shellfish growing areas contingent upon sufficient funding. The DOH will also continue to monitor fecal contaminant levels in shellfish tissue with the level of effort depending upon funding. The development of a protocol to assess shellfish growing areas and swimming beaches is already underway although stalled at present due to a lack of resources.

2. Regarding the issue of a formal procedure for official closing and posting of closed beaches, the DOH will develop a general health advisory and will meet with DEM to discuss a memorandum of agreement covering particular beach monitoring and beach closure policies.

The DOH cannot, however, post beaches without additional authority and resources. The DOH will review the option of publishing maps of closed beaches, but we expect that additional resources will be necessary. Similarly, the DOH will continue to test and analyze analytical procedures for fecal coliform levels in sea water. The level of effort will be constrained by the amount of funding available.

3. The DOH supports the concept of testing for alternative fecal indicators to assess shellfish growing areas and will monitor the development of new analytical techniques, including gene probe technology. Additional resources will be necessary if additional testing is to be performed.

The DOH is willing to meet with DEM to consider submitting letters to the Directors of the EPA Office of Marine and Environmental Protection and the FDA regarding the need for alternative indicators and regarding their jointly-sponsored epidemiological study of human health effects of eating raw shellfish.

Reporting requirements for all infectious diseases, including those that may be attributable to shellfish consumption or swimming in Narragansett Bay, are being established.

I.B. 2. Responsibility for inspections and regulatory oversight of shellfish dealers and distributors rests with the DOH. The DOH agrees to increase inspections and regulatory oversight of all establishments handling shellfish if sufficient resources are made available.

II.A. The DOH is willing to meet with regulatory agencies in Rhode Island and Massachusetts regarding risk management to protect the public from consumption of Rhode Island seafood contaminated with toxic chemicals. However, collection of additional data on tissue contaminant levels in winter flounder and other species and

additional testing of quahogs, such as from inadequately sampled and uncertified waters, will require additional resources. The DOH would also be willing to participate in a survey of local seafood consumption rates if sufficient resources become available. The information gathered in such a survey would then be used to review the risk assessments.

II.C.1. The DOH agrees to work with DEM and the State of Massachusetts to develop a consistent approach to risk assessment, risk management and risk communication to insure the safety of Rhode Island seafood.

2. The DOH agrees to consider establishing as policy an acceptable risk level for carcinogens if sufficient funds become available.

3. The DOH has already developed a health advisory protocol for protecting human consumers from seafood contaminated with toxics. This protocol has been followed in health advisories regarding consumption of striped bass contaminated with PCBs.

4. The DOH also supports expansion of the existing shellfish monitoring program, but additional resources for field and laboratory functions are necessary.

5. The DOH agrees to expand laboratory capability for testing shellfish if sufficient resources are made available.

6. The DOH agrees to participate in a laboratory intercomparison program if sufficient resources are made available.

7. The DOH agrees to expand the existing seafood inspection and testing program if additional resources are made available.

8. Similarly, the DOH agrees to work with DEM to develop an educational program regarding seafood safety contamination and handling and storage issues if additional resources are made available.

Sincerely,

Walter S. Combs, Jr., Ph.D.
Associate Director of Health
Environmental Health

xc: William Waters, PhD

Town of North Smithfield

Memorial Town Building, Slatersville, Rhode Island 02876

401 - 767-1310

Planning Division

April 14, 1992

Mr. Richard Ribb
Environmental Policy Analyst
Narragansett Bay Project
291 Promenade Street
Providence, RI 02908-5767

RE: Letter of Support for CCMP

Dear Rich:

I regret not being able to attend the April 13th NBP Management Committee meeting. However, I'd like to extend my compliments to the Bay Project staff for producing such a comprehensive and technical plan. Certainly, the Town of North Smithfield will take all possible steps towards implementation on the local level, including interstate efforts.

At present, many of the Blackstone Valley planners are helping the Metacomet Land Trust in its goal to purchase a critical portion of the "Blackstone Gorge" on the RI-MA border, near the confluence of the Branch River. The area is certainly a "critical area" because of its "wild" qualities but is influenced by a hydropower facility.

Again, thank you for the opportunity to comment on the CCMP at this late date. Best of luck for its adoption and implementation program.

Sincerely,

Karen L Sherman

Karen L. Sherman
Town Planner

KLS:mrb

715-06 SUMMARY MATRICES

The tables presented in this section are intended to provide readers with an overview of the entire Narragansett Bay *Comprehensive Conservation and Management Plan* (*CCMP*). Specifically, they summarize and provide a cross-reference to all recommendations contained in the *CCMP*; identify expected implementation schedules; report the current status of the recommended actions; and summarize the estimated costs of implementation. Since these tables summarize information contained elsewhere in the plan, they should only be used in combination with the individual *CCMP* chapters to guide implementation of specific actions.

Table 715-06(1), "Summary of *CCMP* Recommendations," aggregates the recommended policies and actions across all *CCMP* chapters. Related recommendations are combined and listed according to the ultimate action that is recommended (*e.g.*, combined sewer overflow abatement), and the type of governmental action that is required. Seven categories of governmental action are used:

- Coordinate Policies and Plans
- Develop Policies and Plans
- Prepare Legislation and Regulations
- Enforce Laws and Regulations
- Provide Technical Assistance and Public Education
- Capital Investment
- Conduct Monitoring and Assessment

Although this system of categorization is somewhat arbitrary, the categories correspond to a logical sequence of governmental action—from information gathering through capital construction—as well as a typical division of responsibilities within the agencies responsible for implementation.

The "Reference" column (Column #1) of Table 715-06(1) cross-references each action listed under "Recommended Action" (Column #2) to the *CCMP* chapters that describe detailed implementation requirements and related actions. When multiple chapters are referenced, the primary chapter is listed first. Those recommended actions that have been identified by the Narragansett Bay Project Management Committee as the highest priority for action in the first two years following approval of the *CCMP* (1992-94) are highlighted in bold in Column #2. Italicized recommendations represent actions that are still under consideration by the Narragansett Bay Project Management Committee.

The primary implementing authorities responsible for executing all or part of the recommended action are listed under "Agency" (Column #3). In most cases, however, agency personnel should refer to the individual *CCMP* chapters to identify their expected role in implementing the specified action since Column #2 omits the explanatory detail associated with each recommended action.

Each recommended action in Table 715-06(1) is also cross-referenced to the *CCMP* goal (Column #4) that it is expected to help address. The *CCMP* goals can be paraphrased as follows:

Goal #1 Prevent further degradation of water quality.

Goal #2 Protect diminishing high quality critical resource areas.

Goal #3 Improve management of Bay-dependent living resources.

Goal #4 Rehabilitate degraded waters throughout the Bay basin.

Goal #5 Establish interstate and interagency agreements, as necessary, to oversee and coordinate implementation of the *CCMP*.

(The full text of the goal statements is presented in Part 715-03.) The purpose of cross-referencing recommended actions to goals is to assist Bay decision-makers and imple-

menting authorities in prioritizing future actions.

The "Schedule" column (Column #5) of Table 715-06(1) identifies the period (1992-94 or 1994-97) in which the recommended action should be initiated. A single asterisk denotes discrete actions that should be initiated and completed within the indicated time frame. Double asterisks indicate that the action is expected to involve an on-going effort. Although not explicitly shown, many identified actions will require continuing effort beyond the five-year planning horizon addressed in the *CCMP*. The current implementation status of each recommended action (*e.g.*, progress to date; availability and source of funding, if known) is reported in the "Comments" column (Column #6).

Table 715-06(2), "Summary of Estimated *CCMP* Costs," presents the total annual personnel and non-personnel costs associated with implementing the recommendations of each chapter of the *CCMP* between 1992 and 1997. Readers should refer to individual *CCMP* chapters for a more detailed breakdown and explanation of expected costs.

Table 715-06(3), "Summary of Estimated *CCMP* Costs, By Implementing Authority," presents the total annual estimated personnel and non-personnel costs associated with implementing each element of the *CCMP* between 1992 and 1997, for each of the primary state implementing authorities. Although many federal and local agencies also have identified responsibilities under the *CCMP*, cost summaries are only presented for the Rhode Island Department of Environmental Management (RIDEM), the Rhode Island Coastal Resources Management Council (CRMC), the Rhode Island Division of Planning (RIDOP), the Massachusetts Department of Environmental Protection (MADEP), and Massachusetts Coastal Zone Management (MACZM) because these state agencies represent the primary implementing or initiating authorities with respect to most actions recommended in the *CCMP*.

As a final note and reminder to readers, these tables are designed to provide a sense of the scope, complexity, and cost of the entire *CCMP*. The tables should *not*, however, be used without reference to the *CCMP* itself.

Reference	Recommended Action	Agency	Goal					Schedule		Comments
			1	2	3	4	5	92-94	94-97	
	COORDINATE POLICIES AND ACTIVITIES									
05-02-01; 05-02-02	**Establish NB Implementation and Policy Committees to coordinate and oversee CCMP implementation; and revise CCMP, as necessary**	NB Executive Committee	X	X	X	X	X	**	**	
05-02-01	**Establish NB planning section to oversee and assist with CCMP implementation**	USEPA, RIDEM	X	X	X	X	X	**	**	Some federal funding available in 1992-93, 1993-94
04-02-01	Coordinate and develop consistent federal policies for the protection of natural resources	USEPA, NOAA, Fed. Highway Admin., USDA, HUD	X	X	X	X	X	**	**	
04-01-06; 04-02-01	Reconcile RIDEM-CRMC water quality and water use standards; RIDEM-CRMC regulations regarding uses of tidal waters	RIDEM, CRMC	X	X	X	X	X	**	**	GIS maps exist showing areas of inconsistency.
04-01-04; 04-03-01; 04-03-02	Reconcile water quality classifications and state CSO policies to the extent necessary to manage interstate waters and meet federal CWA requirements	USEPA, RIDEM, MADEP				X	X		*	Depends on timing of Fall River CSO abatement; results of Blackstone River WLA.
04-03-02	Establish permanent Blackstone River Task Force to address interstate pollution problems, e.g., reconciliation of water quality standards, water withdrawals, sediment remediation, habitat protection	NEIWPCC, USEPA, MA, RI				X	X	**	**	
04-02-01; 04-02-02	Ensure agency participation in coordinated, pre-application permit reviews; request communities to designate a "s.p.o.c." to receive all notices re. permit actions; conform state and local agency policies with approved SAM Plan policies	CRMC, RIDEM, munic.	X	X			X	**	**	
05-02-02	Incorporate relevant elements of the State Guide Plan into the RI CRMP; establish a CZM consistency review process in RI; and coordinate CRMC-MACZM responses re. regional proposals	CRMC	X	X	X	X	X	**	**	
05-02-02	Amend MEPA to include assessment of effect on adjacent states and automatically include RI as a reviewer on MA discharge and water withdrawal permits in Narragansett Bay basin	USEPA, MAEOEA	X	X	X	X	X	*		Suggested language has been submitted to MACZM for review.

Table 715-06(1) SUMMARY OF CCMP RECOMMENDATIONS

Reference	Recommended Action	Agency	Goal					Schedule		Comments
			1	2	3	4	5	92-94	94-97	
04-03-02	Establish a Blackstone River National Heritage Corridor consistency review program; submit comprehensive environmental plans related to the Blackstone River basin to the Federal Energy Regulatory Commission (FERC) for recognition in FERC permits	BRVNHCC, all agencies				X	X	*		
05-02-02	Increase state agency participation in MEPA reviews; USEPA reviews of ACOE permits; CRMC consistency reviews; E.O. 12372 consistency reviews	RIDEM, RIDOP, CRMC	X	X	X	X	X	**	**	
05-02-04	Establish and enforce 1) external review of government-funded studies; 2) standardized data collection, analysis, reporting requirements; 3) data submission requirements	USEPA, NOAA, state agencies	X	X	X	X		**	**	

Reference	Recommended Action	Agency	Goal					Schedule		Comments
			1	2	3	4	5	92-94	94-97	
	DEVELOP POLICIES AND PLANS									
04-02-02; 04-02-01; 04-02-03; 04-01-02; 04-01-06; 04-03-02	**Develop statewide Critical Resource Protection Policies, including 1) objective criteria for designating critical resources; 2) a GIS-based mapped inventory of identified resources; 3) regulatory and nonregulatory controls to protect identified resources**	RIDEM, MADEP, CRMC, MACZM, RIDOP, munic.	X	X	X			**	**	Identify and map critical areas (1992-93); Prepare development standards, overlay districts (1993-94).
04-01-07; 04-02-01	Establish State NPS Management Committees to 1) develop a consistent system for designation of priority waterbodies; 2) coordinate CZM "6217" and CWA "319" NPS programs for implementation of NPS BMPs	USEPA, NOAA, USDA, State NPS Coords.	X	X		X		*		In progress.
04-01-07; 04-02-01; 04-03-01	Adopt regional stormwater management policy, including 1) criteria for prioritizing stormdrain improvements and retrofits and 2) stormwater regulations	USEPA, State NPS Coords, RIDOT, MDOT, Cons. Districts, munic.	X	X		X	X	*		In progress.
04-01-07	Draft local and regional stormwater management plans	USEPA, State NPS Coords, munic.	X	X		X			*	
04-01-02; 04-02-02	Establish Buffer Strip Delineation Work Group to adopt buffer delineation methods that consider 1) habitat values; 2) buffer effects on nutrient attenuation; 3) fertilizer-use limitations	CRMC, RIDEM, URI, others	X	X	X				*	
04-01-02; 04-02-02	**Prepare SAM Plan for Greenwich Bay, including detailed strategies to protect critical marine resources**	CRMC, RIDEM, munic.	X	X	X			*		Funds available for preliminary GB SAM Plan.
04-02-02; 04-03-01	Prepare SAM Plan for Mount Hope Bay, include detailed strategies to protect critical marine resources	CRMC, RIDEM, MADEP, MACZM, munic.		X	X	X			*	Preliminary interstate effort in progress using CZM '309' funds.
04-02-02	Prepare SAM Plan for Sakonnet River, including detailed strategies to protect critical marine resources	CRMC, RIDEM, munic.		X	X				*	
04-02-02; 04-02-03	Update Management Plan for Narragansett Bay National Estuarine Research Reserve	RIDEM, NOAA		X	X			*		In progress.
04-02-01	Ensure that regulatory programs 1) establish objective criteria for all permit decisions; 2) assess cumulative impacts; and 3) clearly state regulatory requirements that apply to local gov't and private sector	RIDEM, CRMC	X	X	X	X	X	**	**	

Table 715-06(1) SUMMARY OF CCMP RECOMMENDATIONS

Reference	Recommended Action	Agency	Goal					Schedule		Comments
			1	2	3	4	5	92-94	94-97	
04-01-02	Develop national ecological, aquatic life, or loading criteria for nitrogen and phosphorus	USEPA	X	X	X	X		*		
04-01-01	Develop national aquatic life and public health criteria for PHCs and PAHs	USEPA, FDA	X	X	X	X		*		
04-01-01; 04-02-03; 04-03-02	Evaluate need for site-specific aquatic life toxics criteria and revised discharge limits based on toxics loadings effects on aquatic community health	USEPA, RIDEM, MADEP	X	X	X	X		*		
04-01-01; 04-02-03; 04-03-01; 05-02-04	Prepare "Narragansett Bay Marine Spill and Natural Disaster Contingency Plan" that includes agreements on coordinated emergency and scientific responses to oil spills, fish kills, algal blooms, etc.	RIDEM, MADEP, USCG, NOAA, RIEMA	X	X	X	X		*		In progress.
04-01-07	Develop water supply management plan, including 1) analysis of environmental impact; 2) analysis of effect of groundwater withdrawals on streamflow; 3) results of agricultural water use inventory	RIDEM, MADEM	X	X	X	X		*		In progress.
04-02-01	Develop State Guide Plan element for enhanced management of water quality and critical areas	RIDOP	X	X	X	X			*	
04-02-02	Develop planning strategies for projected sea level rise	ACOE, RIDOP, CRMC, RIDEM	X	X		X			*	Funding for ACOE demonstration project may be available.
04-02-01	Assess feasibility of establishing a land court in RI	Land Use Comm.	X	X			X		*	
04-01-07	Develop a nutrient management program; encourage installation of waste storage structures; and evaluate tax credits, economic incentives for farmers to promote conservation farming	RIDEM, USDA, MADAG, Cons. Districts	X	X				*		
04-02-03	***Develop management plans for 1) commercially, recreationally and ecologically important species; 2) all threatened or endangered estuarine-dependent plants and animals; and 3) re-introduction of native anadromous and catadromous fisheries***	NOAA-NMFS, USFWS, RIDEM, RIMFC, MADFW, URI			X			**	**	"Shellfish Management Plan" is highest priority. Plans should address causes and solutions for observed declines in Bay species.
04-02-03	*Evaluate whether the RI Marine Fisheries Council should be re-structured to be advisory to the RIDEM Division of Fish and Wildlife*	RIDEM, RIMFC, RI Gov. Ofc.			X			*		

Table 715-06(1) **SUMMARY OF CCMP RECOMMENDATIONS**

Reference	Recommended Action	Agency	Goal					Schedule		Comments
			1	2	3	4	5	92-94	94-97	
04-02-03	*Develop Narragansett Bay Aquaculture Feasibility and Development Plan for native species, e.g. American oyster, bay scallop, mussels*	RIDEM, URI, USFWS, CRMC, RIMFC			X				*	
04-03-02	Reach interstate agreement on minimum threshold flows in Blackstone; negotiate minimum flow and fish passage agreements with dam owners; and evaluate withdrawal proposals	MADEM, MADFW, RIDEM, USFWS			X	X		**	**	
04-02-04	Develop provisional state risk management policy, including 1) state "action levels"; 2) advisories re. chemicals in edible seafood; 3) policies for beach closure and bathing beach monitoring	RIDOH, MADPH, RIDEM, MADEP				X		**	**	Partially complete.
04-01-06	**Prepare a Narragansett Bay marina pump-out facility siting plan, including a consistent written policy for 1) regulating construction of marinas, docks, mooring fields; 2) enforcing prohibitions on boater discharges**	RIDEM, CRMC, MADEP, USACOE	X	X	X	X		*		
04-01-06	Investigate 1) increasing pass-through of federal and state boat registration fees for local enforcement of and discharge regulations; 2) use of State Revolving Fund to assist financing construction of pump-outs	RIDEM, MACZM	X	X		X		*		Partially complete.
04-01-01; 04-03-02	Establish procedures for coordinated permitting and inspections across all disposal media; including a feasibility study re. facility-based discharge permits that cover discharges to all media	USEPA, MADEP, RIDEM, munic.				X			*	
04-01-04	Revise RI CSO policy to include water quality approach and waiver process	RIDEM				X		*		
04-01-04	Implement policy to minimize or eliminate discharges to combined sewers	RI and MA CSO authorities				X		**	**	
04-01-03	Establish commission to evaluate options for consolidation of WWTFs	RI Governor's Office	X	X		X			*	
04-03-04	*Develop national guidance for mgmt. of contaminated sediments; prepare a 20 yr sediment management plan for Narragansett Bay; evaluate all remediation and disposal options for contaminated sediments*	USEPA, USACOE, USFWS, RIDEM, CRMC				X		*		

Table 715-06(1) **SUMMARY OF CCMP RECOMMENDATIONS**

Reference	Recommended Action	Agency	Goal					Schedule		Comments
			1	2	3	4	5	92-94	94-97	
	PREPARE LEGISLATION AND REGULATIONS									
04-01-05; 04-01-01; 04-01-02; 04-01-06	**Adopt legislation requiring municipalities to establish wastewater management districts; and amend existing regulations governing siting, design, construction, and maintenance of on-site sewage disposal systems**	RIDEM, MADEP, WWTFs	X	X		X		**	**	In progress. Implementation costs recoverable from user fees.
04-01-02	Draft legislation requiring property owners to certify status of ISDS on sale or transfer of property	RI Realtors Assoc., RIDOP, RIDEM	X	X				*		In progress.
04-01-02	Incorporate State NPS Plan, "RI Soil Handbook", "RI Stormwater Design Manual" into State Guide Plan in order to enforce use of state nps assessments, designation of priority waterbodies, use of BMPs	RIDOP, all agencies	X	X		X			*	Partially complete.
04-01-07	Adopt Section 401 water quality certification regulations to provide for review and certification of proposed stormwater, nutrient, soil erosion and sediment controls	RIDEM, MADEP	X	X		X		*		In progress.
04-02-01; 04-02-02	Amend Freshwater and Coastal Wetlands Acts and regulations to 1) increase protection of wetland buffers or transition zones; 2) add hydric soils to the wetland definition; 3) require wetland verification prior to site plan review; 4) increase penalties	RIDEM, CRMC	X	X		X			*	
04-01-02	Draft legislation prohibiting sale of phosphorus-based detergents	RIDEM, MADEP	X	X		X		*		
04-02-01	Adopt enabling legislation authorizing communities to 1) implement special purpose programs to protect sensitive natural resources; 2) designate an environmental enforcement officer; 3) establish unified development ordinances	RIDOP, Land Use Commission	X	X				*		
04-02-02	Revise RI Endangered Species Act to allow designation of significant habitats	RIDEM, CRMC		X	X			*		
04-02-03	*Draft legislation establishing 1) marine sanctuaries in Narragansett Bay, possibly via expansion of the NB National Estuarine Research Reserve; and 2) economic incentives for property owners to protect and increase biological diversity via land set-asides*	RIDEM, RIDOP		X	X			*		
04-02-03	*Draft legislation 1) establishing marine recreational fishing and shellfishing license fees; and 2) prohibiting sale of any recreational catch without a commercial fishing license*	RIDEM, MADFW			X			*		

Reference	Recommended Action	Agency	Goal					Schedule		Comments
			1	2	3	4	5	92-94	94-97	
04-02-03	*Adopt regulations prohibiting the deliberate and accidental introduction of non-indigenous exotic and diseased cultivated species to Narragansett Bay*	RIDEM			X				*	
04-02-03	*Require industries with cooling water intakes and/or thermal discharges to improve screen technologies and mitigate thermal shock to reduce fish mortality, e.g., Brayton Point*	USEPA, RIDEM, MADFW			X			*		
04-02-01	Require local officials to attend appropriate training programs or meet minimum qualifications; and require town solicitors to demonstrate proficiency in land use law	Munic., Land Use Commission	X	X					*	
04-01-07	Adopt and implement Soil Erosion and Sediment Control Ordinance	RI, MA municipalities	X	X					**	In progress in Rhode Island.
04-02-01	Revise Subdivision Enabling Act; streamline local subdivision requirements	RIDOP, Land Use Commission,		X				*		In progress.
04-02-04	Establish mandatory reporting requirements for illnesses attributable to shellfishing or swimming in Narragansett Bay	RIDOH				X		**	**	
04-01-06	Require revised municipal Harbor Management Plans to 1) include plans to enforce vessel discharge prohibitions and use of pumpouts; 2) include marinas in WWMDs; 3) contain policy re. "live-aboards"	CRMC, RIDEM, munic.	X	X	X	X			*	
04-01-01	Identify and eliminate unnecessary regulatory barriers to source and loading reductions of toxics	USEPA, RIDEM, MADEP	X	X	X	X		**	**	In progress.
04-01-04; 04-02-04; 05-02-04	Revise RIPDES/NPDES permits to1) require receiving water monitoring for WWTFs, CSOs and significant storm drains; 2) posting of CSOs as unsafe for swimming, fishing, or shellfishing; 3) require electronic data submittal	USEPA, RIDEM, MADEP, munic.	X		X	X		**	**	
04-01-01	**Expand Industrial Pretreatment program to include additional commercial dischargers of toxic chemicals**	USEPA, RIDEM, MADEP, WWTFs	X	X	X	X		**	**	In progress.
04-01-01	Establish industrial wastewater discharge fees and water rate structures based on volume, loading and toxicity in order to promote waste minimization and conservation	WWTFs	X	X	X	X		*		
04-01-01	Draft legislation, if necessary, re. "hard to dispose" materials	MADEP				X		*		Partially complete.
04-01-01	Draft legislation to provide tax credits to industries that can document reduction in toxics discharges	RIDEM, MADEP	X			X		*		

Table 715-06(1) SUMMARY OF CCMP RECOMMENDATIONS

Reference	Recommended Action	Agency	Goal					Schedule		Comments
			1	2	3	4	5	92-94	94-97	
04-01-01	Require professional certification for municipal Industrial Pretreatment program staff	RIDEM, MADEP	X			X			*	
04-01-01	Draft federal and state legislation requiring the use of BMPs on all highway construction projects to control highway runoff	US Congress, RI, MA	X	X		X		*		
04-01-01	Require management plan as a pre-condition for use of Cu-based herbicides to treat anthropogenically-induced eutrophication	RIDEM, MADEP	X	X	X			*		
04-01-01; 04-02-03	Draft comprehensive marine spill legislation re. 1) use of fuel hose fittings at marine fueling stations; 2) satellite navigation and pilots; 3) state remedies for natural resource damage, cleanup and remediation	RIDEM, MADEP, CRMC	X	X	X	X		*		Partially complete.
04-01-01	Establish more rigorous motor vehicle inspection requirements for emissions, leaks	RI, MA	X	X	X	X			*	In progress.
04-01-07	Revise pesticide regulations to 1) modify pesticide and fertilizer labeling requirements, as necessary, to include water quality considerations; 2) increase certification requirements for pesticide applicators	RIDEM, MADAG	X	X	X			*		

Table 715-06(1) SUMMARY OF CCMP RECOMMENDATIONS

Reference	Recommended Action	Agency	Goal					Schedule		Comments
			1	2	3	4	5	92-94	94-97	
	ENFORCE LAWS AND REGULATIONS									
04-02-01	Encourage communities to comply with growth management policies re. 1) concentrating development in areas presently served by public water and sewers; 2) limiting public water and sewer extension in critical areas unless conditions are met	Land Use Commission, RIDOP, RIDEM, CRMC, MADEP, munic.	X	X		X		**	**	
04-01-03	Enforce the requirements of water conservation/water supply management plan legislation (RIGL 46-15.4-1 et seq.)	RIDEM, RIDOP, PUC	X	X		X		**	**	
04-02-03	*Enforce land development performance standards, overlay districts and wetlands regulations to assure protection of critical habitats*	RIDEM, CRMC, RIDOP, munic.	X	X	X				**	
04-02-03	*Invoke Clean Water Act section 404(c) and 404(q) to compel protection of significant habitats, e.g., tidal marshes, eel grass beds, natural rocky intertidal zones*	USEPA, NOAA, USFWS	X	X	X			**	**	
04-01-05	Execute a Memorandum of Agreement between RIDEM and RIDOH transferring responsibility for ISDS inspections to RIDEM	RIDEM, RIDOH	X	X		X		*		MOA completed.
04-01-02	Enforce prohibition on acids, organic chemical additives to ISDSs	RIDEM, MADEP, WWMDs	X						**	
04-02-01	Train regulatory field personnel to recognize obvious violations across environmental media	RIDEM, CRMC	X	X		X		**	**	
04-01-07	Perform on-site inspection of Department of Transportation contractor compliance with required NPS and highway runoff controls	RIDEM, MADEP, RIDOT, MDOT, Atty. Gen.	X	X		X		**	**	
04-02-01	(Municipalities) Hire full- or part-time professional planners	Munic.	X	X					**	
04-01-06	Continue to restrict marina expansion, development of mooring fields in the vicinity of critical marine resources	USACOE, CRMC, RIDEM	X	X	X	X		**	**	In progress.
04-01-06	Review and enforce federal MSD manufacturing, installation and maintenance requirements and negotiate interagency MOA re. 1) increased Coast Guard enforcement of vessel discharge prohibitions; 2) delegation of shared enforcement authority to states	USEPA, USCG, RIDEM, MADEP	X	X	X	X		*		MOA complete.

Reference	Recommended Action	Agency	Goal					Schedule		Comments
			1	2	3	4	5	92-94	94-97	
04-01-06	Install marine signs showing location of pump-outs; enforce use of marine pump-outs; encourage operators of marine facilities to enforce discharge prohibitions; and petition USEPA for "no discharge" zone status for all or part of NB	RIDEM, marine facility operators	X	X	X	X			**	
04-02-03	*Enforce fisheries equipment, catch, landing requirements via establishment of marine enforcement unit*	NOAA, RIDEM, MADFW			X			**	**	
04-03-02	Require and enforce flow and fish passage requirements in all FERC permits	Congress, FERC, USFWS, RIDEM, MADEP			X	X			**	
04-01-01; 04-01-02; 04-03-02	**Revise existing municipal and industrial discharge permits to include numeric, chemical-specific limits for all toxic chemicals on the Narragansett Bay "List of Toxics of Concern"; and enforce compliance with these revised discharge limits**	USEPA, RIDEM, MADEP	X	X	X	X		**	**	
04-01-02	Revise state water quality standards and NPDES/RIPDES permits to include enforceable technology and water quality-based nitrogen (N) and phophorus (P) limits, including monitoring of nitrogen and phosphorus	USEPA, RIDEM, MADEP	X	X	X	X			**	
04-01-02	Incorporate nitrogen and phosphorus criteria or loading limits into Coastal Zone Nonpoint Source Management Plans	CRMC, MACZM	X	X	X				*	
04-01-01	Require all dischargers subject to Industrial Pretreatment program rquirements to file a waste minimization report (developed by USEPA) by 1995	USEPA, RIDEM, MADEP, WWTFs	X	X	X	X			**	In progress.
04-01-01	Develop and enforce standardized technology-based limits for industrial dischargers and require use of proven, affordable technologies	USEPA, RIDEM, MADEP, WWTFs	X	X	X	X		**	**	
04-01-01	Ensure that all dischargers subject to regulation have permits	USEPA, WWTFs	X	X	X	X		**	**	In progress.
04-01-01	**Enforce compliance with Industrial Preatment program by 1) performing on-site assessment for sig. noncompliance; 2) reviewing Ind. Prtmt. programs where ≥15% of dischargers are in sig. noncompliance; 3) seeking administrative, civil, criminal penalties**	USEPA, RIDEM, MADEP, WWTFs	X	X	X	X		**	**	
04-01-01	Hire a Massachusetts Pretreatment Coordinator	MADEP	X					**	**	

Table 715-06(1) SUMMARY OF CCMP RECOMMENDATIONS

Reference	Recommended Action	Agency	Goal					Schedule		Comments
			1	2	3	4	5	92-94	94-97	
04-02-04; 05-02-04	Establish national and state seafood testing program and establish laboratory certification requirements for analysis of tissue, water, sediments	USEPA, FDA, RIDOH, MADPH, RIDEM, MADEP				X		**	**	
04-02-04	Issue public health advisory about swimming in sewage contaminated waters and post areas closed for water quality reasons, and/or publish updated maps indicating location of restricted areas	RIDOH, RIDEM, MA Boards of Health				X		**	**	
04-01-01	Require WWTFs to analyze alternative disinfection technologies to improve disinfection and reduce chlorine toxicity	USEPA, RIDEM, MADEP, WWTFs				X			*	In progress in MA.
04-02-04	Increase enforcement efforts to reduce illegal harvesting of shellfish from uncertified waters of Narragansett Bay	RIDEM, MADFW				X		**	**	
04-02-04	Use viral indicators in addition to fecal coliform to support certification of shellfishing areas, especially where septic systems are a suspected source of fecal contaminants	RIDEM, MADPH				X		**	**	

Table 715-06(1) SUMMARY OF CCMP RECOMMENDATIONS

Reference	Recommended Action	Agency	Goal					Schedule		Comments
			1	2	3	4	5	92-94	94-97	
	PROVIDE TECHNICAL ASSISTANCE AND PUBLIC EDUCATION									
04-01-07; 04-02-01	**Develop guidance for municipal officials regarding 1) BMPS to control NPS pollution; 2) innovative, environmentally protective land management practices; 3) development of local and regional stormwater management plans to reduce or treat storm runoff**	RIFDEM, MADEP, CRMC, MACZM, RIDOP, USEPA, USDA, NOAA, RI and MA Cooperative Extension	X	X		X		**	**	In progress.
04-01-07; 04-02-01; 04-02-02	Continue to offer technical assistance to communities, including 1) site plan review and inspection; 2) description of state wetlands regs. and wetlands maps	RI, MA Conservation Districts	X	X		X		**	**	In progress.
04-01-05	Increase efforts to educate property owners about on-site septic system maintenance and environmental problems related to on-site sewage disposal systems	RIDEM, RIDOP, CRMC, MADEP, WWMDs	X	X				**	**	
04-01-06	Institute boater education program re. proper waste disposal practices, and develop and distribute list of chemical disinfectants, deodorizers that should be phased out	RIDEM, URI Boat Sewage Management Task Force	X	X		X		**	**	In progress.
04-02-03	*Develop public education materials re. protection of threatened and endangered species, biological diversity and critical habitats*	RIDEM, public interest groups			X			*		
04-02-03	*Establish "Public Education" and "Research" Coordinators for the NB National Estuarine Research Reserve*	RIDEM		X	X			**	**	
04-01-01; 04-03-02	Expand hazardous waste reduction technical assistance programs to: 1) train regulators; 2) develop public ed. materials; 3) promote "green" business, products, Incubators; 4) assist with on-site assessments; 5) promote "Industrial Toxics (33/50) Project"	USEPA, RIHWRP, MADEM	X	X	X	X		*	**	
04-01-01; 04-01-07	Develop education materials for homeowners and farmers re. water conservation, wetlands protection, and pesticide use	USDA, RI and MA Coop. Extension, RIDEM, MADAG	X	X	X			*	**	

Reference	Recommended Action	Agency	Goal					Schedule		Comments
			1	2	3	4	5	92-94	94-97	
04-01-07; 04-02-01	Expand research and demonstration projects re. 1) vegetative practices to control nutrient transport and soil erosion; 2) composting techniques; 3) nutrient and soil testing services; and 4) sensitive natural resources	USDA, RI and MA Coop. Extension	X	X				**	**	
04-01-07	Expand "Integrated Pest Management" strategies to additional crops and pests	RI, MA Coop. Extension		X	X			*		
04-01-07	Improve training for pesticide applicators	RIDEM, MADAG		X	X	X		*		
04-02-03; 04-01-07	Establish NB Scientific Advisory Board	RIDEM, MADEP, URI, others	X	X	X	X		*		
04-02-04	Establish interagency Fish Contamination Task Force to 1) coordinate federal seafood risk management activities; 2) develop consistent national policy and criteria for safe consumption of seafood; 3) assist states with interstate risk management strategy	USEPA, FDA, USDA, NOAA				X		*		
04-02-04	Complete epidemiological study of illnesses associated with eating sewage-contaminated shellfish and develop alternative fecal indicators, if necessary	USEPA, NOAA, FDA				X		*		
04-02-04	Expand education re. seafood safety, handling and storage	NOAA, RIDOH, MADPH				X		**	**	
04-03-02	Establish public information program on need to clean up Blackstone	USEPA, MA, RI, BRVNHCC				X		**	**	

Table 715-06(1) SUMMARY OF CCMP RECOMMENDATIONS

Reference	Recommended Action	Agency	Goal					Schedule		Comments
			1	2	3	4	5	92-94	94-97	
	CAPITAL INVESTMENT									
04-02-01	Reorganize RIDEM and other RI resource management authorities into RIDOE; and consider developing a unified regulatory permit process	RIDEM, CRMC, RI Governor's Office	X	X	X	X	X	*		
04-02-02; 04-02-03	Consider altering state land acquisition priorities to acquire and/or restore critical estuarine breeding, spawning and nursery habitats via federal, state, local or private sanctuary designation	RIDEM, RIDOP, USNPS, USFWS, MA agencies, private organizations		X	X			*		
04-01-05	Re-authorize the "Sewer and Water Supply Failure Fund" with loans conditioned on establishment of WWMDs	RIDEM	X	X		X		*		
04-01-04	Survey and eliminate dry weather stormdrain and CSO flows and illegal hook-ups as identified	USEPA, RIDOH, RIDOT, MADOT, munic.	X	X		X		**	**	
04-01-06	Establish and maintain publicly available shore-based toilets and/or pump-out facilities at heavily used state parks with boat facilities and in municipal harbors	RIDEM, munic.	X	X	X	X		*		In progress. User fee supported.
04-01-01	Expand "Household Hazardous Waste" and "Waste Oil" collection programs	RI, MA	X	X		X	X	**	**	
04-01-01	Design and deploy tailored oil booms to protect critical resource areas	USCG, RI, MA		X	X				*	
04-01-01	Require water suppliers to repair or replace delivery system, or improve treatment if copper or lead are local water quality problems	RIDEM, MADEM				X			*	
04-01-01	Establish/expand "Hazardous Waste Reduction" grant-loan funds	RI, MA				X		*		RI has approx. $1.2 million remaining in the "Haz. Waste Reduction Research, Demonstration, Treatment" bond fund
04-02-04	Expand RI and MA state laboratory capabilities	RIDOH, MADPH	X			X			**	
04-03-02	Develop and implement sediment remediation plan for the Blackstone River	MADEP, RIDEM				X			**	Major capital costs expected after 1994.
04-03-02	Negotiate agreement to repair Fisherville Dam	Dam owner, MADFW			X	X		*		

Table 715-06(1) SUMMARY OF CCMP RECOMMENDATIONS

Reference	Recommended Action	Agency	Goal					Schedule		Comments
			1	2	3	4	5	92-94	94-97	
04-03-01	**Conduct CSO abatement project for Fall River; include establishment of interstate notification, review, and mediation processes**	USEPA, MADEP, Fall River, RIDEM				X		**	**	In progress.
04-01-04	**Conduct CSO abatement projects on Blackstone, Seekonk, Providence, Moshassuck, Woonasquatucket Rivers according to statewide priority ranking system**	NBC/BVDC, RIDEM, USEPA				X		**	**	In progress. Major capital costs expected after 1994.

Table 715-06(1) SUMMARY OF CCMP RECOMMENDATIONS

Reference	Recommended Action	Agency	Goal					Schedule		Comments
			1	2	3	4	5	92-94	94-97	
	CONDUCT MONITORING AND ASSESSMENT									
04-01-07; 05-02-04	Reassess eligibility of CWA funds for data collection, monitoring	USEPA	X	X		X		*		No cost estimate prepared.
05-02-04; 04-01-02; 04-02-03; 04-02-04	**Implement a long-term monitoring program for Narragansett Bay**	RIDEM, MADEP, USEPA, RIDOH, MADPH	X	X	X	X		**	**	
04-01-02; 04-01-07; 05-02-04	Establish permanent Citizens Monitoring Program Coordinators in RI and MA	RIDEM, MADEP	X	X	X	X		**	**	
04-01-07; 04-03-02	Study environmental fate of nutrients, pesticides, and effectiveness of bmps; including identifying and reducing nps loadings from landfills and other sources	USEPA, USDA, NOAA, RIDEM, MADEP	X	X				*		
04-01-01; 04-01-07	Survey use and risk associated with pesticides and herbicides in Narragansett Bay basin, including "non-restricted use" pesticide usage	RIDEM, MADAG	X	X	X			*		In progress.
04-02-03	*Assess the effectiveness of fisheries stock enhancement via habitat manipulation and stock supplementation; assess river flow needs to protect existing species and to allow restoration of anadromous and catadromous fish*	USFWS, RIDEM, MADEM, URI			X				*	In progress.
04-02-04	Perform survey of local seafood consumption rates	RIDOH, MADPH				X			*	
04-02-04; 05-02-04	Monitor fecal coliforms in shellfish (from "beds" and trade) and bathing beaches	RIDEM, RIDOH, MADPH, munic.				X		**	**	In progress.
04-01-06	Assess the number of "live-aboards" and houseboats in Narragansett Bay	CRMC, RIDEM, RIMTA, IMI	X	X		X		*		
04-01-02	WLA in Greenwich Bay and revise EG WWTF facilities plan	RIDEM, munic.	X		X				*	
04-01-01; 04-03-01	Conduct DO, nutrient and toxics concentrations assessment of Mount Hope Bay	MADEP, RIDEM, USEPA, NE Power				X		*		In progress.
04-01-07; 04-03-02	Conduct shoreline surveys for Blackstone and Taunton Rivers to support State NPS assessments	MADEP, RIDEM, State NPS Coords, Cons. Districts	X			X		**	**	In progress in RI.

Reference	Recommended Action	Agency	Goal					Schedule		Comments
			1	2	3	4	5	92-94	94-97	
04-01-02; 04-03-02	Conduct nutrient and metals WLA for Blackstone River	USEPA, MADEP, RIDEM, Worcester, NEIWPCC				X		*		In progress.
04-01-02	Complete nutrients WLA for Providence-Seekonk River	RIDEM				X		*		In progress.
04-01-01	Conduct metals WLA for Providence-Seekonk River	USEPA, RIDEM, MADEP				X			*	
04-01-02	Assess effectiveness of advanced treatment on Pawtuxet River	RIDEM, Munic.				X		**	**	
04-01-04	*Estimate Narragansett Bay dredging needs for next 20 yr; identify all historical dredged material disposal sites; identify potential dredged material disposal sites*	USEPA, USACOE, RIDEM, CRMC, marine trades organizations	X			X		*		
04-03-01	Revise monitoring and reporting requirements in Brayton Point NPDES permit to include analysis of historical data and QA/QC requirements	USEPA, MADEP, MACZM				X		*		In progress.

Table 715-06(1) SUMMARY OF CCMP RECOMMENDATIONS

Table 715-06(2)

SUMMARY OF ESTIMATED CCMP COSTS

COST ESTIMATES BY SUBJECT	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
Source Reduction: Toxics	1,532,500	755,000	720,000	755,000	918,500	1,801,000	853,500	1,116,000	853,500	1,116,000	4,878,000	5,543,000
Source Reduction: Nutrients	2,500	150,000	29,375	0	30,625	400,000	54,375	0	29,375	0	146,250	550,000
Source Control: Water Management and Wastewater Treatment	20,000	0	20,000	0	46,250	0	45,000	0	20,000	0	151,250	0
Source Control: Combined Sewer Overflows	102,500	15,090,000	60,000	19,672,000	82,500	103,481,000	65,000	116,462,000	70,000	86,222,250	380,000	340,927,250
Source Control: On-Site Sewage Disposal Systems	138,750	5,000,000	5,000	0	130,000	0	85,000	0	92,500	0	451,250	5,000,000
Source Control: Boater Discharges	210,000	107,250	10,000	6,000	57,500	6,180	20,000	6,000	20,000	6,000	317,500	131,430
Source Reduction: Nonpoint Sources	828,750	12,000	400,000	12,000	880,750	97,000	3,172,000	97,000	3,072,000	97,000	8,353,500	315,000
Land Use	257,500	12,000	167,500	12,000	437,500	12,000	330,000	12,000	305,000	12,000	1,497,500	60,000
Protection of Critical Areas	315,000	334,000	165,000	417,000	211,250	250,000	145,000	167,000	145,000	167,000	981,250	1,335,000
Public Health	384,000	354,550	281,500	340,000	521,500	355,000	456,500	340,000	471,500	340,000	2,115,000	1,729,550
Mount Hope Bay	182,500	50,000	15,000	50,000	37,500	250,000	15,000	0	15,000	0	265,000	350,000
Blackstone River	360,625	134,750	110,625	20,750	355,000	12,140,000	125,000	12,000	125,000	12,000	1,076,250	12,319,500
CCMP Implementation and Governance	448,750	265,000	390,000	265,000	400,000	265,000	400,000	265,000	400,000	265,000	2,038,750	1,325,000
TOTALS	4,783,375	22,264,550	2,374,000	21,549,750	4,108,875	119,057,180	5,766,375	118,477,000	5,618,875	88,237,250	22,651,500	369,585,730
TOTAL BY YEAR		27,047,925		23,923,750		123,166,055		124,243,375		93,856,125		392,237,230

Table 715-06(3)

SUMMARY OF ESTIMATED CCMP COSTS BY IMPLEMENTING AUTHORITY

RIDEM	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
Source Reduction: Toxics	736,250	23,000	305,000	23,000	265,000	513,000	235,000	23,000	235,000	23,000	1,776,250	605,000
Source Reduction: Nutrients	1,250	150,000	0	0	1,250	400,000	0	0	0	0	2,500	550,000
Source Control: Water Management and Wastewater Treatment	5,000	0	5,000	0	11,250	0	10,000	0	5,000	0	36,250	0
Source Control: Combined Sewer Overflows	22,500	0	5,000	0	22,500	0	10,000	0	15,000	0	75,000	0
Source Control: On-Site Sewage Disposal Systems	66,250	5,000,000	0	0	30,000	0	25,000	0	25,000	0	146,250	5,000,000
Source Control: Boater Discharges	108,750	39,750	5,000	6,000	22,500	6,090	10,000	6,000	10,000	6,000	156,250	63,840
Source Reduction: Nonpoint Sources	367,500	6,000	165,000	6,000	391,250	6,000	315,000	6,000	215,000	6,000	1,453,750	30,000
Land Use	36,250	0	17,500	0	18,750	0	5,000	0	5,000	0	82,500	0
Protection of Critical Areas	112,500	167,000	50,000	167,000	57,500	167,000	45,000	167,000	45,000	167,000	310,000	835,000
Public Health	169,000	238,000	146,500	232,000	176,500	232,000	146,500	232,000	151,500	232,000	790,000	1,166,000
Mount Hope Bay	77,500	25,000	5,000	25,000	22,500	0	5,000	0	5,000	0	115,000	50,000
Blackstone River	107,500	6,000	50,000	6,000	175,000	6,070,000	60,000	6,000	60,000	6,000	452,500	6,094,000
CCMP Implementation and Governance	308,750	265,000	295,000	265,000	295,000	265,000	295,000	265,000	295,000	265,000	1,488,750	1,325,000
TOTALS	2,119,000	5,919,750	1,049,000	730,000	1,489,000	7,659,090	1,161,500	705,000	1,066,500	705,000	6,885,000	15,718,840
TOTAL BY YEAR		**8,038,750**		**1,779,000**		**9,148,090**		**1,866,500**		**1,771,500**		**22,603,840**

Table 715-06(3) (cont.)

SUMMARY OF ESTIMATED CCMP COSTS BY IMPLEMENTING AUTHORITY

RI CRMC	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
Source Reduction: Toxics	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Source Reduction: Nutrients	0	0	0	0	0	0	12,500	0	0	0	12,500	0
Source Control: Water Management and Wastewater Treatment	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Source Control: Combined Sewer Overflows	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Source Control: On-Site Sewage Disposal Systems	0	0	0	0	30,000	0	25,000	0	25,000	0	80,000	0
Source Control: Boater Discharges	27,500	0	0	0	25,000	0	0	0	0	0	52,500	0
Source Reduction: Nonpoint Sources	5,000	0	5,000	0	5,000	0	5,000	0	5,000	0	25,000	0
Land Use	17,500	0	5,000	0	5,000	0	5,000	0	5,000	0	37,500	0
Protection of Critical Areas	85,000	167,000	45,000	250,000	40,000	83,000	40,000	0	40,000	0	250,000	500,000
Public Health	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Mount Hope Bay	5,000	0	0	0	0	250,000	0	0	0	0	5,000	250,000
Blackstone River	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CCMP Implementation and Governance	27,500	0	10,000	0	15,000	0	15,000	0	15,000	0	82,500	0
TOTALS	167,500	167,000	65,000	250,000	120,000	333,000	102,500	0	90,000	0	545,000	750,000
TOTAL BY YEAR		**334,500**		**315,000**		**453,000**		**102,500**		**90,000**		**1,295,000**

N/A - Not Applicable

Table 715-06(3) (cont.)

SUMMARY OF ESTIMATED CCMP COSTS BY IMPLEMENTING AUTHORITY

RIDOP	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
Source Reduction: Toxics	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Source Reduction: Nutrients	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Source Control: Water Management and Wastewater Treatment	5,000	0	5,000	0	10,000	0	10,000	0	5,000	0	35,000	0
Source Control: Combined Sewer Overflows	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Source Control: On-Site Sewage Disposal Systems	1,250	0	0	0	30,000	0	5,000	0	5,000	0	41,250	0
Source Control: Boater Discharges	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Source Reduction: Nonpoint Sources	5,000	0	0	0	0	0	0	0	0	0	5,000	0
Land Use	36,250	6,000	25,000	6,000	118,750	6,000	50,000	6,000	25,000	6,000	255,000	30,000
Protection of Critical Areas	62,500	0	35,000	0	35,000	0	35,000	0	35,000	0	202,500	0
Public Health	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Mount Hope Bay	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Blackstone River	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CCMP Implementation and Governance	5,000	0	5,000	0	5,000	0	5,000	0	5,000	0	25,000	0
TOTALS	115,000	6,000	70,000	6,000	198,750	6,000	105,000	6,000	75,000	6,000	563,750	30,000
TOTAL BY YEAR		**121,000**		**76,000**		**204,750**		**111,000**		**81,000**		**593,750**

N/A - Not Applicable

Table 715-06(3) (cont.)

SUMMARY OF ESTIMATED CCMP COSTS BY IMPLEMENTING AUTHORITY

RIDOT

	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
Source Reduction: Toxics	0	720,000	0	720,000	0	720,000	0	720,000	0	720,000	0	3,600,000
Source Reduction: Nutrients	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Source Control: Water Management and Wastewater Treatment	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Source Control: Combined Sewer Overflows	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Source Control: On-Site Sewage Disposal Systems	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Source Control: Boater Discharges	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Source Reduction: Nonpoint Sources	10,000	0	10,000	0	60,000	0	60,000	0	60,000	0	200,000	0
Land Use	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Protection of Critical Areas	5,000	0	5,000	0	5,000	0	5,000	0	5,000	0	25,000	0
Public Health	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Mount Hope Bay	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Blackstone River	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CCMP Implementation and Governance	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTALS	15,000	720,000	15,000	720,000	65,000	720,000	65,000	720,000	65,000	720,000	225,000	3,600,000
TOTAL BY YEAR		735,000		735,000		785,000		785,000		785,000		3,825,000

N/A - Not Applicable

Table 715-06(3) (cont.)

SUMMARY OF ESTIMATED CCMP COSTS BY IMPLEMENTING AUTHORITY

MADEP	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
Source Reduction: Toxics	306,250	12,000	142,500	12,000	140,000	222,000	122,500	12,000	122,500	12,000	833,750	270,000
Source Reduction: Nutrients	1,250	0	0	0	0	0	0	0	0	0	1,250	0
Source Control: Water Management and Wastewater Treatment	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Source Control: Combined Sewer Overflows	15,000	0	5,000	0	10,000	0	5,000	0	5,000	0	40,000	0
Source Control: On-Site Sewage Disposal Systems	43,750	0	5,000	0	10,000	0	5,000	0	5,000	0	68,750	0
Source Control: Boater Discharges	48,750	0	5,000	0	10,000	90	10,000	0	10,000	0	83,750	90
Source Reduction: Nonpoint Sources	298,750	6,000	210,000	6,000	211,250	6,000	210,000	6,000	210,000	6,000	1,140,000	30,000
Land Use	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Protection of Critical Areas	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Public Health	8,500	10,000	3,500	10,000	28,500	10,000	3,500	10,000	3,500	10,000	47,500	50,000
Mount Hope Bay	95,000	25,000	10,000	25,000	15,000	0	10,000	0	10,000	0	140,000	50,000
Blackstone River	209,375	128,750	51,875	14,750	175,000	6,070,000	60,000	6,000	60,000	6,000	556,250	6,225,500
CCMP Implementation and Governance	73,750	0	60,000	0	60,000	0	60,000	0	60,000	0	313,750	0
TOTALS	1,100,375	181,750	492,875	67,750	659,750	6,308,090	486,000	34,000	486,000	34,000	3,225,000	6,625,590
TOTAL BY YEAR		**1,282,125**		**560,625**		**6,967,840**		**520,000**		**520,000**		**9,850,590**

N/A - Not Applicable

Table 715-06(3) (cont.)

SUMMARY OF ESTIMATED CCMP COSTS BY IMPLEMENTING AUTHORITY

MACZM	92-93		93-94		94-95		95-96		96-97		Total 92-97	
	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other	Personnel	Other
Source Reduction: Toxics	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Source Reduction: Nutrients	0	0	0	0	0	0	12,500	0	0	0	12,500	0
Source Control: Water Management and Wastewater Treatment	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Source Control: Combined Sewer Overflows	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Source Control: On-Site Sewage Disposal Systems	0	0	0	0	5,000	0	25,000	0	25,000	0	55,000	0
Source Control: Boater Discharges	5,000	0	0	0	0	0	0	0	0	0	5,000	0
Source Reduction: Nonpoint Sources	5,000	0	5,000	0	5,000	0	5,000	0	5,000	0	25,000	0
Land Use	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Protection of Critical Areas	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Public Health	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Mount Hope Bay	5,000	0	0	0	0	0	0	0	0	0	5,000	0
Blackstone River	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CCMP Implementation and Governance	5,000	0	5,000	0	10,000	0	10,000	0	10,000	0	40,000	0
TOTALS	20,000	0	10,000	0	20,000	0	52,500	0	40,000	0	142,500	0
TOTAL BY YEAR		20,000		10,000		20,000		52,500		40,000		142,500

N/A - Not Applicable

BIBLIOGRAPHY

Adams, M. and S. McCreary, "Institutional Arrangements for State Coastal Programs: Some Strengths and Weaknesses," in: *Coastal Zone '89, Proceedings of the Sixth Symposium on Coastal and Ocean Management, July 1989.* New York: American Society of Civil Engineers, 1989.

Advantage Research Corporation, *Narragansett Bay: Public Opinion Survey (1991).* Report No. NBP-92-95. Providence: Narragansett Bay Project, 1992.

American Public Works Association, Institute of Water Resources, *Financing Stormwater Facilities: A Utility Approach.* Washington, DC: American Public Works Association, 1991.

Anonymous, "Solar Aquatic Treatment," *Currents*, Summer, 1990.

Apogee Research Inc., R. Ribb, A. Dixon, *CCMP Cost Estimation and Funding Report.* Report No. NBP-92-106. Providence: Narragansett Bay Project , 1992.

Archer, J.H., "Resolving Intergovernmental Conflicts in Marine Resource Management: the U.S. Experience," *Ocean and Shore Management*, pp. 253-269 (1989).

Arthur D. Little, Inc., Beta Engineering, CH2M Hill, H20 Engineering, and Wallace Ford Associates, *Water Supply Analysis for the State of Rhode Island.* Report to the R.I. Water Resources Coordinating Council. Providence: Water Resources Coordinating Council, 1990.

Bender, M., D. Kester, D. Cullen, J. Quinn, W. King, D. Phelps, and C. Hunt, *Distribution of Trace Metals in the Water Column, Sediments, and Shellfish of Narragansett Bay.* Report No. NBP-89-25. Providence: Narragansett Bay Project, 1989.

Beta Engineering, Inc. and CH2M Hill, *Bucklin Point Combined Sewer Overflow Study. Volume I.* Draft report to the Narragansett Bay Commission (1992).

Boyd, J., *Stormwater Design and Installation Standards Problems and Recommendations for Rhode Island.* Providence: Draft report prepared for the R.I. Department of Environmental Management (1991).

Brough, M. *A Unified Development Ordinance.* Chicago, IL: American Planning Association, 1985.

Buzzards Bay Project, *Buzzards Bay Project Federal Consistency Report.* Marion, MA: Massachusetts Executive Office of Environmental Affairs, 1991.

Buzzards Bay Project, *Buzzards Bay Comprehensive Conservation and Management Plan,* Public Draft 5/90. Marion, MA: Buzzards Bay Project, 1990.

Cabelli, V.J., A.P. Dufour, L.J. McCabe, and M.A. Levin, "A Marine Recreational Water Quality Criterion Consistent with Indicator Concepts and Risk Analysis," *Journal WPCF,* Vol. 55, No. 10 (1983).

Center for Environmental Studies, *Manual for Hazardous Waste Reduction Planning and Reporting*. Providence: Brown University. Report prepared for Rhode Island Department of Environmental Management Office of Environmental Coordination, 1989.

Committee for the Great Salt Pond Newsletter, "Town Council Votes to Require Great Salt Pond Marinas to Provide Holding Tank Facilities by Memorial Day", Spring, 1992.

Cogger, C., *On-site Septic Systems: the Risk of Groundwater Contamination*. Journal of Environmental Health 51(1): 12-16 (1988).

Connecticut, State of, Department of Environmental Protection, Putting the Public Trust Doctrine to Work, pp. 314-315 (1990).

Corbin, J.M., *Recent and Historical Accumulations of Trace Metals Contaminants in the Sediment of Narragansett Bay, Rhode Island*. M.S. Thesis in Oceanography. Narragansett, RI: University of Rhode Island, 1989.

Desbonnet, A., and V. Lee,*Water Quality and Fisheries Narragansett Bay*.Narragansett, R.I.: University of Rhode Island, Rhode Island Sea Grant, 1991.

Dettmann, E.H., W.A. Brown, W.M. Warren, M.F. Fox, D.R. Kester, *A Steady-State Model of Dissolved Oxygen and Nitrogen in the Providence River-Seekonk River Estuary, Rhode Island*. Report No. NBP-92-102. Providence: Narragansett Bay Project, 1992.

Dettmann, E.H., J.F. Paul, J.S. Rosen, and C.J. Strobel, *Transport, Fate and Toxic Effects of a Sewage Treatment Plant in a Rhode Island Estuary*. R.I. Contrib. No. 1003. Narragansett, R.I.: EPA-ERLN, 1989.

Dixon, A., J. Myers, C. Penniman, and R. Ribb, *Critical Resource Area Protection "Briefing Paper"*. Providence: Narragansett Bay Project, 1991.

Dixon, A., C. Karp, and C. Penniman, *Mount Hope Bay "Briefing Paper."* Providence: Narragansett Bay Project, 1990.

Doering, P.H., C.A. Oviatt, and M.E.Q. Pilson, *Monitoring of the Providence and Seekonk Rivers for Trace Metals and Associated Parameters*. Report No. NBP-89-16. Providence: Narragansett Bay Project, 1988a.

Doering, P.H., M.E.Q. Pilson, and C.A. Oviatt, *SPRAY Cruise Dissolved Oxygen and Chlorophyll*. Report No. NBP-89-24. Providence: Narragansett Bay Project, 1988b.

Durbin, A.G., and E.G. Durbin, *Zooplankton and Ichthoyoplankton in Narragansett Bay: Status and Trends. Part 2: Ichthyoplankton*. Report No. NBP-90-27. Providence: Narragansett Bay Project, 1990.

Durbin, A.G. and E.G. Durbin, *Zooplankton and Ichthyoplankton in Narragansett Bay: Status and Trends. Part 1: Zooplankton*. Report No. NBP-89-18. Providence: Narragansett Bay Project, 1989.

French, D., H. Rines, D. Mendelsohn, J. Boothroyd, C. Galagan, M. Harlin, A. Keller, G. McPhee, S. Pratt, A. Ross, M. Gould, and L. Gould, *Habitat Inventory/Resource Mapping for Narragansett Bay and Associated Coastline.* Providence: draft final report to the Narragansett Bay Project. (1992)

Frithsen, J.B., *The Benthic Communities within Narragansett Bay.* Report No. NBP-90-28. Providence: Narragansett Bay Project, 1990.

Frithsen, J.B., D. Nacci, C. Oviatt, C.J. Strobel, and R. Walsh, *Using Single-Species and Whole Ecosystem Tests to Characterize the Toxicity of a Sewage Treatment Plant Effluent.* Report No. NBP-90-38. Providence: Narragansett Bay Project, 1990.

Frithsen, J.B., C.A. Oviatt, and A.A. Keller, *A Comparison of Ecosystem and Single-Species Tests of Complex Water Toxicity: A Mesocosm Experiment Data Report.* Report No. 7, MERL Series. Narragansett, RI: University of Rhode Island, 1987.

Germano, J. and D. Rhoads, *Narragansett Bay Sediment Quality Survey, August 1988.* Report No. NBP-89-23. Providence: Narragansett Bay Project, 1989.

Gold, A.J., G.W. Loomis, and B.E. Lamb, *Field Evaluation of Nitrogen Removal Septic Systems for Coastal Communities.* Report No. NBP-90-43. Providence: Narragansett Bay Project, 1990.

Gray, C.L., *Winter Founder (Pseudopleuronectes americanus) Species Profile.* Report No. NBP-91-56. Providence: Narragansett Bay Project, 1991.

Groffman, P.M., A.J. Gold, T.P. Husband, R.C. Simmons, and W.R. Eddleman, *An Investigation into Multiple Uses of Vegetated Buffer Strips (1988-1989).* Report No. NBP-91-63. Providence: Narragansett Bay Project, 1991.

Hinga, K.R., N. F. Lewis, R. Rice, K. Dadey, and A. Keller, *A Review of Narragansett Bay Phytoplankton Data: Status and Trends.* Report No. NBP-89-21. Providence: Narragansett Bay Project, 1989.

Hoffman, Eva J., *The First Year of the Narragansett Bay Project: Results and Recommendations.* Report No. NBP-90-41. Providence: Narragansett Bay Project, 1988.

Horsley Witten Hegemann Inc., *Evaluation of Critical Protection Area Delineation Technique—Narragansett Bay.* Report No. NBP-90-53. Providence: Narragansett Bay Project, 1990.

IEP, Inc, *Vegetated Buffer Strip Designation Method Guidance Manual.* Report No. NBP-91-55. Providence: Narragansett Bay Project, 1991.

International Marina Institute, *New England Coastal Marine Pumpout Survey EPA Region I: A Study of the 1991 Boat Pumpout Facilities Located in the New England Coastal Region—Maine, New Hampshire, Massachusetts, Rhode Island and Connecticut,* (1990).

Jacobson, J.L., S.W. Jacobson, G.G. Fein, P.M. Schwartz, and J.K. Dowler, "Prenatal Exposure to an Environmental Toxin: A Test of the Multiple Effects Model," *Development Psychology,* Vol. 20 (1984).

Jeffries, H.P., S. Hale, A. Keller, *Historical Data Assessment: Finfishes of the Narragansett Bay Area, August 1988*. Report No. NBP-89-15. Providence: Narragansett Bay Project, 1989.

Jeffries, H.P. and W.C. Johnson, "Seasonal Distributions of Bottom Fishes in the Narragansett Bay Area: Seven-year Variations in the Abundance of Winter Flounder (*Pseudopleuronectes americanus*)," *Journal of the Fisheries Research Board of Canada,* Vol. 31 (1974).

Jeon, H. and C.A. Oviatt, *A Review of the Biological Effects of Toxic Pollutants on Organisms in Narragansett Bay*. Report No. NBP-91-75. Providence: Narragansett Bay Project, 1991.

Johnson, M., M. Ryan, and P. Marquis, *Compendium of User Fees: Massachusetts Cities and Towns*. Watertown, MA: Massachusetts Municipal Association, 1990.

Karp, C., and J. Korch, *CCMP Governance: Implementation and Oversight "Briefing Paper"*. Providence: Narragansett Bay Project, 1991.

Karp., C., and C. Penniman, *Boater Waste Disposal "Briefing Paper" and Proceedings from Narragansett Bay Project Management Committee*. Report No. NBP-91-61. Providence: Narragansett Bay Project, 1991.

Karp, C., C. Penniman, R. Zingarelli, and A. Dixon, *Sewage Contamination—Pathogens "Briefing Paper."* Providence: Narragansett Bay Project, 1990.

Kern, K.G., *Quahog Histopathology Studies*. Report No. NBP-90-34. Providence: Narragansett Bay Project, 1990.

King, J., *A Study of the Sediments of Narragansett Bay*. Draft report to the Narragansett Bay Project (1991).

Kipp, K., and R. Zingarelli, *Blackstone River "Briefing Paper"*. Providence: Narragansett Bay Project, 1991.

Kipp, K., *Health Risk from Chemically Contaminated Seafood "Briefing Paper."* Providence: Narragansett Bay Project, 1990.

Kolek, D., *Lee River Kill Investigation.* Unpublished report. Sandwich, MA: Massachusetts Division of Marine Fisheries, (1988).

Korch, J., "Growing Concerns: Population Increases in the Bay Watershed," *Narragansett Bay Watch,* February, 1990.

Korch, J., ed., *Narragansett Bay Project Progress Report: Pollutant Trends in Narragansett Bay*. Providence: Narragansett Bay Project, 1989.

Kremer, J.N., *Improving An Estuarine Water Quality Ecosystem Model for Narragansett Bay*. Report No. NBP-90-42. Providence: Narragansett Bay Project, 1990.

Kremer, J.N., and S.W. Nixon, *A Coastal Marine Ecosystem—Simulation and Analysis*. Ecological Studies. Volume 24. Springer Verlag, Heidelburg (1978).

Krieger, Y., S. Mulsow, and D.C. Rhoades, "Organic Enrichment of the Seafloor: Impact Assessment Using a Geographic Information System," in: Pillmann, W. and A. Jaesche, eds., *Computer Science for Environmental Protection: Proceedings of the 5th Symposium, September 19-21, Vienna, Austria.* New York: Springer Verlag, 1990.

Kumekawa, G., C. Gilberto, L. Carlson, and G. Poirer, *Towards the Management of Narragansett Bay: An Institutional Analysis.* Report No. NBP-90-35. Providence: Narragansett Bay Project, 1987.

Lacouture, P.V., "Legal Status of Tidal Flats in Rhode Island," in: The Sounds Conservancy, *Intertidal Flats: Their Value and Legal Status.* Stonington, CT: The Sounds Conservancy, 1990.

Lamphere, A., "The Fifty States: Sixth Annual Financial Report," *City and State*, Vol. 8, No.8, April 22-May 5, 1991.

Latimer, J.S., *A Review of the Major Research Done in Rhode Island on Polychlorinated Biphenyls in Water, Atmosphere, Sediment, and Biota.* Report No. NBP-89-20. Providence: Narragansett Bay Project, 1989.

Lee, T.C., S.B. Saila, and R.E. Wolke, *Winter Flounder Contaminant and Pathological Survey: Narragansett Bay and Vicinity.* Report No. NBP-91-51. Providence: Narragansett Bay Project, 1991.

Lippson, A.J., M.S. Haire, A.F. Holland, F. Jacobs, J. Jensen, R.L. Moran-Johnson, T.T. Polgar, and W.A. Richkus, *Environmental Atlas of the Potomac Estuary.* Report prepared for the Power Plant Siting Program of the Maryland Department of Natural Resources. Annapolis: Maryland Department of Natural Resources, 1979.

Maguire Group Inc., *City of Fall River CSO Phase II Facilities Plan. Volume I Report.* Draft report prepared for the Fall River Sewer Commission (1990).

Marine Research, Inc., *Analysis of Heavy Metals in Quahogs Collected at Six Stations in the Taunton River and Mount Hope Bay, October 1989.* Report to the New England Power Company (1990).

Massachusetts, Commonwealth of, *Massachusetts Water Quality Standards Implementation Policy for the Abatement of Pollution from Combined Sewer Overflows.* Boston: Commonwealth of Massachusetts, 1990.

Massachusetts, Commonwealth of, Department of Environmental Protection, Commonwealth of Massachusetts Summary of Water Quality 1990: 1990 305(b) Report to Congress. Boston: Massachusetts DEP, 1990.

Massachusetts, Commonwealth of, Governor's Task Force on Local Finance, Report of the Governor's Task Force on Local Finance. Boston: Executive Office, Commonwealth of Massachusetts, 1990.

Massachusetts, Commonwealth of, Department of Environmental Quality Engineering, Division of Water Pollution Control, *Commonwealth of Massachusetts Summary of Water Quality 1989, Appendix IV—Nonpoint Source Assessment Report.* Boston: Massachusetts DEQE, 1989.

McGinn, J.M., *A Sediment Control Plan for the Blackstone River.* Pub. # 14,946-244-25-7-30-CR. Boston: Massachusetts DEQE, Office of Planning and Program Management.

McKenna, J., *Narragansett Bay Survey Dat Summary: Temperature, Salinity, Dissolved Oxygen Profiles. 8/28/91 and 9/18/91.* Narragansett, R.I.: University of Rhode Island, Marine Ecosystems Research Lab, 1991.

McMaster, R.L., "Sediments of the Narragansett Bay System and Rhode Island Sound, Rhode Island," *Journal of Sedimentary Petrology*, Vol. 30 (1960).

Metcalf & Eddy, Inc., *Assessment of Toxics Pollution in Narragansett Bay.* Draft report to the Narragansett Bay Project (1991a).

Metcalf & Eddy, Inc., *Narragansett Bay Combined Sewer Overflows.* Report No. NBP-91-58. Providence: Narragansett Bay Project, 1991b.

Metcalf & Eddy, Inc., *Narragansett Bay Regionalization Study.* Report No. NBP-91-59. Providence: Narragansett Bay Project, 1991c.

Michelman, M., *Monitoring Inventory.* Draft report to the Narragansett Bay Project (1990).

Millar, S., G. Beiser, and R. Ribb. *Land Use As It Relates to Water Quality and Wildlife Habitat in the Narragansett Bay Watershed "Briefing Paper".* Providence: Narragansett Bay Project, 1992.

Monahan, R., S. Beede, J. Costa, K. Kipp, C. Penniman, C. Pring-Ham, B. Rosinoff, J. Sulak, "Controlling Nitrogen Loading to Coastal Waters", pp. 3068-3080, *Coastal Zone '91. Volume 4. Proceedings of the Seventh Symposium on Coastal and Ocean Management. Long Beach, CA. July 8-12, 1991.* New York, NY: American Society of Civil Engineers, 1991.

Myers, J. (Land Management Project), *Management Measures for Onsite Sewage Disposal Systems in Coastal Areas—Coastal Zone Management Act Amendments.* Draft report (1991).

Myers, J. (Ehrenfield & Associates), *Governance of Nonpoint Source Inputs to Narragansett Bay: A Plan for Coordinated Action.* Report No. NBP-88-09 Providence: Narragansett Bay Project, 1988.

Narragansett Bay Commission, *FY 1992-FY 1996 Capital Improvement Program.* Providence: Narragansett Bay Commission, 1991.

Narragansett Bay Commission Annual Report. Providence: Narragansett Bay Commission, 1990.

Narragansett Bay Project, *Progress Report: Pollutant Trends in Narragansett Bay.* Providence: Narragansett Bay Project, 1987.

Needham, B., and D. Robadue, *Historical Review of Water Quality Management and Pollution Abatement in Narragansett Bay.* Report No. NBP-90-45. Providence: Narragansett Bay Project, 1990.

Nickolai, K., and L. Remington, *Seeking Consistent Government Action in the Narragansett Bay Watershed "Briefing Paper"*. Providence: Narragansett Bay Project, 1991.

Nixon, S.W., *A History of Metals Inputs to Narragansett Bay.* Report No. NBP-91-52. Providence: Narragansett Bay Project, 1991.

Nixon, S.W., *A History of Nutrient Inputs to Narragansett Bay from Human Sewage.* Draft report to the Narragansett Bay Project (1990).

NOAA, National Ocean Service, *50 Years of Population Change Along the Nation's Coasts (1960-2010).* Rockville, MD: U.S. Department of Commerce, 1990.

NOAA, *National Status and Trends Program: A Summary of Data on Tissue Contamination from the First Three Years (1986-1988) of the Mussel Watch Project.* NOAA Tech. Mem. NOS OMA 49, 1989a.

NOAA, *National Status and Trends Program: A Summary of Selected Data on Chemical Contaminants in Sediments Collected During 1984, 1985, 1986, and 1987.* NOAA Tech. Mem. NOS OMA 44, 1989b.

NOAA/EPA, "Agreement on the National Estuary Program," September 13, 1988.

NOAA, *National Status and Trends Program Progress Report and Preliminary Assessment of Findings of the Benthic Surveillance Project 1984.* Washington, D.C.: Department of Commerce, NOAA, NMFS, 1987.

Nowicki, B.L. and J.H. McKenna, *A Preliminary Assessment of Environmental Quality in Greenwich Bay, Rhode Island.* Draft report to the Narragansett Bay Project (1990).

Olsen, S., D. Robadue, and V. Lee, *An Interpretive Atlas of Narragansett Bay.* University of Rhode Island Marine Bulletin No. 40. Narragansett, RI: University of Rhode Island, Coastal Resources Center, 1980.

Olsen, S.B., and D.K. Stevenson, *Commercial Marine Fish and Fisheries of Rhode Island.* Narragansett, R.I.: University of Rhode Island, Rhode Island Sea Grant, 1975.

Oviatt, C.A., *Some Aspects of Water Quality in and Pollution Sources to the Providence River.* Report for EPA Region I, September 1979 to September 1980. Boston: U.S. Environmental Protection Agency, 1980.

Oviatt, C.A., *Menhaden, Sportfish and Fishermen.* Narragansett, R.I.: University of Rhode Island, Rhode Island Sea Grant, 1977.

Penniman, C., R. Zingarelli, C. Karp, K. Kipp, and L. Remington, *Control of Toxics Inputs to Narragansett Bay "Briefing Paper"*. Providence: Narragansett Bay Project, 1991a.

Penniman, C., C. Karp, L. Remington, and R. Zingarelli, *Control of Nutrient Inputs to Narragansett Bay "Briefing Paper"*. Providence: Narragansett Bay Project, 1991b.

Penniman, C., *Long Term Monitoring "Briefing Paper"*. Providence: Narragansett Bay Project, 1990.

Pilson, M.E.Q., *Summary of the Scientists' Response to the World Prodigy Oil Spill at Brenton Point, Rhode Island-June 23, 1989.* Report for RIDEM, 1990.

Pilson, M.E.Q. and C.D. Hunt, *Water Quality Survey of Narragansett Bay: A Summary of Results from the SINBADD, 1985-1986.* Report No. NBP-89-22. Providence: Narragansett Bay Project, 1989.

Pilson, M.E.Q., "On the Residence Time of Water in Narragansett Bay," *Estuaries,* Vol. 8 (1985).

Planners Collaborative, Inc., J. Korch, K. Nickolai, and C. Karp, *Public Participation "Briefing Paper."* Providence: Narragansett Bay Project, 1990.

Powell, J.C., *Finfish Species of Narragansett Bay Present and Historical Records.* Research Reference Document 89/7. Report prepared by Rhode Island Division of Fish & Wildlife, 1989.

Pratt, S.D., A.R. Ganz, M.A. Rice, *A Species Profile of the Quahog in Rhode Island.* Narragansett, R.I.: University of Rhode Island, Rhode Island Sea Grant, 1992.

Pratt, S.D., *Status of the Hard Clam Fishery in Narragansett Bay.* Report No. NBP-88-07. Providence: Narragansett Bay Project, 1988.

Pratt, S.D., B.K. Martin, and S.B. Saila, *Status of the Hard Clam (Mercenaria mercenaria)in the Providence River and Mt. Hope Bay.* Report No. NBP-88-08. Providence: Narragansett Bay Project, 1988.

Pruell, R.J. and J.G. Quinn, "Geochemistry of Organic Contaminants in Narragansett Bay Sediments," *Estuarine, Coastal and Shelf Science,* Vol. 21 (1985).

Quinn, J.G., *A Review of the Major Research Studies on Petroleum Hydrocarbons and Polycyclic Aromatic Hydrocarbons in Narragansett Bay.* Report No. NBP-89-19. Providence: Narragansett Bay Project, 1989.

Raytheon Co. *Areawide Water Quality Management Plan, Inventory Report and Preliminary Evaluation-Marinas Task Study.* Contract No. 77-28. Report for R.I. Statewide Planning Program. Raytheon Co., Portsmouth, R.I., 1978.

Reneau, R.B., C. Hagedorn, and M.J. Degen, *Fate and Transport of Biological and Inorganic Contaminants from On-site Disposal of Domestic Wastewater.* Journal of Environmental Quality 18: 135-144 (1989).

Rhode Island, State of, Coastal Resources Management Council, *The State of Rhode Island Coastal Resources Management Program,* Providence: R.I. Coastal Resources Management Council, March 1978.

Rhode Island, State of, Department of Administration, Division of Planning, *Scituate Reservoir Watershed Management Plan.* State Guide Plan Element 125. Report No. 70. Providence: R.I. Division of Planning, 1990a.

Rhode Island, State of, Department of Administration, Division of Planning, *Survey of Local Development Fees.* Handbook 17. Providence: R.I. Division of Planning, 1990b.

Rhode Island, State of, Department of Administration, Division of Planning, *Handbook on the Local Comprehensive Plan.* Providence: R.I. Division of Planning, 1989a.

Rhode Island, State of, Department of Administration, Division of Planning, *Land Use Policies and Plan.* State Guide Plan Element 121. Report No. 64. Providence: R.I. Division of Planning, 1989b.

Rhode Island, State of, Department of Administration, Division of Planning, *Scituate Reservoir Management Plan: Wastewater Management Districts: A Starting Point.* Report No. 62. Providence: R.I. Division of Planning, 1987.

Rhode Island, State of, Department of Environmental Management, *The State of the State's Waters—Rhode Island.* A Report to Congress. Providence: R.I. Department of Environmental Management, 1992.

Rhode Island, State of, Department of Environmental Management, Division of Water Resources, *Rules and Regulations Pertaining to the Treatment, Disposal, Utilization and Transportation of Wastewater Treatment Facility Sludge.* Providence: R.I. Department of Environmental Management, 1991.

Rhode Island, State of, Department of Environmental Management, *The State of the State's Waters—Rhode Island.* A Report to Congress. Providence: R.I. Department of Environmental Management, 1990a.

Rhode Island, State of, Department of Environmental Management, Division of Water Resources, *Combined Sewer Overflow Policy.* Providence: R.I. Department of Environmental Management, 1990b.

Rhode Island, State of, Department of Environmental Management, Office of Environmental Coordination, *An Assessment of Nonpoint Sources of Pollution to Rhode Island's Waters.* Providence: R.I. Department of Environmental Management, 1990c.

Rhode Island, State of, Department of Environmental Management, *Capacity Assurance Plan. October 1989.* Providence: R.I. Department of Environmental Management, 1989a.

Rhode Island, State of, Department of Environmental Management, *Rules and Regulations Establishing Minimum Standards Relating to Location, Design, Construction, and Maintenance of Individual Sewage Disposal Systems.* Providence: R.I. Department of Environmental Management, 1989b.

Rhode Island, State of, Department of Environmental Management, *Rhode Island's Nonpoint Source Management Plan.* RIDEM Office of Environmental Coordination, 1989c.

Rhode Island, State of, Department of Environmental Management, *State Clean Water Strategy.* Providence: RIDEM, 1989d.

Rhode Island, State of, Department of Environmental Management/U.S. Department of Agriculture Soil Conservation Service, *Rhode Island Soil Erosion and Sediment Control Handbook.* Providence: R.I. Department of Environmental Management, 1989e.

Rhode Island, State of, Department of Environmental Management, *Rules and Regulations Establishing Minimum Standards Relating to Location, Design, Construction and Maintenance of Individual Sewage Disposal Systems.* Providence: R.I. Department of Environmental Management, 1989f.

Rhode Island, State of, Department of Environmental Management, Office of Environmental Coordination, *Recommendations of the Stormwater Management and Erosion Control Committee Regarding the Development and Implementation of Technical Guidelines for Stormwater Management.* Providence: R.I. Department of Environmental Management, 1988a.

Rhode Island, State of, Department of Environmental Management, Division of Water Resources, *Water Quality Regulations for Water Pollution Control.* Providence: R.I. Department of Environmental Management, 1988b.

Rhode Island Geographic Information System Data Base. University of Rhode Island, Graduate School of Oceanography, Narragansett, R.I. 1991.

Ries, K.G., III, *Estimation of Surface Water Runoff to Narragansett Bay, Rhode Island and Massachusetts.* Report No. NBP-90-39. Providence: Narragansett Bay Project, 1990.

Rippey, S.R., *Shellfish Borne Disease Outbreaks.* Davisville, R.I.: U.S. Food & Drug Administration, 1988.

Rippey, S.R. and W.D. Watkins, *Mt. Hope Bay Sanitary Survey— Microbiological.* Report No. NBP-88-11. Providence: Narragansett Bay Project, 1988.

Robadue, D., Jr., *Providence Harbor: A Special Area Management Plan.* Adopted November 22, 1983. Narragansett, R.I.: University of Rhode Island, Coastal Resources Center, 1984.

Roman, C.T., *Pathogens in Narragansett Bay—Issues, Inputs and Improvement Options.* Report No. NBP-90-47. Providence: Narragansett Bay Project, 1990.

Roque, J.A., *Reduction, Recycling, and Treatment of Hazardous Wastes Generated in Small Quantities in Rhode Island.* Report prepared for the Office of Environmental Coordination, R.I. Department of Environmental Management. Providence: Brown University, 1991.

Rorholm, N. and J. Farrell, *Narragansett Bay and the Surrounding Economy.* Report No. NBP-92-80. Providence: Narragansett Bay Project, 1992.

Smayda, T.J., *Survey of Environmental Conditions and Plankton Dynamics along a Eutrophication Gradient.* Draft report to the Narragansett Bay Project (1989).

Smayda, T.J., *Environmental Conditions and Plankton Dynamics in Narragansett Bay During an Annual Cycle Characterized by a Brown Tide.* Report No. NBP-88-13. Providence: Narragansett Bay Project, 1988.

Solley, Wayne B., Charles F. Merk, and Robert. R. Pierce, *Estimated Use of Water in the United States in 1985.* U.S. Geological Survey Circular 1004. U.S. Geological Survey, 1988.

Stuart, K.A., *Nonpoint Source Management in the Narragansett Bay Watershed "Briefing Paper" Appendices*. Draft report to the Narragansett Bay Project (1992).

Stuart, K.A., *Nonpoint Source Management in the Narragansett Bay Watershed "Briefing Paper"* . Providence: Narragansett Bay Project, 1991.

Sutinen, J.G. and S.G. Lee, *Regulatory Compliance and Enforcement: Industrial Wastewater Pretreatment Programs in Rhode Island.* Report No. NBP-90-48. Providence: Narragansett Bay Project, 1990.

Taylor, D., C. Oviatt, L. Beatty, *Long-Term Monitoring Plan-Narragansett Bay.* Draft report to Narragansett Bay Project. (1991)

Thibodeau, F., and B. Ostro, *An Economic Analysis of Wetland Protection.* Journal of Environmental Management. Volume XII. 1981.

United States Department of Agriculture, Soil Conservation Service, *Narragansett Bay Nonpoint Source Management, MA/RI Joint Proposal.* West Warwick, RI: U.S. Soil Conservation Service, 1990.

United States Department of Commerce, Bureau of the Census, *1990 Census of Population and Housing.* Washington, DC: U.S. Government Printing Office, 1990.

United States Department of Commerce, Bureau of the Census, *1987 Census of Wholesale Trade.* Washington, DC: U.S. Government Printing Office, 1987.

United States Department of Commerce, Bureau of the Census, *1982 Census of Governments: Volume 4—Government Finances, No. 2—Finances of Special Districts.* Washington, DC: U.S. Government Printing Office, 1984.

United States Environmental Protection Agency, Office of Municipal Pollution Control, Office of Water, *Revised Design Manual for Onsite Waste Disposal Systems.* Draft report (1992).

United States Environmental Protection Agency, *Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters.* Washington, DC: U.S. Environmental Protection Agency, 1991a.

United States Environmental Protection Agency, *State Revolving Fund Report to Congress.* Washington, DC: U.S. Environmental Protection Agency, 1991b.

United States Environmental Protection Agency, *Monitoring Guidance for the National Estuary Program. Interim Final. August 1991.* Washington, D.C.: U.S. Environmental Protection Agency, 1991c.

United States Environmental Protection Agency/National Oceanic and Atmospheric Administration, *Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance.* Washington, DC. 1991.

United States Environmental Protection Agency, *Biological Criteria National Program Guidance for Surface Waters.* EPA 440/5-90-004. Washington, DC: U.S. Environmental Protection Agency, 1990.

United States Environmental Protection Agency, *National Combined Sewer Overflow Control Strategy*. Washington, D.C.: Environmental Protection Agency, 1989a.

United States Environmental Protection Agency, *Federal Financial Assistance Programs: Targeting Programs Applicable to Coastal Management*. EPA 503/8-90-001. Washington, D.C.: U.S. Environmental Protection Agency, 1989b.

United States Environmental Protection Agency, *Septic Tank Siting to Minimize the Contamination of Ground Water by Microorganisms*. Washington, D.C.: Office of Groundwater Protection, 1987a.

United States Environmental Protection Agency, *Priority Wetlands in New England*. Boston, MA: Region I Environmental Protection Agency, 1987b.

United States Environmental Protection Agency, *Design Manual: Onsite Wastewater Treatment and Disposal Systems*. EPA 625/1-80-012. Cincinnati: U.S. Environmental Protection Agency, 1980.

United States Department of the Interior, Fish and Wildlife Service, *National Wetlands Inventory—Wetland Loss Report*. St. Petersburg, Florida. Draft report (1990).

United States, Department of the Interior, Fish and Wildlife Service, *Restoration of Atlantic Salmon to New England Rivers*. Newton Corner, MA.: Department of the Interior Final Environmental Impact Statement, 1989.

University of Massachusetts and U.S. Department of Agriculture, Soil Conservation Service, *National Pesticide/Soils Database and User Decision Support System for the Risk Assessment of Ground and Surface Water Contamination (NPURG), Version 9.0* (1991).

University of Rhode Island, Intergovernmental Policy Analysis Program, *A Review of the Relationship Issues between the Narragansett Bay Commission and the Blackstone Valley Commission*. Kingston, R.I.: University of Rhode Island, 1990.

Valente, R.M., D.C. Rhoades, J.D. Germano, V.J. Cabelli, "Mapping of Benthic Enrichment Patterns in Narragansett Bay, Rhode Island," *Estuaries*, 15:1-12 (1992).

Valiela, I., and J. Costa, *Eutrophication of Buttermilk Bay, a Cape Cod Coastal Embayment: Concentrations of Nutrients and Watershed Nutrient Budgets*. Environ.Manage. 12:539-551 (1988).

Vandel, G.M. and W.F. Fitzgerald, *Mercury in the Waters of Narragansett Bay*. Report No. NBP-88-12A. Providence: Narragansett Bay Project, 1988.

Varin, D. W., "Existing Land Use Laws," *Rhode Island Division of Planning Monthly Progress Report*, December, 1987.

Virginia, Commonwealth of, Department of Health, *Alternative Discharging Sewage Treatment System Regulations for Individual Single Family Dwellings*. Draft report (1992).

Weiskel, P., and G. Heufelder, *The Impact of Septic Effluent on Groundwater Quality, Buttermilk Bay Drainage Basin, Massachusetts. Part I: Indicator Bacteria*. Report submitted to The Buzzards Bay Project, U.S. Environmental Protection Agency, Region I and Massachusetts Executive Office of Environmental Affairs, 1989.

Wright, R.M., Y.S. Lee, R.R. Chaudhury, I. Runge, J. Cleary, L. Thiem (University of Rhode Island)/A.C. Turner, S. Puckett, T. Isaji, S. Feng, S. Asselin (ASA, Inc.)/W.D. Watkins, S.R. Rippey (U.S. Public Health Service)/J.S. Latimer, J.T. Ellis, L. LeBlanc, J. Quinn, B.J. Huebert, and J.R. Fraher (URI-GSO), *Problem Assessment and Source Identification and Ranking of Wet Weather Discharges Entering the Providence and Seekonk Rivers.* Report No. NBP-92-86. Providence: Narragansett Bay Project, 1992a.

Wright, R.M., I. Runge, Young-Soo Lee, and R.R. Chaudhury, *Blackstone River 1990.* Report No. NBP-92-85. Providence: Narragansett Bay Project, 1992b.

Zingarelli, R., and C. Karp, *Water Management: Supply, Use, and Treatment "Briefing Paper"*. Providence: Narragansett Bay Project, 1991.

Zingarelli, R., and C. Karp,*Combined Sewer Overflows "Briefing Paper"*. Providence: Narragansett Bay Project, 1990.