The Pawcatuck River Estuary and Little Narragansett Bay:

An Interstate Management Plan

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This document was prepared for the Rhode Island Coastal Resources Management Council and the Connecticut Department of Environmental Protection, Office of Long Island Sound Programs by

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~~DEDICATION~~

~~This Interstate Management Plan is dedicated in memory to Clement Griscom, Ph.D. His love of the estuary and his foresight toward its protection led to this plan, and shaped many of its goals. His contributions were greatly appreciated and his participation will be missed.~~

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EXECUTIVE SUMMARY

INTRODUCTION

The Pawcatuck River estuary and Little Narragansett Bay: An Interstate Management Plan describes the current status of the resources within the estuary, characterizes its watershed, identifies estuary resources of concern, and recommends management strategies and other initiatives concerning the use and protection of this highly regarded estuary. Accomplishing this invdved the enlistment of a citizen's advisory committee to assist in developing an issues list which reflected public concerns about the estuary. Development and research of these issues invdved the collection of data regarding past and current land use and development trends, water quality status, critical wildlife habitats, recreational patterns of use, and the development of new investigations conducted by the project's staff. This information is presented in this interstate management plan as "Findings of Fact" sections in the various chapters. Each chapter concludes with recommended management regulations and initiatives aimed at addressing the issues raised within each chapter. (More detailed information and discussions of the Findings are contained in a series of Technical Reports, which are supporting documents for this Interstate Management Plan.)

The management of coastal areas and resources is a concept well established in New England. However, management programs are based upon and segregated among political jurisdictions. These artifices of government often do not recognize the ecological inter-relationships between resources, geographic areas and uses of coastal systems. The problem is particularly acute when the ecosystem in question forms the boundary between two states, as do the Pawcatuck River estuary and Little Narragansett Bay. Thus, the Interstate Management Plan has put forth management regulations and initiatives, programs, and strategies which are focused on coordination of government agencies and bodies, identification and restoration of sources of pollution, identification and protection of critical wildlife habitats, guidance and management measures for various uses of the estuary, and to provide a consistent, ecologically-based policy framework for decisions involving the use of the estuary's resources.

FRAMEWORK OF MANAGEMENT

The Pawcatuck River estuary, Little Narragansett Bay and their associated watersheds lie within the political jurisdictions of two states, three towns and a multitude of local, state and federal agencies. The Pawcatuck River estuary and Little Narragansett Bay also serve as the interstate boundary between Connecticut and Rhode Island. There is currently no interstate authority with jurisdiction over the area.

The Interstate Management Plan provides several mechanisms to coordinate these

separate governmental bodies, including the following:

- An Interstate Notice Procedure is recommended to allow all governmental authorities to receive public notices concerning proposals and reviews under their respective jurisdictions;

- Interstate Memorandums of Agreement are recommended to be developed between all authorities to coordinate issues of concern such as boating safety enforcement, sewage treatment management notification, and dredging operations;

- Coordinated Reviews for Large-Scale Projects are recommended to be developed to facilitate the reviews of proposals on the basis of shared expertise from all affected agencies;

- A Pawcatuck River Bi-State Commission is proposed to be instituted in Rhode Island to compliment and effectuate legislation establishing such a commission by the Connecticut legislature.

THE WATERSHED ENVIRONMENT AND IMPACTS TO WATER QUALITY

Water quality conditions of the Pawcatuck River estuary and Little Narragansett Bay have improved recently. Currently, water quality in the estuary can be considered consistent with state and federal standards, showing no pollutant concentrations considered harmful to aquatic life. However, concentrations of fecal coliform bacteria, an indicator of potential human health hazard, exceed criteria acceptable for shellfish harvesting in the upper and lower Pawcatuck River estuary and Little Narragansett Bay, thereby prohibiting shellfishing for direct human consumption. Sources of fecal coliform and other pollutants include the Pawcatuck River basin, the municipal sewage treatment plants, shoreline septic systems, runoff and recreational boats. Also, the estuary's relationship to the freshwater portion of the Pawcatuck River drives the functioning of the estuary, greatly influences flushing dynamics, range of saltwater encroachment up estuary, and overall loading and behavior of pollutants within the estuary. Urban runoff is also a major contributor to the total load of pollutants entering the estuary.

The water quality management programs of the States of Rhode Island and Connecticut are generally consistent in their assessment of the condition of the estuary, and management strategies for controlling direct discharges. The programs are not, however, closely coordinated, or undertaken cognizant of the bi-state nature of the estuary. Additionally, adequate programs for controlling nonpoint sources of pollution do not generally exist.

Management Regulations and Initiatives include:

1. Watershed Controls for Surface Water Runoff centering around

stormwater management measures and plans;

2. Regional Wastewater Management Initiatives that aim to correct and maintain failed on-site disposal systems, avoid the extension of sewers to areas capable of supporting on-site disposal systems, and septage management and disposal;

3. A Pilot Marina Nonpoint Source Pollution Management Program which encourages the use of best management practices in marina operations;

4. Controls on Freshwater Withdrawals; and,

5. Interstate Coordination on Discharge Regulation and Water Quality Management that calls for a formal process for the exchange of information pertaining to discharges to the estuary on an interstate level.

HABITAT PROTECTION AND RESTORATION

The Pawcatuck River estuary and Little Narragansett Bay contain a wide diversity of natural habitats critical to the survival of many different species. Many of these areas are of outstanding quality on a national, regional and statewide basis. These habitats support commercially important fisheries, rare and endangered species, as well as provide the foundation for the estuarine ecosystem.

A complex series of interrelationships within the estuary exists among the various habitat types and components, creating unique conditions and characteristics which define their quality. These habitats include the open water and aquatic habitats, wetland systems and the upland areas adjacent to the estuary. Each is linked and interdependent, forming the basis for a highly productive and diverse wildlife population, and a unique natural resource. Additionally, the estuary serves as the gateway to the freshwater portion of the Pawcatuck River watershed, a regional resource in itself.

Each of the various critical habitat areas has experienced degradation and impacts from manmade alterations and uses, however, these areas remain ones of outstanding quality.

Management Regulations and Initiatives include:

1. Protection of Critical Habitat Areas;

2. Development of Habitat Restoration Programs aimed at re-establishing and revitalizing functional habitat characteristics and processes which have been diminished or lost as a result of past alterations, activities, or catastrophic events;

3. Land Use Management Controls for Habitat Protection which

outline methods to protect wildlife habitat and environmental quality; and,

4. Dredging Management initiatives that impose dredge windows, operations scheduling, and interstate notification.

RECREATIONAL USES

The number of users within the estuary has significantly increased, reflecting the growth and changes in the populations of the towns, and the accessibility and desirability of coastal recreation. The open waters of the bay and the recreational boating facilities of the estuary all play an increasing role in the quality of life within the area, building upon an extensive historical relationship between the people of Stonington and Westerly and the estuary.

The numbers of boats within the estuary itself have grown by approximately 70% over the last ten years, providng access to the waters for approximately 59,000 individuals in a single season. The waters off Napatree Point are crowded with local and transient boaters throughout much of the summer, as is the barrier island of Sandy Point. The anchorage at Watch Hill harbor has expanded to capacity in recent years, to the exclusion of many transient boats and necessitating the establishment of a waiting list for space. The public boat launching ramp at Barn Island Wildlife Management Area is the fourth most popular in the entire state of Connecticut, and averages 200 launches per weekend day. Additionally, the improvements in water quality have renewed an interest in recreation centered within the Pawcatuck River estuary itself; expanding canoe use of the upper Pawcatuck system is spilling over into the estuary, bringing new, low-intensity users seeking access and open waters.

This growing amount of recreational use within the estuary has raised concerns among the public, municipal officials and state management agencies about the need for increasing levels of active management. The large numbers and diversity of recreational users within the estuary inevitably result in some incompatibility and conflict among them, and with the basic, shared objective of environmental protection.

Management Regulations and Initiatives include:

1. Increasing Low Impact and Local Access to the estuary through the development and improvement of small boat ramps, improvements to commercial and public facilities, and the development of new ramps where appropriate;

2. Instituting an Estuary-wide Mooring Program that requires the permitting of all moorings, siting mooring fields in appropriate areas and managing levels of use, and providing adequate access to these mooring fields;

3. Establishing and coordinating the roles of Harbor Management

Commissions and Harbormaster and Police Patrols to ensure enforcement actions and coordination and develop estuary-wide policies on harbor management; and,

4. The establishment of Interstate Estuary Policies for the Management of Recreational Boating Facilities and the protection of open water areas through structures management and regulation.

PUBLIC ACCESS, OPEN SPACE, AND PROTECTION OF SCENIC VALUES

Public access to the Pawcatuck River estuary and Little Narragansett Bay occurs in many different forms. The beaches of Sandy Point and Napatree Point provide access for beachgoers, birdwatchers and bathers. Boaters gain access to the estuary through the boat ramps at the Barn Island Wildlife Management Area and the commercial marinas, as well as transients coming from other areas and canoeists from access sites upriver. The Wildlife Management area provides almost 600 acres of open space for the public, much of it available through trails and walking paths. The Pawcatuck River Park, the Riverbend Cemetery and various bridges provide scenic views and fishing and shoreline access to the river in the urban areas of the estuary. Roads ending at the shoreline are often traditional rights of way, providing for low impact access to the water for fishermen and others. Additionally, undeveloped open space and vistas from shoreline highways and roads provide visual access to the estuary for many residents as well as tourists.

However, there are several more potential access and scenic sites in the estuary, but no local programs to identify, maintain or develop these areas. Many of the Rhode Island potential Right of Ways (ROWs) have not been designated by the RICRMC under its program, and therefore, are not protected from possible blocking or infringement. Also, neither the towns nor the state governments require the development or dedication of public access as an established condition of permit approvals, even where the applicant proposes to utilize public waters. However, the CTDEP-OLISP does often require the provision of access as a condition of meeting its water dependency requirements, and the RICRMC in the past has required public access at marina developments.

Presently, there are no comprehensive policies or guidelines within the estuary for public access development, or standards to guide projects proposing access. Additionally, there is no comprehensive plan for access within the estuary to provide a context for individual permit decisions.

Management Regulations and Initiatives include:

A. Protecting and Increasing Access through the development of

general public access policies, improvement and development of municipally-owned sites, expansion of access to the urban section of the estuary, and the formal designation, development and management of public rights-of-way; and,

B. Protecting Scenic Qualities of Open Water Areas by guiding management decisions about siting of facilities, use of the water surface, and environmental protection actions.

PLAN OF USE

A Plan of Use has been established as a mechanism for coordinating the ongoing regulatory programs of either state, and to account for and properly manage cumulative changes in the estuary. The Plan of Use recommends that each state CZM program adopt a comprehensive Plan of Use for the planning area which provides clear delimitations between areas where specific activities may take place; such a plan should establish marine commercial development zones, conservation areas and low intensity use areas. Such a plan will provide a basis for consistent application of policies between states, and provide a mechanism for interstate reviews and federal consistency. Within each management zone, specific objectives and initiatives should be established according to the issues occurring there.

The Plan of Use is intended to provide an overall context for the application of existing programs; it builds upon existing authorities, requirements and policies. All recommendations contained within it are subject to site specific application and regulatory requirements.

100 INTRODUCTION

110. An Interstate Management Plan

1. The management of coastal areas and resources is a concept well established in New England. The traditional stewardship of the citizenry has evolved into comprehensive and sophisticated government programs on all levels, town, state and federal. However, in a equally long lived tradition, management programs are based upon and segregated among political jurisdictions. These artifices of government often do not recognize the ecological inter-relationships between resources, geographic areas and uses of coastal systems. The problem is particularly acute when the ecosystem in question forms the boundary between two states, as do the Pawcatuck River estuary and Little Narragansett Bay.

2. The development of an interstate management plan for the Pawcatuck River estuary and Little Narragansett Bay grew from several sources. The first was the ongoing concern for the estuary of local residents, which provided for constant pressure on government agencies to assess the changes occuring within the area, and to reconsider the adequacy of programs and policies in place to protect the resource. Secondly, the surge of development in coastal New England in the 1980's pushed concerns about the impacts of this growth upon the estuary to the forefront of the environmental agenda. Lastly, the impacts of a marina dredging project in 1987 on the returning Atlantic salmon highlighted inadequacies in interstate coordination of such projects, and the need for common policies governing the use of the estuary.

3. In the spring of 1989, efforts began to initiate an interstate planning project with the aim of detailing management strategies through a plan tailored to the estuary. Following a series of roundtable discussions sponsored by the Wood-Pawcatuck Watershed Association, the Connecticut Department of Environmental Protection, Coastal Resources Management Division (CTDEP, CRMD, now the office of Long Island Sound Program - OLISP) and the Rhode Island Coastal Resources Management Council (RICRMC) successfully sought funding from the National Oceanic and Atmospheric Administration, Office of Coastal Resource Management for the development of the plan. The project had three overall goals:

(a) To evaluate the current uses and status of resources within the estuary and to encourage establishment of a sustainable level and mix of uses consistent with the paramount consideration of protection of the estuary's natural and cultural resources;

(b) To facilitate and establish consistent goals and policies between the states and municipalities for the future management and development of the estuary and its resources;

(c) To develop formal coordinating mechanisms for the implementation of the agreed upon goals and policies through future project reviews and programs.

4. At the initiation of the project a Citizen's Advisory Committee (CAC) was appointed to assist the state agency personnel in the development of the plan. The CAC developed an issues list to reflect public concerns about the estuary, and to help focus the investigations which would provide the substantive basis for the management plan. The issues identified were subsequently organized under five broad areas: Water Quality; Habitat Protection and Restoration; Recreational Uses; Public Access, Open Space and Protection of Scenic Value; and Coordination of Management Programs. A comprehensive characterization of these subject areas was documented through collation and summarization of available research, as well as new investigations conducted by the project staff. This information is contained in a series of technical reports which are supporting documents for this Plan. From these technical reports, past and present problems were evaluated and goals, policies, management strategies and other initiatives were developed concerning the use and protection of the estuary which are contained within this plan.

120. Issue Area Goals

(a) Water Quality

• To protect existing water quality, to prevent its degradation by existing and new uses of the estuary, and to work to improve water quality by remediation of existing pollution sources.

(b) Habitat Protection and Restoration

• To protect aquatic and shoreline areas of significant value, and where possible restore presently degraded areas of potentially significant resource values; such areas include viable shellfish areas, important migratory fish pathways, spawning, nursery and feeding areas, and wintering and resting areas for migratory birds.

• To ensure that the policies and regulations of the states and municipalities protect aquatic and shoreline areas and resources of significant value from alterations, either in-water, along the shoreline, or inland which may adversely impact those areas or resources;

• To coordinate the policies and regulations of the states and municipalities to provide maximum protection of living resources and critical habitat areas.

(c) Recreational Uses

• To maintain a balance among the diverse activities which coexist within the estuary, allow for open water areas that provide scenic open space, low impact uses such as small boat sailing and fishing, and undisturbed areas for wildlife, and to accommodate the changing characteristics of traditional activities and the development of new water-dependent uses in keeping with the principle of preservation and restoration of ecological systems.

- To ensure that marina development occurs in appropriate areas, and to implement innovative solutions to increased demands for moorings, dockage and storage space;

- To ensure that the cumulative level of marina development within the estuary does not degrade water quality, exceed the capacity of shoreside facilities to support it, create unsafe levels of boating use or impact or degrade the natural resources of the estuary, including its scenic beauty;

(d) Public Access, Open Space and Protection and Enhancement of Scenic Value

- To expand physical and visual public access to the estuary;

- To preserve, protect and, where possible restore the scenic values of the estuary by retaining the visual diversity and unique visual characteristics of the water areas and shoreline; to safeguard from obstruction significant views of, to and across the water from highways, scenic overlooks, public parks and other vantage points enjoyed by the public; to protect the visual qualities of open expanses of water.

(e) Coordination of Management Programs

- To integrate municipal land use policies with considerations for use and protection of the estuary;

- Evaluate inconsistencies between state and local programs, and between state programs as regards the use, development and management of the estuary and its resources and to establish common policies and restrictions on allowable uses, evaluation procedures, in water restrictions and decision making processes between the management authorities;

- To provide the most complete and accurate information base possible for all levels of government and the public to use in management decisions and activities affecting coastal resources.

210 FINDINGS OF FACT

210.1 Management Authorities

(a) The Pawcatuck River estuary, Little Narragansett Bay and their associated watersheds lie within the political jurisdictions of two states, three towns and a multitude of local, state and federal agencies. The Pawcatuck River basin extends inland to include approximately one third of the land area of Rhode Island, encompasses a large area in Connecticut, and is within the jurisdiction of seven separate towns.

(b) The Pawcatuck River estuary and Little Narragansett Bay also serve as the interstate boundary between Connecticut and Rhode Island. There is currently no interstate authority with jurisdiction over the area.

(c) In addition to the divisions of authority based on jurisdiction, the management programs within the different states are carried out through very different institutional structures. While both states have established coastal management programs with similar objectives and authorities, the Connecticut program is implemented primarily through municipal authorities with the state regulating development below the high tide line and in tidal wetlands, while the Rhode Island program has a larger emphasis on state permitting of all activities along the shoreline.

(d) The federal government also has a significant role in regulating activities such as marina and dock development, channel dredging and maintenance, wetlands regulation and habitat protection. These authorities are exercised primarily through the Army Corps of Engineers, with interaction from the Environmental Protection Agency, the US Fish and Wildlife Service and the National Marine Fisheries Service.

(e) The procedures for review of projects within the estuary are often time consuming, without effectively promoting coordination between the various reviewing agencies. Conflicts are often found between the review concerns and requirements of each level of government, and the process is often ineffective in transferring information or assessments developed by one level to another. The permit review process usually occurs in a sequential, independent manner. This reduces the opportunities for integration of the diverse concerns of individual agencies and separate levels of government. While the decisions reached in this manner may be legally valid, they forego the opportunity to increase their effectiveness. The issue of coordinating

regulatory reviews centers around several main areas: consistency of allowable activities between levels of government, or states; differing requirements, standards or review procedures; transfer of technical information; redundancy in requirements; administrative problems engendered by multiple reviews.

(f) The authorities and responsibilities of the municipalities and the state and federal agencies are sufficient to effectively manage the Pawcatuck River estuary and Little Narragansett Bay. The challenge lies in coordinating the individual actions of these authorities towards implementing a consistent management policy. This interstate management plan provides a policy and management framework around which to build the needed coordination among the various authorities, private organizations and individuals. During its development, the municipalities involved, state agencies, and citizens of the estuary's watershed actively participated in the formulation of decisions and recommendations embodied in the Plan. Its effective implementation can only be assured by sincere adherence to the agreed upon objectives. Each of the invdved parties, the citizens and town councils of the municipalities, have unique and individual roles to play within the implementation of the Plan. Each also bears unique responsibility for its success.

(a) MANAGEMENT POLICIES AND RECOMMENDATIONS

The following policies and recommendations are based on Section 210, Findings of Fact, and the goal of promoting effective coordination between the management authorities within the estuary.

- *Interstate Notice Procedures*

- *The RICRMC, RIDEM and CTDEP should develop and adopt procedures for the exchange of public notices concerning proposals and reviews under their respective jurisdictions, as outlined in the relevant sections of this plan. Primary areas of concern include applications under coastal management review, discharge permits for municipal and industrial discharges, modifications to river flows, reconstruction of the Route 1 bridge, applications for construction seaward of the high tide line or in tidal waters, and dredging operations.*

- *The States of Rhode Island and Connecticut and the Army Corps of Engineers should exchange public notices on all proposed activities within the estuary as a matter of standard practice. These notices should also be sent to any boards and commissions suggested by the Towns of Stonington and Westerly, as well as to the Harbor Management Commissions.*

- *Interstate Memorandums of Agreement*

(a) *The Towns of Westerly and Stonington, and appropriate agencies of the States should execute the Memorandum of Agreement concerning coordination of harbormaster and boating safety enforcement, as recommended in Section 520.*

(b) *The RIDEM, CTDEP and the Towns should develop and execute a Memorandum of Agreement providing for notification of disinfection failures at the sewage treatment plants or other events which may impact shellfishing operations within the Pawcatuck River estuary or Little Narragansett Bay as recommended in Section 320.*

(c) *The RICRMC and CTDEP should execute the Memorandum of Agreement concerning establishing coordinated management procedures for dredging operations within the estuary, and setting consistent "dredge windows", as recommended in Section 420.*

- *Coordinated Review for Large Scale Projects*

- *The RICRMC, CTDEP and the Towns should establish a coordinated review process for large scale projects occurring within the estuary. The coordinated review procedure should not alter existing authorities or change the legal basis or sequence by which permits are issued. State agencies and municipal bodies will continue to be constrained by their specific legislative authorities to act upon limited aspects of a proposal, and applicants must continue to meet the requirements and criteria of each permitting agency. The purpose of the cooperative procedure is:*

- *To identify, evaluate and inform review agencies and applicants of all potential significant impacts on the ecosystem at the beginning of the permitting process;*

- *To reduce possible conflicts between regulatory program requirements;*

- *To facilitate the review of proposals on the basis of shared expertise from all affected agencies and boards, and to ensure that relevant concerns of all agencies are addressed.*

- *Activities to be reviewed under the Coordinated Review for Large Scale Projects include but should not be limited to, the following:*

- *All new marina construction or expansion of existing facilities beyond 25% of their existing capacity as of July 1, 1991;*

- *All dredging operations and dredged materials disposal within the study area;*

- *New discharges to the Pawcatuck River estuary and Little Narragansett Bay requiring National Pollution Discharge Elimination System (NPDES) permits, or equivalent permits under delegated state programs; the modification and-or enlargement of existing discharges;*

- *Residential developments of 6 units or more within the CSPR boundary or RICRMC jurisdiction; commercial or other nonresidential developments involving the disturbance of 1 acre or more of land;*

- *All construction or reconstruction of bridges, railway lines or filled causeways;*

- *Modifications to river flow.*

- *Pawcatuck River Bi-State Commission*

A. The State of Rhode Island should take action to complement the Bi-State Pawcatuck River Commission Act (CGS Section 25.160 - 25.164), in order to activate this body. The two states and towns should discuss the extent of the Commission's authorities and the procedures for its operations within the first year of the Commission's existence (Appendix A).

(a) FINDINGS OF FACT

1. Introduction

1. Water quality conditions of the Pawcatuck River estuary and Little Narragansett Bay have improved recently. Improvement can be attributed to several events, including the passage of the Federal Clean Water Act in 1972, the construction of secondary sewage treatment facilities in Westerly and Pawcatuck, the decline of industry along the river corridor, introduction of pretreatment programs for remaining industrial discharges, better land use regulation and greater environmental awareness.

2. Unlike the Hudson River estuary, New Bedford Harbor, Boston Harbor and several other New England estuaries, the Pawcatuck River estuary and Little Narragansett Bay are not highly industrialized and therefore do not have comparable pollutant loadings or extent of contamination. The river and bay are located among mostly rural uplands and lightly industrialized towns, and the waters are generally used for recreation. The Pawcatuck River's watershed drains mostly rural, forested and agricultural land, and the river itself flows through historic mill villages.

3. At present, overall water quality in the estuary can be considered consistent with state and federal standards, showing no pollutant concentrations considered harmful to aquatic life. However, concentrations of fecal coliform bacteria, an indicator of potential human health hazard, exceed criteria acceptable for shellfish harvesting in the upper and lower Pawcatuck River estuary and Little Narragansett Bay. Sources of the fecal coliforms and other pollutants include the Pawcatuck River basin, the municipal sewage treatment plants, shoreline septic systems, runoff and recreational boats. Additionally, there is some indication that nutrient enrichment may be occurring in Little Narragansett Bay, and that low dissolved oxygen concentrations occur at the head of the estuary.

4. The high fecal coliform levels within parts of the estuary act to restrict its use for direct contact recreation and shellfishing. Shellfishing is prohibited for direct human consumption throughout the estuary and bay. The closures are due to concerns over potential health hazards.

5. The estuary's relationship to the Pawcatuck River is an overriding significant characteristic of the ecological system. The freshwater portion of the river drives the functioning of the estuary, greatly influences flushing dynamics, range of saltwater encroachment up estuary, and overall loading and behavior of pollutants within the estuary. Urban runoff is also a major contributor to the total load of pollutants entering the estuary.

6. The water quality management programs of the States of Rhode Island and Connecticut, while utilizing slightly different mechanisms, are generally consistent in their assessment of the condition of the estuary, and management strategies for controlling direct discharges. The programs are not, however, closely coordinated, or undertaken cognizant of the bi-state nature of the estuary. Additionally, adequate programs for controlling nonpoint sources of

pollution do not generally exist.

2. Natural Features Affecting Water Quality

1. Watershed

- The Pawcatuck River is the major source of freshwater to the estuary. The Pawcatuck River watershed drains a land area of 486km^2; 389km^2, in the state of Rhode Island, 97km^2 in the state of Connecticut. (Figure 3-1) The watershed drains one-third the state of Rhode Island, most of the encompassed land being forested, rural, or suburban residential. Drainage of this vast watershed results in a naturally tea-colored river water, a product of tannins and humics from the breakdown of leaves and other organics in the watershed.

- The Pawcatuck River estuary and Little Narragansett Bay study area has two sub-watersheds which contribute directly to the estuarine system; these have been designated as the Pawcatuck estuarine watershed and the Wequetequock watershed, named after their respective receiving waterbody (Figure 3-2).

2. Physical Oceanography

- The Pawcatuck River estuary is a highly stratified estuary, with a layer of freshwater originating from the Pawcatuck River riding over a saline bottom water layer which originates in Block and Fishers Island Sounds. The estuarine portion of the river is 8 km long, and begins at the Stillmanville Avenue Bridge. Little Narragansett Bay averages 2m in depth, covers 3.2km^2, and is generally a well mixed salt water bay.

- Freshwater discharge from the Pawcatuck River drives the flushing dynamics, residence time of pollutants, nutrients, and other suspended particulates, and the range of saltwater encroachment up estuary. The freshwater surface layer is flushed from the estuary every 1-3 days, while the salty bottom water layer is flushed every 2-8 days (Doering, unpublished data). The river is a consistent source of freshwater input to the estuary, which is closely linked to the precipitation which falls in the watershed (Figure 3-3).

- The large volume of freshwater entering the head of the estuary moves particulates and pollutants introduced by the river towards open ocean waters, speeding the transport of pollutants out of the estuary. The time for pollutant removal from the estuary is more rapid when freshwater input from the river is large, and is reduced as river flow decreases.

3. Land Use Along The Estuary

• Current Land Use Patterns

- Although previously more industrialized, present land use along the estuary is primarily residential. The upper reaches of the Pawcatuck estuarine watershed are completely urbanized within the Towns of Westerly and the Pawcatuck section of Stonington. The downtown section of Westerly is generally developed for commercial-business use. The age of the development raises concerns about inadequate or nonexistent treatment of urban runoff. Many stormwater conveyances from the urban area of the watershed discharge directly into the Pawcatuck River. The general density of development decreases down estuary, ranging from high to moderate. Spans of open space and undeveloped land exists upon both borders of the estuary, particularly within the town of Stonington.

- The Wequetequock Cove sub-watershed is more predominantly undeveloped and extends into the Town of North Stonington. The land uses within this watershed are of lower densities, and a substantial portion of the area is retained in open space, primarily along the shoreline of Little Narragansett Bay, and to the north of the State of Connecticut's Barn Island Wildlife Management Area.

- Industry located along the banks of the estuary has generally declined over time. Current plans by both towns are to revitalize the river and estuary waterfront for multiple use of a recreational, commercial, and business nature. However, a substantial portion of the waterfront within Westerly is zoned for manufacturing.

- Approximately 34% of the land in the Town of Stonington is in a developed condition. In terms of the Pawcatuck-Wequetequock watershed, the developed land figure is slightly larger, approximately 39-40%. Approximately 53% of Westerly is developed, including areas outside the watershed of the Pawcatuck River estuary.

- Roads and Highways

- Roads and highways are an important land use when considering impacts to surface water runoff. These paved areas, as well as parking lots, driveways, and roofs are typically referred to as impervious material that allows almost all precipitation to run off without percolating into the soil. This limits the natural filtering process provided by soils, which act to reduce contaminants such as road tars and oils, trace metals, nutrients, sediments, and petroleum fuels from stormwater runoff.
In excess, these substances are harmful to the natural estuarine environment.

- The major highways traversing the estuarine region are Routes 1 and 1A. Easy access to the Stonington-Westerly region is gained from I-95 north of the estuary. Secondary roads border both sides of the estuary, throughout its length.

- Bridges cross the estuary at Stillmanville Avenue and Route 1, at the Stonington-Westerly border. Bridge design does not impede water flow from the river

to the estuary. Filled crossings on secondary roads crossing many of the minor coves and tributaries to the estuary do, however, cause reduced flow and restricted tidal flushing, often with localized impacts to water quality. The filled crossing for the railroad at Wequetequock is the largest and most significant of these.

- Public Utilities

- Public sewer lines service both the towns of Westerly and Stonington. The urban portion of Westerly is nearly 100% sewered, while the Avondale and Watch Hill sections of town rely upon individual sewage disposal systems (ISDS). In Stonington, all the heavily developed regions are tied into the municipal sewer system; those areas not tied into the sewer system are sparsely developed and residences are widely scattered.

- All regions serviced by public sewer systems in the towns of Stonington and Westerly are also serviced by public water lines.

- Those areas not serviced by public water systems run a risk of groundwater contamination from bacteria, nutrients, toxins, metals, hydrocarbons, and road salts. Those areas with high water tables are particularly at risk. The public water system which services Westerly and the Pawcatuck region of Stonington has been compromised on a number of occasions from petroleum contamination resulting from leaking underground gasoline storage tanks. As long as underground gasoline storage tanks are allowed in areas over the public water supply aquifer, such as is presently allowed, the only water supply for these areas remains at risk of contamination.

- Development Trends

- Growth along the Pawcatuck River estuary has been greatest in the past 30 years, as a greater percentage of the population moves to rural and coastal regions.

- Industry has generally declined over the past 30 years, mainly due to declines in textile manufacturing in the region. Industry still exists along the estuary, but generally is limited. Both towns are presently attempting to attract industry to the area, with "clean" industry as the primary target group for future industrial development.

- Zoning is the principle determinant of the type, density and intensity of land use in the region. Both towns have established zoning districts, with residential zoning a primary designation. The highest density development exists in the urban center of Westerly and the Pawcatuck section of Stonington.

- Growth within the commercial boating facilities, private docks, and overall numbers of boats within the estuary has accompanied the increased development

~~within the towns.~~

~~4. Water Quality Status~~

~~A. State Classifications~~

~~1. The federal Water Quality Act of 1990 (formerly the Clean Water Act) establishes certain chemical and biological parameters by which to measure the health of the nation's waters, and to utilize in setting water quality management goals and evaluating acceptability of proposed discharges. These parameters, in turn, are utilized by the states to establish classifications for different water bodies, reflecting a synthesis of assessments of present conditions, appropriate use and goals; these being SA, SB and SC (Table 3-1 & 3-2). Different classifications are assigned to the various areas of the Pawcatuck River estuary and Little Narragansett Bay (Figure 3-4).~~

~~2. Each state conducts a monitoring program within the estuary, primarily associated with programs for certifying shellfishing areas. In accordance with~~

national guidelines, bacterial contamination is assessed by concentrations of coliform bacteria in the water. Since the early 1970s state officials have used the concentration of fecal coliform bacteria as an indicator of sewage contamination when determining whether water is safe for drinking, shellfish harvesting, and swimming. The monitoring programs therefore concentrate on bacterial levels, and do not generally monitor other ecological parameters such as dissolved oxygen although these are fundamental criteria in the water quality classification scheme. Nutrients, another important input to coastal waters is also not monitored.

3. The CTDEP and RIDEM consider the majority of the Pawcatuck River estuary and Little Narragansett Bay out of compliance with the water quality classifications and requisite standards established for it (Figure 3-5). This has led to ongoing shellfishing closures within the estuary, and other restrictions on use.

B. Present Water Quality Conditions

1. Dissolved oxygen levels, a primary indicator of water quality, are generally within designated limits throughout the year within the estuary (Figure 3-6). Observed conditions in the bottom waters of the upper estuary are a measure of worst case conditions during August 1990, i.e. low water flow and high temperatures. Such conditions exist over only a short period of time in late summer. At no time in recent years has the Pawcatuck River estuary been shown to be anoxic (lacking oxygen). Concentrations of dissolved oxygen within the riverine portion of the estuary, as well as Little Narragansett Bay, are therefore considered healthy and adequate to support a diverse assemblage of marine plants and animals throughout the majority of the year (Desbonnet, 1991).

2. Concentrations of nutrients within the estuary generally decline down estuary due to mixing, dilution, biological uptake and chemical precipitation. Concentrations of nutrients were lower during August than May, 1990, a common phenomena caused by the intensive use of nutrients in the water column by aquatic plants throughout the estuary. The increases in nitrogen in the late summer in the upper estuary may be a reflection of nutrient discharges from the sewage treatment plants. The introduction of these discharges into nutrient depleted summer waters of the estuary results in an increase in

phytoplankton in the areas of the discharges, as evidenced by the increase in chlorophyll concentrations (Figure 3-7).

3. A recent scientific survey of the Pawcatuck River did not find detectable levels of most toxins, such as DDT, DDE or PCBs (Quinn et. al., 1987). Since estuarine concentrations are likely to be a reflection of the riverine loading, it is expected that levels in the estuary are below levels of concern, though no sampling has taken place.

4. Toxicology testing for metals in clams taken from the Pawcatuck River have shown all heavy metal concentrations to be within Food and Drug Admini-stration (FDA) established acceptable limits (CTDEP, 1990; RIDEM, 1990).

5. Fecal coliform concentrations within the upper portion of the estuary are consistently high, and above allowable standards from the head of the estuary to a point 5 kilometers down estuary, after which concentrations decline rapidly with distance towards the mouth of the estuary. Once within Little Narragansett Bay, fecal coliform concentrations tend to remain low, and generally stay below the criteria for shellfishing. However, sampling of these levels by RIDEM has indicated wide variability with established FDA standards. Long term non compliance with the standards has led to the recent permanent closure of the area (Deacutis, PC 1991).

C. Comparison of Present Water Quality Conditions to Classification

1. The monitored water quality of the Pawcatuck River estuary and Little Narragansett Bay has improved significantly. Water quality data collected by the RIDEM indicate that bacteria concentrations have generally decreased over the past decade. The most recent year for which data was available indicate that, for the time period measured, levels were within the standards established for the assigned water quality classifications (Figure 3-8). However, an essential component of the water quality standards is the percentage of samples which exceed the standards and an established statistical range beyond the standard (Table 3-2). Both RIDEM and CTDEP have observed both a greater incidence or level of variability in measured samples. Therefore, it appears that while bacteria concentrations are often within, or close to the standards associated with each classifications (SA, SB), sporadic unidentified pollution sources continue to cause violations of the standards in terms of allowable variation of sampled levels. This variability results in the present water quality conditions not being in conformance with the requirements of the water quality standards, and therefore not in conformance with the assigned classifications. Such variability violates established U.S. Food and Drug Administration (FDA) standards under the National Shellfish Sanitation Program (NSSP); compliance with these standards is necessary to allow the area to remain open for active shellfishing.

D. Pollution Source Assessment

1. Bacterial Contamination

(a) All of the Pawcatuck River estuary and Little Narragansett Bay have been closed to shellfishing due to high coliform bacteria concentrations since 1948 (1947 in RI waters). In 1989, the RIDEM opened a seasonal shellfishing area in a portion of Little Narragansett Bay, however, recent increases in observed bacteria levels have required the reestablishment of the permanent closure. Connecticut allows commercial harvest of shellfish in the estuary provided they are depurated in state certified waters.

(b) Water quality data collected by the RIDEM for the Pawcatuck River estuary and Little Narragansett Bay show that bacteria concentrations have generally decreased over the past decade, but that variability in the collected samples has increased. Connecticut Department of Aquaculture (CTDA) has similarly noted increased variability in bacteria concentrations during recent years. The increased variability observed in collected fecal coliform samples is a result of decreased concentrations in recent years. Occasional high concentrations in collected samples increases the observed variation from normally low concentrations. Variability in collected samples have the potential to close an area to shellfishing.

(c) Figure 3-8 shows the distribution of fecal coliform bacteria con-centration down estuary transects conducted by RIDEM during 1989. Concentrations exceed acceptable limits in the upper Pawcatuck River Estuary, decreasing down estuary, particularly south of Pawcatuck Rock.

(d) Bacteria sampling data collected by the Aquaculture Division of the Connecticut Department of Agriculture show a similar trend of down estuary decreasing concentrations, but concentrations on the flood tide are greater than ebb tide, suggesting bacterial sources outside of the cove, although the observations may be due to the restricted tidal exchange within the cove.

(e) Sources of bacterial contamination that exist within the estuary include storm drains, septic systems, sewage treatment plants, recreational boats, and fecal material from domestic animals and wildlife. Sources outside the estuary include all of the above throughout the Pawcatuck River basin.

(f) ISDS are a well known source of fecal coliforms, particularly when situated in poor soils, close to the water table, or when the systems fail or are poorly maintained. The average life span of an ISDS is 10-15 years, during which time the soil becomes clogged and reduces the efficiency of the system. An estimated 1,523 ISDSs exist within the direct drainage area of the estuary and the bay. The potential for bacterial contamination of estuarine waters from ISDS input is most probable from the coastal fringe areas such as Westerly, south of Pawcatuck Rock, and the Wequetequock Cove shoreline, where soils are highly permeable, a very shallow water table exists, and systems are located close to the shore.

(g) The Westerly and Pawcatuck Sewage Treatment Plants provide a source of fecal coliform bacteria to the estuary. Both facilities, however, generally produce concentrations of bacteria in the discharge effluent that are well below their respective NPDES permitted values, and have limited effect upon use impairment. Dye release studies performed for each facility show that bacteria concentrations would be reduced to acceptable levels for shellfishing by the time the effluent stream reached Pawcatuck Point in the event of a raw sewage release from either plant (FDA, 1984).

(h) Recreational boats potentially provide approximately 4 percent of the total fecal coliforms entering the estuary, and may account for restricted use of the resource (i.e., swimming, shellfishing) because of the potential for sewage contamination of nearby waters. Although exact impact to receiving water from boat sewage discharge is difficult to determine, the potential impact generally keeps popular mooring sites and marinas closed to shellfishing; the impact of boat sewage discharges is very localized and problems occur because of the physical proximity of these different, incompatible uses within the estuary.

(i) Domestic animals and wildlife as a source of bacterial contamination in the estuary have not been investigated in detail in the estuary or watershed. Elevated concentrations of fecal coliform bacteria in regions of Little Narragansett Bay not proximal to any source of sewage input during winter

months suggests that waterfowl are significant sources of fecal coliforms in the estuary and river. Studies by CTDEP suggest that there may be agricultural sources within the Wequetequock Cove watershed that contribute to observed levels of coliform bacteria.

(j) Stormwater and urban runoff wash coliform bacteria from land into the estuary. Measured bacteria concentrations generally exhibit a dramatic increase in nearby waters following rainfall events.

2. Nutrient Loading

(a) Nutrients in the estuarine environment, specifically nitrogen and phosphorus, are similar in function to fertilizers used on land. They promote the growth and development of plants, the basis of the food chain. When excessive amounts of nutrients enter the estuary, increased algal growth occurs creating surface scum on the water and decreasing the amount of oxygen available to fish and shellfish. This, in turn, increases the hydrogen sulfide level (toxic to most organisms at high levels), decreases water clarity, and may change surface sediment texture to a black organic ooze. This condition is often referred to as eutrophication, meaning well-nourished, and implies natural and artificial addition of nutrients to bodies of water and their effects.

(b) The most extreme of the classic signs of nutrient enrichment and eutrophication are not observed in the Pawcatuck River estuary and Little Narragansett Bay (i.e., algae scums, fish kills). However, the extensive fouling communities (algae growing on submerged aquatic

vegetation), such as those present in Little Narragansett Bay may be an expression of nutrient enrichment. Light limitation in the upper reaches of the estuary, due to the tea brown coloration of Pawcatuck River water, may limit the abundance and growth of aquatic plants at the head of the estuary. Limitation of nutrient uptake in the upper estuary results in an abundance of nutrients becoming available to plants in Little Narragansett Bay. Additionally, the load of nutrients from urban runoff may create localized impacts and algal blooms within the many small, poorly flushed embayments within the estuary and Wequetequock Cove.

(c) The primary sources of nutrients to the estuary are the Pawcatuck River watershed (via the Pawcatuck River), the sewage treatment plants, ISDS, and urban runoff. The Pawcatuck River is a major provider of nitrogen (58%) and phosphorus (35%) to the estuary. Urban runoff from adjacent land draining directly to the estuary provides the second greatest input of nitrogen (24%) and phosphorus (44%), exceeding the combined input of nutrients to the estuary by the Westerly and Pawcatuck STPs (Figures 3-9 & 3-10).

(d) A large portion of the ISDS nutrient load to the estuary is due to the number of unsewered houses in the region. However, those ISDSs located along the coastal fringe south of Pawcatuck Rock and bordering Wequetequock Cove are expected to contribute a larger percentage of the loadings due to their being sited over poor ISDS soil conditions, high water tables, and proximity to the shore.

3. Biological Oxygen Demand and Total Suspended Solids

(a) Estuarine loading of BOD (Biological Oxygen Demanding Substances) is dominated by the Pawcatuck River (56%). Urban runoff from the two sub-watersheds adds a significant amount of BOD to the estuary (40%) of the total load, more than the Westerly and Pawcatuck STPs combined. (Figure 3-11) The BOD load contributed by urban runoff may create some adverse impact on the smaller embayments within the estuary.

4. Other Contaminants

(a) Other pollutants which threaten or affect water quality include trace metals, petroleum hydrocarbons, pesticides and herbicides, and various chemicals. Very little study has been given to these pollutants within the estuary and the bay. Studies completed in the Pawcatuck River watershed however, suggest that concentrations of these pollutants in the estuary are minimal and do not pose potential threats to human or aquatic life (Quinn, et. al., 1987, Desbonnet, 1991).

(b) On occasion illegal or accidental spills and discharges occur which enter estuarine waters. The nature and extent of illegal or accidental spills and discharges to the estuary will determine the potential for damage to the resource.

(c) Underground gasoline storage tanks located at gasoline stations directly adjacent to the estuary pose a potential risk to groundwater supplies, surface waters, aquatic organisms, and human life in the event of leaking tanks that permit contamination with petroleum hydrocarbons.

E. Summary

1. The large volume of freshwater discharge from the Pawcatuck River to the estuary causes the river to serve as the provider of most of the pollutants. This relationship places critical importance on the impacts and proper management associated with land use, and modification of flow discharges within the upper basin. Many of the pollutants discharged to the estuary show declining trends over the past decade. However, concern still remains due to the existing restrictions on uses due to fecal coliform concentrations, the potential for degradation as development in the watershed proceeds, and the ecological impact of other pollutants, especially nutrients.

2. Of the three point sources within the estuary, the Westerly STP provides the majority of pollutants and nutrients, due to its predominant discharge. Due to their small discharge volumes, the Pawcatuck STP and Yardney Technical Products are

relatively minor sources of pollution. All three generally meet their discharge permit criteria, except during limited periods. The out of compliance periods are generally short in duration and will have little long term effect or impact.

3. Loadings from nonpoint sources are considerable, even in comparison to those of the Pawcatuck River, and rival or exceed inputs from point sources. Urban runoff provides significant loads of metals, BOD and nutrients to the estuary. Nutrient and pollutant loading to the estuary from urban runoff may have some eutrophic or toxic effects in Wequetequock Cove and other smaller, less well flushed coves and bays of the estuary. The potential impact of urban runoff can increase by 40% under possible future development scenarios established under current zoning designations (Desbonnet, 1991). Contributions of nutrients and metals to the estuary from runoff are greater than those contributed by the two sewage treatment plants. Nutrient additions to the estuary from septic systems is of similar concern, exceeding the contributions of the treatment plants (Table 3-3; 3-4).

5. Other Management Issues

- Withdrawal of Freshwater from the Pawcatuck River

- Freshwater withdrawals from the Pawcatuck River occur for agricultural purposes throughout the Pawcatuck River watershed, predominantly in Rhode Island. Withdrawals are presently unregulated by the RIDEM, and no maximum levels for volumes withdrawn or review criteria have been established.

- The impact of freshwater withdrawals in the Pawcatuck River watershed on the estuary and bay are at present unknown, but have the potential to alter the functioning of the estuary, particularly during times of drought, when withdrawals are most likely to occur at peak volumes.

- Potential impacts of freshwater withdrawals upon the estuary include reduced vertical stratification of the water column, increased salinity throughout the estuary, an increase in residence time of pollutants in the estuary, and alteration of the physical environment utilized by aquatic organisms.

- At present, no management or monitoring structure exists by which to assess the potential impact to the estuary of reduced freshwater input from the Pawcatuck River. Any decisions or actions taken within the river watershed with regard to water withdrawals or discharges into the river do not include assessment of potential impact upon the estuary.

- Sewage Treatment Plant Operations

- The issues of management, treatment and disposal of wastewater within the

estuary's watershed, through both on-site disposal systems (OSDS) and sewering, are fundamental to addressing and remediating the current impairment of water quality and long-range protection of ecological health.

- The treatment plants will play an exceedingly important regional role in septage disposal in the future. The pollutant loading data suggests that there may be significant sources generating septage within the Pawcatuck River basin, such as residential septic systems or inadequate treatment facilities, which may have to be addressed to improve water quality within the estuary. This issue becomes critical in light of the limited treatment capacity remaining at the Westerly Plant. The issues of septic system maintenance and upgrading, and septage disposal extend beyond the immediate planning area. A significant proportion of the contribution of bacterial contamination to the impairment of uses within the estuary originates in the upper watershed; a portion of this

may originate with failed or inadequate septic systems. Proper management and remediation of on-site disposal system (OSDS) problems in the upper watershed will require regional sdutions to several aspects of the problem, primarily septage disposal and establishing consistent programs for maintenance and upgrading.

• While detailed surveys and inventories are not available, there are several areas within the planning areas where concentrations of ISDS failures are probable; the areas potentially contribute significantly to the bacterial contamination problems, as well as provide other pollutants of concern such as nutrients. In these areas, such as Watch Hill, Avondale, Greenhaven, and along Wequetequock Cove, the use or upgrading of on-site disposal systems (OSDS) may not be feasible due to site constraints. In such instances, the extension of sewers may be the only feasible approach to correcting the problems.

• The extension of sewers to areas where there are concentrated, failed septic systems, and site constraints preventing on-site upgrading is not currently a policy within the watershed; there are currently no evaluations as to where these areas are. The Town of Westerly does not have a sewer avoidance policy, requiring the use of on-site disposal, where appropriate; the Town of Stonington has developed such a policy and is currently considering its adoption. This issue is especially critical in Westerly, given the limited remaining capacity of the treatment plant.

• The increased discharges from the STPs resulting from increased sewer inputs and septage treatment must be evaluated for potential restrictions on estuarine uses, both within the Pawcatuck River estuary and Little Narragansett Bay. Evaluations of these impacts must also be coordinated on an interstate basis.

• Interstate Coordination of Discharge Permits

• A lack of coordination between the states exists as regards reviewing and issuing wastewater discharge permits. Each state considers the impacts of new discharges only in regard to other discharges by that state, rather than on an estuary-wide basis. The result is a lack of proper assessment of new discharges relative to all discharges to the estuary, regardless of origin. This lack of coordination could result in an over-burdening of the estuary with certain wastewater pdlutants.

• A lack of coordination between towns and states also exists with regard to shellfish harvest in the estuary. No emergency notification system exists by which to warn shellfishermen in the event of sewage treatment discharges exceeding levels that may place human health at risk. This is especially important given that Connecticut allows the harvesting of shellfish for depuration within the estuary, and that there is currently an active aquaculture operation.

• Although permitting discharges to the estuary is presently uncoordinated between

states, NPDES permit limits established for dischargers in each state appear to be currently adequate in regulating individual point sources. Coordination in permitting discharges will ensure that overall loading to the estuary does not cause degradation of the resource and its uses.

- Water Quality Monitoring and Assessment

- The instream water quality monitoring programs of the States of Connecticut and Rhode Island are currently carried out in an independent and uncoordinated manner; additionally, these are not coordinated with the USGS monitoring program at the head of the estuary. Each of these agencies uses different sampling methodologies, stations and times of sampling, making comparison or consistent evaluation between data sets difficult. These programs are also carried out independently of the self-monitoring programs by permitted discharges.

- Instream water quality monitoring programs carried out within the estuary are focused on bacterial measurements, and are primarily carried out by the shellfish management programs. These programs, despite being the only ongoing monitoring programs within the estuary, do not assess other important water quality parameters; such parameters provide for a clearer understanding of environmental quality and changes.

1. MANAGEMENT REGULATIONS AND INITIATIVES

The following regulations and initiatives are based on Section 310, Findings of Fact, and the primary objective of protecting and restoring the water quality of the Pawcatuck River estuary and Little Narragansett Bay.

1. *Watershed Controls for Surface Water Runoff*

1. *Stormwater Management*

(a) *Definition. Stormwater management refers to a) for quantitative control, a system of nonstructural and structural measures that control the increased volume and rate of surface runoff caused by man-made changes to the land, and b) for qualitative control, a system of nonstructural and structural measures that reduce or eliminate pollutants that might otherwise be carried by surface runoff.*

(b) *Management Policies and Regulations*

~~(1) The state and local governments should require proper stormwater management within areas under their jurisdiction, extending to the watersheds defined within this plan when possible, to prevent the degradation of surface water quality and downstream flooding resulting from direct and cumulative impacts of development.~~

~~(2) It shall be the policy of the state and local governments to establish consistent minimum standards for stormwater management to achieve the objectives of water quality protection and flood control, utilizing existing regulatory and development control procedures. At a minimum, all developments subject to Coastal Site Plan Review within the Town of Stonington and the jurisdiction of the Rhode Island Coastal Resources Management Council (RICRMC) should be subject to these requirements, with the following exceptions:~~

~~• The development of one (1) new single-family residential lot or structure, unless within 100 feet of tidal wetlands or other coastal resources as subject to regulation under the laws of the State of Connecticut and Rhode Island;~~

~~• Alterations to existing residential structures, except as those might result in a significant increase in runoff from the site;~~

~~• Maintenance activities; for the purposes of RICRMC review these are activities as defined in Section 300.14 of the RI Coastal Resources Management Program (CRMP);~~

~~• Roadway maintenance resurfacing projects, general roadway maintenance, and emergency drainage repair projects, except as may be subject to the requirements of Section 420.3 Restoration of Critical Habitats.~~

~~(3) All activities subject to this section should be required to demonstrate compliance with the applicable standards for stormwater management as set forth in the document "Minimum Technical Standards and Specifications for Stormwater Management Measures" (RICRMC, 1990 Draft) upon its adoption by the appropriate state and local~~

~~*governments. Adherence to the Water Quality Base Standard and the Flood Control Base Standard as defined within that document should be required by the towns and states in their reviews.*~~

~~**(4)** *All activities subject to this section should, in addition to adhering to the technical standards as recommended in section (c) above:*~~

~~**(a)** *First reduce the volume of runoff generated by minimizing the extent of imperviousness and enhancing overland flow and pre-concentration infiltration, and secondarily, treat or control the off-site transport of runoff;*~~

~~**(b)** *Maintain the natural hydrodynamic characteristics of the watershed and tributary waterways;*~~

~~**(c)** *Protect or improve the quality of surface and ground waters;*~~

~~**(d)** *Protect groundwater levels and quality;*~~

~~**(e)** *Protect the beneficial functioning of wetlands as areas for the natural storage of flood waters, the chemical reduction and assimilation of pollutants, and wildlife and fisheries habitat;*~~

~~**(f)** *Prevent increased flooding and damage that results from improper location, construction, and design of structures;*~~

~~**(g)** *Prevent or reverse salt water intrusion into groundwater supplies;*~~

~~**(h)** *Protect the natural fluctuating levels of salinity in estuarine areas;*~~

~~**(i)** *Minimize alteration to flora and fauna and adverse impacts to fish and wildlife habitat;*~~

~~**(5)** *It is recommended that the municipal governments integrate these standards on a watershed basis through existing subdivision and zoning, or other regulatory procedures, in addition to the CSPR and RICRMC reviews.*~~

Initiatives should be taken to encourage the extension of these policies and actions to North Stonington and other towns within the watersheds.

(6) *It is recommended that the Town of Westerly enter into a Memorandum of Agreement for subdivision reviews with the RICRMC to provide for an integrated and coordinated regulatory review between local and state levels of government, in accordance with the RICRMC's established program.*

2. *Remedial Stormwater Management Activities*

(a) *Definition. Remedial stormwater management activities are those actions taken to address a situation where no stormwater management, as defined in Section 320.2.A presently exists.*

(b) *Management Policies and Regulations*

(1) *The state and local governments should require retrofitting and upgrading of existing stormwater outfalls, redevelopment sites or other appropriate activities in order to remediate or mitigate existing problems. These efforts should use the best practicable technologies or approaches as dictated by the site conditions present, in accordance with the requirements of Section 420.3. In these instances, consideration may be given to waiving compliance with inappropriate standards outlined in Section 320.1.A.2. However, all reasonable steps should be taken to provide the greatest or most effective degree of treatment possible, minimize the environmental impacts and use conflicts created by the activity, and maintain compliance with the objectives of Section 320.1.A.2.d. The reviewing agencies should also require that the applicant demonstrate that there is no reasonable alternative means or location for those aspects of the proposal which must vary from the standards.*

3. *Comprehensive Stormwater Management Plan*

(a) *The states and the towns should undertake a cooperative program to upgrade existing direct discharges of stormwater which do not employ appropriate treatment techniques and are discharging into the Pawcatuck River estuary and Little Narragansett Bay and its tributaries. This may be achieved in part*

through regulatory actions concerning ongoing projects as recommended by Section 420.3 Restoring Impaired Wildlife Habitat. As a first step, the states and towns should identify and prioritize existing discharges, identify and prioritize non-stormwater related inputs (dry weather discharges) and actively seek funding sources for planning, design and upgrading. The established priorities should be integrated into appropriate plans of development and facilities plans on the town level, and public works projects on the state level. The RICRMC and OLISP should act as coordinators for actions on the state and federal level. Oversight for the project should be undertaken by the Bi-State Pawcatuck River Commission.

(b) *Additionally, there is a need to conduct further study on the impacts and mitigation of stormwater inputs. Investigations should include:*

(a) *Analysis of stormwater composition beyond that of just bacteria levels, including the assessment of present concentrations for pollutants of concern and mass loading balances for the estuary;*

(b) *Quantification of the total volume of runoff which enters the estuary and bay;*

(c) *Development of technical and mitigative techniques for stormwater management within urban environments, and identification of innovative funding sources to encourage development and implementation;*

(d) *Effects of subsurface discharges of stormwater on groundwater levels and quality, and integration of this information into standards governing the siting of these facilities.*

(e) *The feasibility of regional stormwater management.*

2. *Regional Wastewater Management*

(a) *Correcting Failed On-Site Disposal Systems*

- *The Towns of Stonington and Westerly should undertake an inventory of on-site disposal systems in unsewered areas.*

~~• Failed, substandard (not conforming to current standards) or problem systems (sporadic failures, inconsistent functioning) should be identified by plat and lot. Site inspections of all problem systems should be undertaken to assess rehabilitation needs and estimate the potential for on-site retrofits.~~

~~• Field data gathered in the site inspections should identify:~~

~~• general condition of systems and signs of system malfunction;~~
~~• evidence of undersizing;~~
~~• lot configuration;~~
~~• soils data;~~
~~• availability of replacement area, including evaluation of setbacks and separation distances;~~
~~• relationship to other nearby systems;~~
~~• general potential for use of alternative system (from Myers, 1991).~~

~~• The towns should coordinate these efforts and agree to consistent content for the inventories.~~

~~• Priority areas to be addressed include: Watch Hill, Avondale, Greenhaven, and along Wequetequock Cove.~~

~~• On the basis of the preceding evaluation, the towns should identify which wastewater management options should be pursued in specific coastal locations. A combination of OSDS, clustered or centralized systems or sewers may be required to address the need for new systems and upgrade efficiently.~~

~~• The recommended inventory and evaluation should be funded and undertaken as part of the Facilities Planning process.~~

~~• Each town should establish a priority scheduling of specific areas that require sewer service, with priority consideration given to areas with concentrated failed OSDS where replacement or upgrading has been found infeasible. Priority should also be given to areas where OSDS are located over soil conditions considered unsuitable for use of OSDS. The CTDEP and RIDEM should require that these policies be adhered to in their review and approval of any revised or updated facilities plans.~~

- *Each town should develop a strategy for the phased replacement of individual failed systems.*

- *All applications for significant improvements or renovations to existing structures before the Town of Stonington and Westerly should be required to establish that the septic system serving the dwelling or commercial operation complies with current standards and requirements.*

(b) *Sewer Avoidance Policy*

- *Each town should adopt a policy restricting extension of sewers to areas or properties capable of supporting the use of on-site disposal systems in an environmentally safe manner, consistent with current standards. Such areas should be identified on a town-wide basis.*

- *Zoning designations with each town should be adjusted to establish minimum lot sizes consistent with the use of OSDS in the areas identified in (1) above.*

(c) *Septage Management and Disposal*

- *The Town of Westerly should institute a Wastewater Management District (WWMD) within the unsewered portions of the study area. The Town of Stonington should utilize the Rhode Island model WWMD to institute a comparable program.*

- *The towns should establish the treatment of septage generated by mandatory pumping of OSDS as a priority as regards the allocation of treatment capacity at the STPs. Septage generated at marine pumpout facilities should be included within the scope of this policy. Implementation of this policy should include ensuring proper acceptance and treatment technology is in place at the STPs.*

- *The treatment and disposal of septage should be addressed on a regional basis. A special task force should be established to evaluate regional arrangements for insuring adequate treatment of additional septage created by the initiatives in (A) and (B) above, necessary regional or interstate initiatives and other relevant issues. Towns without treatment plants within the Pawcatuck River basin should be included in these discussions.*

- *The towns, in conjunction with the State Nonpoint Source*

~~*Pollution Management Programs, should develop programs to educate local residents about the use and maintenance of on-site septic systems.*~~

~~**(d)** *Expansion of Treatment Plant Discharges*~~

~~• *Any expansion of discharges from the STPs as a result of the above recommendations should be treated at a level sufficient to prevent the expansion of currently established discharge zones.*~~

~~**(e)** *Septic System Maintenance*~~

~~• *Until such time as the areas prioritized for extension of sewer lines are serviced by these lines, and in all areas not prioritized for sewer service within the planning area, the towns should undertake a program to support the regular maintenance of septic systems. The septic system maintenance program should include, as a minimum, the following:*~~

~~**(a)** *Septic systems should be inspected and pumped every 3 years;*~~

~~**(b)** *Various funding sources for a maintenance program should be identified, including service charges and the establishment of utility districts (WWMD);*~~

~~**(c)** *Septic systems pumpers should be responsible for reporting to the office designated by each town those septic tanks not able to be pumped, or requiring pumping more than 3 times per year;*~~

~~**(d)** *As an incentive to eliminate chronic septic system problems and to protect future homeowners, information pertaining to failed septic systems or violations of state OSDS regulations should be recorded on property deeds until such time as they are corrected;*~~

~~• *Through the use of regular maintenance, or pumping, the life span of a septic system, its effectiveness in treating waste, and protection of groundwater can be increased. Homeowners should be educated on how their wastes are being treated, the importance of regular pumping and what preventative measures can be applied to alleviate future problems. Suggested measures include:*~~

~~**(a)** *Water conservation practices;*~~

~~**(b)** *Discouragement of garbage disposals;*~~

~~**(c)** *Avoidance of disposal of greases and oils into household drains;*~~

~~**(d)** *Proper disposal of chemical wastes (paints, thinners, alcohol, acids,drain cleaners);*~~

~~**(e)** *Separate drainfield for washing machine discharges;*~~

~~**(f)** *Prohibition of use of chemical OSDS "rejuvenators";*~~

~~**(g)** *Planning for alternate sites in the event of primary site failure;*~~

~~**(h)** *Resting part of the leachfield system periodically through design or installation of alternate beds;*~~

~~• *All applications for significant improvements, renovations or conversions to existing structures before the Town of Stonington or Westerly should be required to establish that the septic system serving the dwelling or commercial operation complies with current standards and requirements.*~~

~~3.~~ *Controls for Managing Recreational Boat Sewage*

~~**(a)** *Regional Boat Sewage Management Program*~~

~~• *Direct discharges of sewage wastes from recreational boats within the estuary have the potential to create significant impacts to water quality and impairment of uses. The proximity of shellfishing, contact recreation and important natural habitats indicates a need to institute stronger protection measures regarding the discharge of boat sewage. Through a comprehensive, regional program to manage boat sewage, these impacts may be prevented. The program should be developed by a bi-state committee including RICRMC, CTDEP, RIDEM, the towns and the Bi-State Pawcatuck River Commission, and incorporated into the respective Harbor Management Plans for Stonington, Pawcatuck and Westerly.*~~

- *Management Policies and Regulations*

- *The overboard discharges of all sewage wastes from recreational boats, treated or untreated, should be prohibited within the Pawcatuck River estuary and Little Narragansett Bay. This prohibition should be incorporated into the Harbor Management Plans and Ordinances of the towns, and fines established for violations. Enforcement powers extending to levying fines for overboard discharges should be authorized for harbormaster and police patrols. Marina operators and dockmasters should be considered for such authorization for violations within their facilities. The OLISP and RICRMC should seek the designation of Little Narragansett Bay and the Pawcatuck River estuary as a "No Discharge Zone" by the US Environmental Protection Agency.*

- *The Harbor Management Commissions of both towns, in cooperation with area marina operators, should develop educational materials on boat sewage management and support its distribution to boaters.*

- *The CTDEP and RIDEM should require, through the state water quality regulations, the installation of marine sewage pumpout facilities at priority sites throughout the estuary. This requirement should be implemented when significant expansions or modifications are made to the identified facilities. The CTDEP and RIDEM should also enforce existing permit requirements pertaining to pumpout facilities, where these exist. Concurrently, possible nonregulatory approaches to developing the facilities should be pursued. The priority sites are:*

- *Nor'west Marine*
- *Westerly Yacht Club*
- *Avondale Boatyard*
- *Watch Hill Yacht Club*

- *The CTDEP and RIDEM should require that marine sewage pumpout facilities developed at these sites be required to be available for use by the general public; appropriate fees for use should be allowed. Where possible, these facilities should be tied into municipal sewers lines. Cooperative arrangements between marina operators to provide service to their patrons should be encouraged.*

These agreements should be established on a regional basis.

- *A "port-a-potty" dump station should be established by CTDEP at the Barn Island boat ramp; a program supporting the use of a "pump-out barge" should be developed for use in the Watch Hill, Napatree Point and Sandy Point areas.*

- *The Towns, working with the appropriate state agencies, should develop and implement a program to ensure proper and appropriate sanitary waste disposal at all private recreational boating facilities, and where feasible at town facilities and launching ramps. As part of this program, the following elements should be included:*

- *The CTDEP and RIDEM should develop a standardized program detailing the requirements for treating recreational vessel wastes at municipal sewage treatment plants, including facilities development requirements, effluent quality restrictions, predicted volumes and impact on treatment plant operations, septage management and pretreatment requirements. The states should further ensure that current regulations allow for the actual implementation of the identified requirements, and make appropriate revisions where necessary;*

- *The Towns should review, and where necessary, revise their respective zoning ordinances and other authorities related to development control and health and safety to require the provision of proper sanitation disposal facilities at all new or expanded recreational boating facilities, marinas and waterfront developments as appropriate; all marinas having live-aboard residents should be required to establish that proper measures have been taken to tie these vessels into a disposal system. The Towns should ensure that these authorities allow for the actual implementation of the identified requirements, and make appropriate revisions where necessary. Future facility planning for the Sewage Treatment Plants should provide for direct marina tie-ins where possible, and for septage acceptance from marinas.*

- *The States, through the Nonpoint Source Pollution*

~~*Management Programs or other appropriate sources, should make funding and technical assistance available to the Towns to facilitate the implementation of this program. Each Town Harbor Management Commission should undertake pursuing such funding and coordinating the implementation of the program,*~~

~~• *Marina operators should develop language within their slip rental agreements that prohibits overboard discharges, and makes it a violation enforceable by loss of slip privileges.*~~

~~• *The houseboats moored off Napatree Point during the summer should be moved to marinas, as required by Rhode Island law. The Westerly Harbor Master should enforce this.*~~

~~4.~~ ~~*Pilot Marina Non-point Source Pollution Management Program*~~

~~**(a)** *Marina Plans of Operations*~~

~~**(1)** *There exists a need within the planning area to address nonpoint sources of pollution arising from everyday operations at marina facilities. These operations pose a range of potential water quality problems. Efforts to encourage the use of Best Management Practices through specific Plans of Operations is a direct way of promoting awareness of the problem and on the ground solutions outside of the regulatory process. These plans should be developed in all marinas operating within the Pawcatuck River estuary, Little Narragansett Bay and Wequetequock Cove, with technical and financial assistance from the state agencies of Connecticut (Connecticut is developing marina BMP's), and Rhode Island, as available, and be consistent with federal initiatives.*~~

~~**(2)** *Management Policies and Recommendations*~~

~~• *The States of Rhode Island and Connecticut should cooperate in the development of a voluntary program to demonstrate and encourage the use of Best Management Practices in marina operations within the estuary.*~~

~~• *The states and local governments should establish consistent minimum standards for marina operations*~~

~~*regarding the control of nonpoint source pollution through marina operations;*~~

~~• A Marina Operation and Maintenance Plan guidance document should be prepared which identifies appropriate Best Management Practices for a range of operations and marina sizes. The guidance document should include, at a minimum:~~

~~• Descriptions of practices for spill prevention and mitigation;~~

~~• Collection and treatment of bilge and bottom washing waters;~~

~~• Practices for disposal of waste petroleum products;~~

~~• Controls on routine maintenance practices.~~

~~• Marina operators should be encouraged to develop a Marina Operational Plan which conforms to the elements of a common, estuary-wide program, based on the guidance above. Such plans should address, at a minimum, the following:~~

~~• Methods to manage stormwater runoff and eliminate sources of pollution to rainfall runoff;~~

~~• Methods for the minimization of the accumulation and storage of maintenance wastes; all methods used for material storage and handling should be examined;~~

~~• Descriptions of methods to be used to protect the environment during regular boating maintenance operations;~~

~~• Plans of action for emergencies including fuel and oil spills, sewage spills, fire and severe weather. This should include procedures for evacuation in emergencies and securing of boats;~~

~~• All boaters at the marina should get a copy of marina~~

~~*regulations regarding the above.*~~

~~• *Completed plans should be posted at a prominent location at the marina;*~~

~~• *Rules and regulations applying to boaters should be included in the plan and should include the following:*~~

~~• *Rules for boat maintenance activities.*~~

~~• *Restrictions on live-aboards.*~~

~~• *Restrictions on overboard sewage discharge, rules on use of Marine Sanitation Devices (MSDs) and pumpouts.*~~

~~• *Explanations of boater responsibility for spills, clean up costs, and reporting requirements.*~~

~~• *Procedures for fueling up.*~~

~~• *Procedures for the disposal of oils, removal of oil from bilges and removal of garbage.*~~

~~• *Emergency procedures for fuel and sewage spills, fire, and severe weather.*~~

~~• *Procedures for fire prevention and protection.*~~

~~• *Swimming restrictions.*~~

~~• *Boat wake speeds.*~~

~~• *Penalties for violations.*~~

~~*320.5. Interstate Coordination on Discharge Regulation and Water Quality Management*~~

~~**(I)** *A formal process for exchange of information pertaining to discharges to the estuary on an interstate level needs to be established; permitting decisions, monitoring and water quality assessments are all currently conducted independently. Additionally, since the estuary is a shared resource, there should be a mechanism for regional discussion*~~

~~*on decisions to allow new discharges and other issues affecting water quality. Finally, a common data base, available to all should be developed in order to better evaluate the potential impacts of new discharges, and to track total loadings to the estuary over time.*~~

~~**(II)** *The water quality classification system utilized by the two states needs to be made consistent in its goals and objectives in the northern portion of the estuary. Currently, the CTDEP classifies the area as SB, while RIDEM classifies it as SC. Given the relatively recent water quality improvements, the classification in Rhode Island should be adjusted to preserve these improvements, and better reflect the objectives of this plan to provide for a maximum level of multiple use within the estuary.*~~

~~**(1)** *Management Policies and Regulations*~~

~~• *It should be the policy of the state and local governments to formally notify all concerned government bodies and agencies, private parties and the general public within the watershed of actions relating to pollution discharges, permit issuance and renewal and other regulatory activities through established public notice procedures.*~~

~~• *It should be the policy of the state and local governments to routinely exchange monitoring reports, water quality evaluations and other pertinent information concerning the status of the water quality of the Pawcatuck River estuary and Little Narragansett Bay. Additionally, the CTDEP and RIDEM should coordinate their monitoring and sampling programs to the greatest degree possible, including coordination with USGS.*~~

~~• *All proposed actions relating to pollutant discharges, including land use decisions within the estuarine watershed, should be referred to the Bi-State Pawcatuck River Commission, when established, for review and comment in addition to those referral agencies already required by statute.*~~

~~• *The RIDEM should reclassify that sector of the Pawcatuck River estuary currently SC as SB.*~~

~~• *The town of Westerly, the RIDEM, the CTDEP and the Stonington Water Pollution Control Authority should develop a procedure and agreement to provide notification*~~

~~*in the event of a disinfection failure at either STP, in order to provide additional public health protection during the harvest of shellfish from the Pawcatuck River estuary for relay.*~~

~~**a.** *Controls on Freshwater Withdrawals*~~

~~**(b)** *Relationship to the Management and Protection of the Estuary*~~

~~**(1)** *The alteration of the freshwater flow of the Pawcatuck River to the estuarine portions of the system and Little Narragansett Bay has the potential to alter the chemical, physical and biological properties of the estuary. Further, such alterations may interfere with its functions as wildlife habitat, recreational resource, and impair efforts at pollution control and abatement. As such, it is the finding of the RICRMC and CTDEP that alterations and activities which may significantly change the timing and volumes of fresh water entering coastal waters have a reasonable probability of conflicting with established plans and programs for the management of coastal resources within the region, may make the area unsuitable for uses and activities to which it is allocated, and may significantly damage the environment of the coastal region.*~~

~~**(2)** *Management Policies and Regulations*~~

~~**a.** *All activities or alterations inland of the coastal zone which may significantly change the timing and/or volumes of freshwater entering coastal waters should be reviewed for their impact to the Pawcatuck River estuary and Little Narragansett Bay. Thresholds for activities requiring such review should be established as part of the policy recommended under (c);*~~

~~**b.** *The states should reciprocally provide notice and an opportunity to comment on all proposed alterations or activities which may significantly alter the volume and/or timing of freshwater inputs to the Pawcatuck River estuary and Little Narragansett Bay. This policy should be implemented through a Memorandum of Agreement between CTDEP, RIDEM, and RICRMC.*~~

~~**c.** *The states should cooperate in the development of an*~~

appropriate policy and approach governing the withdrawal of water from the entire (fresh and estuarine) system for agricultural, industrial, and other purposes; it is recommended that the RIDEM make this a priority item. The policy should establish a regulatory program requiring permits for withdrawals, and establish maximum levels of withdrawals for commercial and industrial uses, as well as agricultural uses:

b. *Future Initiatives*

(a) *The states and towns recognize that further research and work need to be undertaken to help protect the Pawcatuck River estuary and Little Narragansett Bay. As funding and/or opportunity for new initiatives becomes available, priorities should include the following:*

- *A determination of the overall extent and persistence of bottom waters low in dissovled oxygen content should be made in the estuary, particularly in the region north of Pawcatuck Rock. Investigations should be conducted cooperatively between state agencies, or by a citizen's monitoring group that is working cooperatively with the state agencies. The investigations of low oxygen bottom waters should be directed at determining what impact these conditions have upon benthic organisms, as well as upon migratory fishes, and should attempt to identify anthropogenic sources that influence dissolved oxygen content of bottom waters.*

- *The status of nutrient levels and loadings, and their current and future impacts to the estuary needs further investigation. These investigations should focus on determining if the present availability of nutrients in the estuary is responsible for the fouling growth noted on the eelgrass of Little Narragansett Bay, and if changes in the viability of the aquatic habitat is occurring as a result of present nutrient levels.*

- *Fecal coliform bacteria exceeds levels acceptable to the plan's recommended SB classification revision. RIDEM and CTDEP should initiate a program to identify sources of this bacterial contamination and rectify this situation.*

- *A complete and thorough survey of visible discharge pipes throughout the entire estuary should be undertaken by state agencies or citizen monitoring groups that are coordinating efforts*

with the state agencies. The survey should note wet and dry weather discharges, and their locations on maps. A task force of state personnel, town officials, and private citizens should be assembled to monitor and sample identified discharge pipes, modeled upon other successful citizen's monitoring programs. The monitoring and sampling results should be used to focus follow-up enforcement actions by the appropriate government agencies.

- *A dynamic model of the Pawcatuck River Estuary and Little Narragansett Bay should be developed to determine the effect of freshwater flow into the head of the estuary on flushing time, circulation patterns, distribution and residence time of particulates and pollutants, and changes in salinity distributions within the estuary and bay. The model should also be used to assist in the determination of a minimum flow of water from the Pawcatuck River that is required to maintain the flushing and circulation dynamics of the estuary.*

- *The relationship between fecal coliform and fecal streptoccoci bacteria concentrations should be further explored to determine its usefulness in the identification of contaminant sources (i.e. animal or human), particularly in determining the contribution of waterfowl to the fecal coliform contamination measured in the estuary.*

410. FINDINGS OF FACT

Introduction

(a) The Pawcatuck River estuary and Little Narragansett Bay contain a wide diversity of natural habitats critical to the survival of many different species. Many of these areas are of outstanding quality on a national, regional and statewide basis. These habitats support commercially important fisheries, rare and endangered species, as well as provide the foundation for the estuarine ecosystem.

(b) A complex series of interrelationships within the estuary exists among the various habitat types and components, creating unique conditions and characteristics which define their quality. These habitats include the open water and aquatic habitats, wetland systems and the upland areas adjacent to the estuary. Each is linked and interdependent, forming the basis for a highly productive and diverse wildlife population, and a unique natural resource. Additionally, the estuary serves as the gateway to the freshwater portion of the Pawcatuck River watershed, a regional resource in itself.

(c) Each of the various critical habitat areas has experienced degradation and impacts from manmade alterations and uses, however, these areas remain ones of outstandng quality.

The Open Water and Aquatic Habitat

(a) Description

(1) Various types of aquatic habitats can be found within several environmental subsystems of the Pawcatuck Estuary. These environments range from a high energy, marine system near the mouth, to sheltered cove systems found in isolated branches of the estuary (after McConnaughey, 1985) (Figure 4-1). Each habitat supports a different community where species have adapted to that environment; the diversity of the system gives rise to many different plant and animal assemblages and the overall quality of many of the habitat types.

(2) Specific environmental conditions are the primary factors controlling the distribution of ecological communities found in estuaries. These conditions

include substrate availability, temperature variations, salinity regimes, tidal regime, landform, sedimentation and vegetation type (Cortright et. al, 1987) (Figure 4-2).

(3) Within the Pawcatuck River estuary and Little Narragansett Bay, some species show a positive correlation to salinity; the salinity tolerances of some organisms establishes their location within the various environments of the estuary (Gibson, personal comment, 1990). Some species which have wide salinity tolerances are found in a wider range of the aquatic system, while others may be restricted from ranging in the upper or lower salinity levels. The Pawcatuck River estuary displays a distinct stratification of density between the freshwater and saltwater elements; the lighter freshwater originating in the river flows seaward over the heavier sea water which moves in the opposite direction during tidal surges. This stratification is sometimes so pronounced that a phenomenon called a "salt wedge" exists, where very little mixing occurs between the two layers.

(4) Several features contribute to the richness of the estuary by trapping and recycling nutrients, including fine sediment particles carried to the estuary from the river which offer surface area for the absorption of nutrients, and the salt wedge feature which helps trap nutrients.

(5) Sampling of the Pawcatuck River Estuary and Little Narragansett Bay over the last 20 years has revealed a diversity of aquatic vegetation, benthic flora and fauna, as well as free floating plankton. The high productivity of the estuary is reflected in the abundance and diversity of vertebrate and invertebrate populations (Demos, 1986).

(b) The Subtidal Community

(1) One of the more important aquatic habitats within the estuary is that which supports the subtidal community. Abundant nutrients coming from the Pawcatuck River, combined with shallow waters and warmer temperatures, make the lower estuary rich in phytoplankton and submerged aquatic vegetation (SAV) production. Because of these valuable food sources, the shallows of the estuary provide homes for juvenile fish and many crustaceans well as shelter from predators.

(2) Submerged aquatic vegetation forms an integral and critical component of the subtidal ecosystem. Among its more important functions are high organic productivity, reducing current velocities, promoting sedimentation and binding bottom sediments, providing a nursery and refuge for fishes, acting as a food source for fish and waterfowl and as a residence for invertebrates; eelgrass beds (Zostera marina), found extensively in Little Narragansett Bay, are recognized as being of outstanding quality and importance as a food source for numerous waterfowl species. They are critical habitat for Brant's geese (Branta canadensis), which are abundant in the bay during migration (Merola, personal comment, 1989).

(3) A diversity of aquatic vegetation, benthic flora and fauna, as well as free floating organisms (plankton) and other biota inhabit the project area. A bottom study conducted in 1972 of the small bay (locally called the "Kitchen") area off Napatree Point indicated the presence of five macrofloral species: Zostera marina, Ulva lactuca, Laminaria saccharina, Codium fragile, and Dulse (White, 1972). Alfieri (1975) studied the growth of attached biota to two artificial reefs placed in Little Narragansett Bay off the west shore of Napatree Point in 1972 and 1973. Five species of macroalgae became permanent residents on an automobile tire reef, with Polysiphonia the dominant species. In addition to macroalgae, a number of invertebrates colonized the reef and three species of fish commonly associated with the reef. A study undertaken in 1982 of Fisher's Island Sound presented a sample of the macrobenthic community found in the waters off Sandy Point (Pellegrino and Hubbard, 1983). The study showed a moderate diversity of species as part of an ecosystem typical of those found in areas of continual sand movements (Whitlatch, 1982). Other organisms included crustaceans, starfish, sea squirts and various barnacles. A dense population of polychaetes, or marine worms (Scoloplos fragilis), as well as soft shell clam juveniles (Mya arenaria), were found to inhabit an extensive mud flat area at the northwestern end of the point.

(4) Bottom invertebrates are an important food source for white-winged, surf and common scoters, goldeneye and bufflehead ducks. Fish-eating birds such as merganser, grebes, loon and cormorant are common. The bay is an important feeding area for osprey.

(c) Finfish

(1) The Pawcatuck River estuary and Little Narragansett Bay support a substantial population of finfish sought by recreational and commercial fishermen. A wide diversity and abundance of finfish reside, reproduce, or migrate through the estuary as well as use it for juvenile growth and feeding (Olsson, 1987).

(2) Fifty two species of finfish from 33 families of marine, freshwater, anadromous and catadromous fish have been documented as using the Pawcatuck River estuary

at some point in their life history; also documented have been the larvae of fourteen families and eighteen species of fish (Sisson, 1987). While it is believed that some of these larvae were likely washed down river by water flow, it is probable that many of these species spawn in the estuary (Sisson, 1990) (Table 4-1).

(3) Winter flounder, one of the most important recreational and commercial species in Rhode Island and Connecticut, spawn in the estuary. Little Narragansett Bay and the Pawcatuck Estuary are considered critical to its survival. Their numbers have gradually decreased since 1980 and are now severely depleted, to a point where they cannot support a productive fishery. This is believed to be due mostly to overfishing climatic variations, and somewhat to habitat degradation. Flounder prefer inlets and coves of the estuary, in shelf or shoal type areas where the river is wider and slower, and where sandy silty bottoms can be found; young of the year prefer such shallow, silty areas. All inlet fingers are believed to support populations of flounder (Gibson, 1990).

(4) Striped bass, an important commercial and recreational fishery along the Atlantic coast, are often found in the estuary. This species has been over exploited, and are now recovering due to a massive, coast-wide effort, including moratoriums on harvest to reduce fishing mortality. During the spring months, tremendous numbers of school bass follow bait fish, and especially anadromous fish such as river herring, into the Pawcatuck River estuary. During the summer and fall, large numbers of bass may be found at Napatree Point and the offshore reefs. This species overwinters in coves of the estuary (Sposato, 1989).

(5) White perch, a significant estuarine commercial species along the Atlantic coast, are present in good numbers, although yellow perch are no longer as common. This is presumably because more preferable habitat upstream has been made available by the opening of fish passageways in dams throughout the freshwater portion of the watershed (Gibson, 1990).

(6) Both wild and stocked populations of brook trout exist within the Pawcatuck watershed. Mastuxet Brook, the only major tributary on the eastern shore of the Pawcatuck River Estuary, is believed to support a wild population. While all streams probably have some trout populations, few streams in Rhode Island are believed to have the right temperature gradient for good brook trout populations (Gibson, 1990). Wild stocks of fish are extremely valuable, as they are vital to maintaining strong and diverse genetic pools; there are a decreasing number of wild stocks in existence.

(7) Anadromous fisheries such as smelt, alewives, shad, and salmon have been species of concern since the early 1970s, and efforts towards their restoration in the estuary have been conducted on an ongoing basis by the Rhode Island Department of Environmental Management, Division of Fish and Wildlife. The restoration projects were initiated by the passage of the Anadromous Fish Act, in 1965. Since that time, anadromous alewife and American shad have been restored to the river, and small returns of adult Atlantic salmon have been achieved.

(8) The Pawcatuck River is one of only three smelt runs existing in Connecticut and is one of only a few rivers in Rhode Island where a population is known to occur (Visel, 1989). Smelt are considered a rare species in Rhode Island, and have recently been significantly less abundant than in past years; lack of habitat is believed to be a major contributing problem. In the Pawcatuck River estuary, the prime spawning grounds are limited to a very small area around the Route 1 bridge and south about one quarter mile (Sisson, 1990).

(9) Bluefish, an important recreational species, can be found in large numbers in the Pawcatuck River estuary in the spring in response to the movement of bait fish into this area. In the summer and fall, bluefish occur in the river and at Napatree Points and offshore reefs.

(d) Shellfish

(1) The Pawcatuck River estuary is believed to have one of the most extensive oyster beds (Crassostrea virginica) in Rhode Island as well as in Connecticut (Visel, 1989). Good populations of quahogs (Mercenaria mercenaria), surf clams (Spisula solidissima) and mussels (Mytilus edulus) also exist (Ganz, 1989) (Figure 4-3).
Historically, there has been good scallop (Agropecten irradians) population near Barn

~~Island. There was a small but locally popular recreational scallop shellfishery. Unlike hard clams or soft clams, scallops may be harvested for direct human consumption in the waters of Little Narragansett Bay because only the muscle of the scallop is eaten. In recent years the scallop population has gone nearly to zero. The cause is not known. Since 1985 the Stonington Shellfish Commission has been conducting a scallop seeding program. It purchases seed scallops, grows them out in nets suspended from a raft in Stonington harbor and places the animals on the bottom in the late fall. The size of the program ranges from 20,000 to 80,000 scallops, depending on budgetary constraints. The intent of the program is not to seed scallops for later harvest, but rather to maintain a breeding stock that could reproduce should environmental conditions improve. Thus far, the success has been modest. There is evidence that some of the seeded scallops are surviving and that there is a small natural set, but the recreational shellfishery has not yet returned. The Stonington Shellfish Commission maintains the seeding area as a special shellfish management area.~~

~~(2) The main issue affecting the harvest of shellfish is water quality. Shellfish are filter feeders and will concentrate any contaminants found in the water column. These include bacteria, viruses and metals. Data show that there is a probable link between boating activity and coliform levels, as well as from terrestrial runoff and sewage treatment plants (Desbonnet, 1991). Possible pollution impact sources of site specific shellfish growing areas within the Pawcatuck are wastewater treatment facilities, storm drain discharges, industrial processing, recreational boats, marinas, and other non-point pollution sources, such as failed septic systems and urban runoff.~~

~~(3) Rhode Island's portion of Little Narragansett Bay was closed to shellfishing in 1947 and the closure was extended by Connecticut in 1948 to include the remainder of the bay (Gaines, 1982). Direct consumption of shellfish from the~~

Pawcatuck River estuary-Little Narragansett Bay waters has not been permitted since because of the high level of fecal coliform bacteria (Citak, 1989).

(4) Since the construction of the Stonington sewage treatment plant in 1976, and the Pawcatuck plant in 1980, the transplanting of shellfish to clean waters (called relaying), has been allowed due to improvements in water quality sufficient to allow this process, used to purify the shellfish and make them fit for consumption. This technique is presently permitted in the Pawcatuck River estuary and Little Narragansett Bay by Connecticut, but not Rhode Island.

(5) New proposed classifications by Connecticut for shellfish growing waters in the estuary will permit the harvesting of shellfish for relay from within the Pawcatuck River estuary and Little Narragansett Bay to "Approved" areas outside of the estuary. Rhode Island has more restrictive limitations; recently, one area, a triangular shaped zone located north of Napatree Beach, was opened as a "seasonally approved" area. This area had been meeting water quality criteria for direct shellfish harvest for a predictable period, and was opened or closed to harvesting according to the high boating use season (from April to October), which corresponds to observed increases in coliform bacteria levels. However, recent high bacterial measurements have resulted in the permanent closure being reinstated. All other areas within Rhode Island's borders are presently closed to shellfish harvest for either direct harvest or relaying. With the exception of the Special Management Area for scallops and some privately owned and leased by the State of Connecticut bottom, the Stonington Shellfish Commission permits commercial shellfish harvesting in these areas.

(6) Shellfish populations within the estuary are viable despite water quality problems; however, the lack of harvest activity may lead to a loss of reproductive success (Sisson, 1990). Impacts of non-harvest are primarily that mature clams choke out the smaller one as the beds get too dense, become overcrowded, and most individuals die off (Visel, 1989). Several sources have stated that management of the beds for a sustained yield would help the population (Visel, Ganz, 1999).

(e) Human Impacts

(1) The first dam on the Pawcatuck River was built in 1700, and was the first of at least ten dams to be built on the main stem of the river from 1700-1871. These dams marked the beginning of the decline of the anadromous fisheries in the Pawcatuck and Wood rivers (Guthrie, 1979). Since 1941, and particularly since the enactment of the Anadromous Fisheries Act of 1965, the restoration of fishways and the anadromous fish run has been a continuous project.

(2) Many species living in the estuary are not native to this environment, having been introduced over the past 200 years from various areas of the world, primarily as fouling communities on ships (Carlton, 1990). While no native species have been known to become extinct because of these introductions in the estuary, population size and abundance for several species is believed to have decreased (Carlton, 1990).

(3) As noted above, water pollution from many different sources has restricted the utilization of the extensive shellfish resources within the estuary, as well as limiting recreational uses in the Pawcatuck River estuary.

(4) Commercial and recreational uses of the estuary's resources have contributed to both direct and indirect impacts, including overfishing, and habitat modifications such as bulkheading and filling, and dredging.

(5) The large commercial marina industry within the Pawcatuck River Estuary and Little Narragansett Bay, the federal navigation channels and the area's history as a waterborne commerce center have created an ongoing need for dredging. Dredging may alter the aquatic habitat by increasing turbidity, reducing oxygen content, reducing the amount of shallow water habitat and directly impacting organisms. Dredging operations may also release contaminants or sediments into the water column.

(6) All dredging operations remove bottom dwelling organisms which constitute a primary basis for the estuarine and marine food chains. In previously dredged areas, renewed disturbance by maintenance dredging is likely to result in little change to the benthic community; substantial damage to indigenous benthos is far more likely to result from new dredging projects, in areas where a more diverse assemblage of organisms would be expected to occupy the higher quality sediments.

(7) Dredging within the Pawcatuck River estuary conducted during the spring of 1987 may have contributed to impacts to that year's anadromous fish run because the activity occurred during the migration.

(8) Recreational activities in the water and along the shoreline may impact the productivity of aquatic, wetland and terrestrial wildlife habitat. These impacts will increase as the amount of area used and intensity of use increases. Noise levels and human activity may affect the viability of habitat as a wildlife refugium; noise levels from outboard motors have been reported to reach 80 decibels at 50 feet (Chmura and Ross, 1978). During busy recreational seasons, it is unlikely that wildlife populations would make extensive use of marinas or heavily trafficked waters, except those species which have adapted to human presence (U.S.EPA, 1985).

(9) Similarly, by making secluded wildlife habitat accessible to humans, boating can be detrimental to wildlife populations. Studies conducted exploring the impact on colonies of nesting waterfowl have shown that nesting success of gull and tern colonies is reduced by boaters passing by or by visiting otherwise secluded colonies (Chmura and Ross, 1978); Sandy Point, Napatree Point and other areas of the estuary all have documented losses of wildlife species concurrent with increasing human use of the area. Benthic succession may also be prevented by turbulent waters and

waves where motorized craft frequent. Water propulsion may disturb spawning areas in shallow waters (Chmura and Ross, 1978).

(10) Aquatic ecosystems are particularly susceptible to the impacts of urbanization. Changes in stream hydrology, which occur as a result of site clearing and grading, will reduce the habitat value of the stream. Various studies have tracked trends in fish diversity and abundance over time in urbanized streams. Many show that fish communities become less diverse and are composed of more tolerant species after the surrounding watershed is developed.

(11) As a result of urbanization, natural vegetative cover is frequently replaced by impermeable surfaces, reducing available area for stormwater percolation. Pollutants carried by stormwater runoff often reach the estuary through storm sewers and other pathways. It often carries sediment, oil, road dirt, salts, heavy metals and nutrients. Not only may these substances be toxic to marine organisms at certain concentrations, but they may have sublethal effects which reduce the ability of organisms to survive predation or competition, to reproduce and may produce physical growth defects (Champ and Bleill, 1988).

The Wetlands Habitat

(a) Description

• Wetlands are vital areas within the estuarine ecosystem that serve many functions. Tidal wetlands perform an important role in collecting, assimilating, storing and supplying nutrients to the estuary, in the form of decaying plant material (detritus) and minerals. A portion of the plant material produced by marshes is flushed to the estuary where it supports many estuarine inhabitants. In addition to food, wetlands provide habitat, protected cover from predators, and nursery areas for invertebrates, fishes and various local and migratory birds. Wetlands also act to offset the impacts of adjacent human uses of the upland; stormwater and other drainage is cleansed by marsh vegetation; wetlands act to slow the drainage from upland areas for natural flood control. These concepts are well recognized and documented; alteration of wetlands and disruption of their ecological function is considered detrimental to the environment and to society (Boule and Bierly, 1987). Wetlands protection has been established through statute on both the state and federal level as paramount, as altered environments cannot be restored to their original condition.

• Tidal wetlands are complex ecosystems made up of various distinctive plant communities. Most of these communities remain very clearly segregated, yet exist very closely to each other. The dominant ecologic factors of the tidal wetland system consist of constantly acting factors, such as daily tidal flooding, fluctuations in the water table, recharge of the water table by spring tides, and evaporation and

transpiration - factors integrally dependent upon the wetland complex's hydrologic regime.

(b) Vegetation

• A wide variety of wetland acreages and types exist in the Pawcatuck River Estuary and Little Narragansett Bay (Figure 4-4). The most extensive of the wetland areas is the Barn Island Wildlife Management Area (756 wetland and upland acres) and Continental Marshes (276 acres of marsh and farmland). The Barn Island marshes "represent the finest wild coastal area within the state of Connecticut" (VLAUN, et. al., 1982). Wequetequock Cove's wetlands total approximately 125 acres (VLAUN, et. al., 1982). Scattered wetland acreages can be found on Elihu Island, along the Connecticut shoreline across from Elihu Island and on Napatree Point. The high quality and extensive habitats of these wetlands provide for significant wildlife concentration and breeding areas, with many resident and migrating marsh, shore, waterfowl and wading birds.

• Along the reaches of the Pawcatuck River can also be found scattered tidal wetlands. These wetlands vary in their size, diversity and type of vegetation, cover, proximity to other wetlands and the degree to which developed or open land borders them. In general, these wetlands fall into one of two categories; those associated with coves and inlets, and fringe wetlands located along the river's edge. The tidal and brackish marshes along the Pawcatuck River are limited in extent in part because of the linear orientation of the river and the relatively small number of cove type areas where marshes are likely to develop, and because of development. The majority of these wetlands are small marshes (<20 acres), bordered or interlaced with upland vegetation. They are nearly always bordered in part by a road, residence, or commercial establishment which effectively limits their potential for expanding in acreage. Wetland fringe, so called because it is limited to a narrow band (<20') that follows the water's edge, tends to be found wherever seawalls and bulkheads are absent, as well as in areas where the river has less scouring action (such as small riverbends). They are occasionally found in areas where the bulkheading exists but has eroded away. This wetland type has been limited to a fringe area in large part because of development. The plant species is most frequently Spartina alterniflora, though occasionally Spartina patens will be found in wider fringes that slope up from the water.

(c) Birdlife

• A wide diversity of resident, migrating and wintering birds use the Pawcatuck River Estuary and Little Narragansett Bay (Table 4-2). Fringe wetlands are highly valuable to surface feeding waterfowl (black ducks, mallards, widgeon, gadwall), shorebirds and wading birds (Merda, Pers.

Comm., 1989). Birds observed in wetland areas of the estuary include terns, sparrows, rails, bitterns, chats, egrets, and herons. The deeper waters of the river are important feeding area for diving ducks, such as bufflehead, goldeneye, common and red breasted merganser. Other diving birds such as grebes, cormorants and common loon frequent the river. Canada geese and mute swans are common. The river is an important feeding area for locally nesting as well as migrant osprey and Brant's geese.

(d) Other Wildlife

• Additional species observed in the wetland areas include rabbit, muskrat, river otter, bat, raccoon, weasel, skunk, fox, frogs, salamanders, toads and snakes, in addition to the rare and endangered species discussed in Section 410.6.

(e) Human Impacts

• During the colonial period, wetlands were seen as agricultural opportunities. The mowing of the short meadow grasses on tidal wetlands was a common activity. Salt marsh hay was used extensively for bedding, packing and mulching. Mowing on some marshes, most notably the Barn Island and Continental Marshes, is believed to have occurred continuously since colonial days, and has undoubtedly affected the nature of the vegetation (Miller and Egler, 1950). Miller and Egler have documented the effects of mowing within the Barn Island marsh. Their research produced strong evidence that prolonged mowing of the high marsh zone reduces the vitality of the predominant species, eventually bares the soil and is followed by soil erosion.

• Because of their close proximity to waterways, which were major travel routes, wetlands and areas adjacent to wetlands were also prime areas for settlement. The siting of commercial ports was also a significant factor in the development of the estuary. Later, the need to maintain navigational channels led to dredging and the disposal of dredged material was often in nearby wetlands. The land created by this fill was soon recognized as having industrial or commercial value (Boule and Bierly, 1987). Several significant areas within the estuary have been filled to support urbanization including the industrial site in Stonington behind the hurricane dike, parts of the downtown, several areas now occupied by marinas, and the cove south of Ram Point, which served as a dredge materials disposal site in the 1940s (Willis, 1991).
Extensive bulkheading along the estuary's shoreline has also replaced shallow water and wetland habitat.

• In the Barn Island area, the ditching of marshes for the purpose of mosquito control was begun in 1931 and completed the following year. These ditches are quite extensive in their coverage of the marsh. Many other wetland areas within the Pawcatuck Estuary have also been ditched, but the exact dates during which construction took place is unknown. These ditches have had a negative effect on the productivity of the marshes, both in terms of vegetative and wildlife habitat (Miller

and Egler, 1950; Warren and Niering, 1985). Recent definitive studies have conclusively demonstrated that the highest wildlife usage and productivity are associated with natural (un-ditched) marshes, whereas the intensely grid-ditched marshes support the lowest wildlife productivity (Warren and Niering, 1985). A dramatic decline in waterfowl and shorebird use of the Barn Island marshes has occurred as a result of the ditching of much of the salt marsh habitat (Warren and Niering, 1985). Impoundments were constructed at Barn Island in the late 1940's to offset the impacts to wildlife due to the elimination of open water habitat from ditching. Dikes were constructed to pond water over approximately 144 acres of tidal wetland. These impoundments attracted large numbers of waterfowl, but wildlife use declined as perennials such as cattail and phragmites displaced open water habitat. Presently, approximately 90% of the impounded wetlands have been, or are being restored to tidal salt and brackish wetlands. Connecticut has discontinued its maintenance ditching program in favor of selective open marsh water management techniques. It is expected that this approach will restore the historic water table and recreate pools and pannes (Rosza, personal comment, 1990).

- In the Pawcatuck River estuary and Little Narragansett Bay, as in many other estuaries, the largest factors impacting existing wetlands are those caused by the pressures of a growing population on land and water use. This includes the historic loss of wetland acreage due to filling, impacts to water quality, and the development of uplands adjacent to wetlands. The encroachment of residential, commercial, and industrial development into areas adjacent to wetlands has further limited the ability of these wetlands to perform their natural functions.

Upland Habitat

(a) Description

- The upland habitat area is defined as land covering the areas inland of wetland and aquatic areas. Uplands act as a significant habitat or may serve to protect adjacent wetland habitat, providing an essential barrier between wildlife, the ecosystem in which they live, and human activity. These areas, when retained in their natural and undisturbed condition, are frequently crucial to the survival of many wildlife species.

- A large portion of upland habitat in the Pawcatuck estuary watershed has been lost as urbanization has occurred. However, land whose previous uses have been abandoned, and have returned to a more natural state, remain extremely valuable to wildlife. For example, abandoned pastures and agricultural fields occupy some of the upland territory. These are areas where there is much open area, with small percentages of cover. The vegetation is in the primary stages of succession, and has been noted as being highly productive for wildlife (MacConnell, 1974).

- Many coastal animal species require a combination of tidal wetland and upland habitat to carry out their daily activities of feeding and nesting. These animals often feed on the abundant organisms within the tidal wetland, but use upland habitats for nesting and roosting. For these animals, an adequate upland area around the wetland is essential as a refuge from the daily inundation of tides which may flood out nests and burrows. The upland area also acts as an alternative site for foraging activities.

(b) Vegetation

- The vegetative community of the upland habitat for the project area consists primarily of oak forest with a mixture of hickory, black oak, white oak, shagbark hickory and bittemut. Black gum is also common and thickets are typical on abandoned agricultural lands. Such thickets will also have catbrier, dwarf sumac, sassafrass, blueberry and wild rose. Vegetation around abandoned farms consists primarily of grasses such as little bluestem Schizachyrium scoparius, big bluestem Andropogon furcatus and indian grass Sorghastrum nutans. Between the marsh and high upland is frequently a narrow shrub border composed of upland species. These are killed back by storms bringing extreme high tides. Where the shrub border is mowed, it is replaced by a grassland of Panicum virgatum (Miller and Egler, 1950).

(c) Upland Animals

- A large number of small mammals can be found within the project's upland area, (e.g., mice, squirrels, skunks, foxes, raccoons and rabbits) (Table 4-3). Large

mammals such as deer, and more recently the coyote have been observed (Narragansett Times, 1986). One of the largest mammals that lives in the watershed is the river otter (Lutra canadensis). Muskrats (Ondatra zibethicus) can also be found in the project area; about 4000 are caught statewide annually .

- Birdlife abounds and include many common species; quail, pheasant, wild turkey, dove, woodcock, grouse, may be residents or occasional visitors to the estuary and are commonly hunted in the region.

(d) Human Impacts

• The greatest cause of species loss is habitat destruction and fragmentation, the reduction of the size and contiguity of habitat parcels such that they no longer contain all the elements that many species require for their survival. As urbanization in an area increases, certain populations of wildlife that rely on either a wide diversity of contiguous habitats, a specific type of habitat, or simply require isolation from human activity, may decrease in population or be forced to leave the area. The loss of a population may have a dramatic effect on other species that have been dependent on the lost group, either as a food source or for population control (Howard-Stroebel, et. al. 1986). The loss of these more sensitive species further reduces the diversity of wildlife. Often these induced impacts cause species dominance changes, and other shifts in population dynamics.

Coastal Barrier Habitat

1. Description

a. There are two coastal barriers in the management area, Napatree Point and Sandy Point. There are three primary habitats associated with these areas. The beach habitat lies seaward of the dune, and is devoid of vegetation except for annual and perennial wrackline vegetation. Sand dunes support a coastal grassland vegetation dominated by American Beachgrass (Ammophila brevilagulata). Associated species include seaside goldenrod (Solidago sempervirens) and evening primrose (Oenothera parviflora). Sandflats are the more or less level areas of stable sands located landward of the dunes.

b. A portion of the northern section of Sandy Point has been used as a disposal site for sandy dredged materials. This increased the amount of coastal barrier habitat and provided habitat for sandflat species and colonial seabirds.

2. Function

a. One of the most critical functions of the barriers is that they created and protect the sheltered waterbody of Little Narragansett Bay. In the absence of these beaches, wave energy and exposure would be considerably higher. Critical habitats such as the eel grass beds and the tidal wetlands at Barn Island could be severely impacted. Protection of various habitats within Little Narragansett Bay is thus dependent on the protection of the coastal barriers.

3. Birdlife

a. Unvegetated areas of the coastal barriers are especially important habitat for colonial seabirds such as Common terns, least terns and the shorebird, the Piping

Plover; the backshore beaches, sandflats and disposal site on Sandy Point are especially important. These species have been observed to nest on these barriers. Herring and Great Blackbacked Gulls nest in unvegetated and vegetated beaches, sand dunes and sandflats. A variety of other types of birds use the barriers, including Sanderlings, Savannah sparrows, Short-eared owls and Snowy owls.

Buffer Zones

1. To assure the survival of some wildlife species, sufficient separation from human habitation and activities is required. Upland buffer zones are areas that are retained in their natural condition to protect wetlands, water quality, and wildlife habitats from degradation by human activity. By protecting and providng wildlife habitats, undisturbed buffers allow for a more diverse wildlife population. The presence or absence of a buffer influences the degree of this diversity as well as the abundance of populations. When rare or endangered species are present, a buffer can contribute to their continued existence by reducing the potential of human impacts. Without buffers, encroachment by humans on the habitat of facultative species (those which require a specific habitat) often forces the population to abandon the site. In intensively developed surroundings, these areas become still more valuable, as they may serve as one of the few areas for wildlife oases.

2. In Stonington, buffers (called "non-infringement" areas) are required through the zoning ordinance, and are assigned to adjoin significant aquatic or wetland areas, and may not be disturbed. The sizes of these areas are established on a site specific basis, but generally range from 50-100' in coastal residential and rural residential areas. In other, more densely settled areas, the term "buffer" is used to define areas designated to be used for the protection of adjoining and surrounding properties, and may be planted or landscaped. Such buffers range from 15-35 feet. In addition to these setbacks and buffers, 25-100' non-infringement area may be added where protection of significant natural resources is needed.

3. In Rhode Island, buffers in the coastal zone are established on a site specific basis for the values and sensitivities of the area. They must be maintained as undisturbed areas and in their natural condition. Buffer zone widths, when required, generally range from 25-100'. Additionally, "setbacks" are defined as the minimum distance from the inland boundary of a coastal feature that an approved activity or alteration may take place. They must be at least 50' from the inland boundary of the coastal feature, except in critical erosion areas, where size is determined by erosion potential.

Areas of Significance to Endangered, Threatened, or Species of Special Concern

A. The Pawcatuck River estuary and Little Narragansett Bay provide habitat for over 25 rare species, indicating a highly valuable and diverse habitat within the region that should be preserved.

(1) The Connecticut DEP's Natural Resources Center and Coastal Area Management (1985) have identified statewide significant wetlands from a biological-ecological standpoint. Significant wetlands in the project area identified are the Barn Island Wildlife Management Area and Continental Marshes and Little Narragansett Bay. Several areas which harbor rare plants and/or animals and merit particular protection have been identified by the Rhode Island Natural Heritage Program; they include Napatree Point, Sandy Point, and Horace Island (Figure 4-6).

(2) The Barn Island area and Continental Marshes are noted as having high quality habitat, including estuarine salt and brackish wetlands. They provide significant breeding areas for wildlife, and are areas of heavy wildlife concentration, as well as for a number of rare species (Table 4-4). The Barn Island area is also a significant research and scientific area.

(3) The Atlantic sturgeon (Acipenser o. oxyrhynchus), an occasional visitor to Little Narragansett Bay, is listed as a Species of Special Concern in Rhode Island, Massachusetts, Connecticut, New York and other states by the American Fisheries Society (Williams et al., 1989). Another visitor, the

Shortnose sturgeon (Acipenser brevirostrum) (Sisson, 1990) is listed as Threatened in Rhode Island, Connecticut, Massachusetts, New York, as well as by other states. These fish depend on large lakes and rivers for their survival. It should be noted that 67% of the various species of North American sturgeon are now listed as rare species. This indicates a severity of problems facing this family of fishes and others that depend on the integrity of large river systems (Williams et. al., 1989).

(4) The Pawcatuck River estuary is one of only three smelt runs known to exist in Connecticut (Visel, Pers. Com., 1989), and is one of only a few rivers in Rhode Island where a population is known to occur. Smelt are considered a rare species in Rhode Island. In the Pawcatuck River estuary, the best spawning grounds are limited to a small area around the Route 1 bridge and south about one quarter mile (Sisson, 1990).

(5) Wequetequock Cove, northwest of the railroad tracks, as well as Elihu Island, and the Barn Island Marsh, have been noted as a nesting grounds for the osprey (Pandion haliaetus) as recently as 1988.

(6) Elihu Island is privately owned, bordered on the north by the railroad, on the east by Wequetequock Cove and on the south and west by Long Island Sound. Great Blue herons (Ardea herodias), Double crested cormorants (Phalacrocorax auritus), Snowy egrets (Egretta thula) all Rhode Island Species of Special Interest, as well as Common terns (Sterna hirundo) Rhode Island Species of Concern, have been observed there.

(7) Napatree Point has been listed by the RI Natural Heritage Foundation and the Audubon Society as a unique natural area (Swimmer, 1984). As a coastal barrier habitat, this one mile long, extensive sand spit and dune formation is one of the most important migratory bird stopover points on the east coast. It is also an important year round habitat for a variety of bird species; over 125 species of birds are known to use the area. The area is also a known nesting site for the Federally Threatened Roseate tern (Sterna dougallii), American Oystercatcher (Haematopus palliatus), a Species of State Interest, Least tern (Sterna antillarum), Piping plover (Charadrius melodus), and Osprey (Pandion haliaetus), all Species of Special Interest. In addition, the Tall Wormwood (Artemesia campestris), a plant listed as a Species of Concern, occurs here.

Napatree Beach is managed as a conservation area by the Watch Hill Fire District although significant recreational use is allowed (IEP, 1989).

(8) Sandy Point has historically been noted as harboring the Seabeach Sandwort (Honkenya peploides) a Species of Special Concern, last observed around 1900, and Beach Heather (Hudsonia tomentusa) a Connecticut Species of Special Concern, noted in 1978. It was known as a historic nesting site for the Piping Plover (Charadrius melodus) and the Least Tern (Sterna antillarum), both Species of Special Interest in Connecticut and Rhode Island, during the late 1970s and early 1980s. Recently, Least terns and Piping plovers have had poor success nesting on the point. Large gull colonies and frequent visits by boaters have disrupted nesting attempts. Habitat degradation, in the form of increased vegetative growth and cover, has also discouraged nesting by Least terns. Other birds which have been observed include the Oystercatcher (Haematopus palliatus) a Species of Special Interest.

(9) Horace Island is the site of a historic Roseate Tern (Sterna dougallii) colony, and the Common Tern (Sterna hirundo) may nest here currently. These species are listed as Federally Threatened and Species of State Interest, respectively.

420. MANAGEMENT REGULATIONS AND INITIATIVES

The following regulations and initiatives are based on Section 410, Findings of Fact, and the primary objective of protecting and restoring the wildlife habitat of the Pawcatuck River estuary and Little Narragansett Bay.

Protection of Critical Habitat Areas

B. *Resources of Regional Importance and Need for Protection*

- *The Pawcatuck River estuary, Little Narragansett Bay and their watersheds support critical habitat areas of local and regional significance. The subtidal, shoreline and adjacent upland areas constitute a valuable, fragile part of the estuarine system, where growing human uses may create significant impacts on fish and wildlife habitats. The capacity of these areas to withstand pressures associated with current and future growth within the region is limited, and additional steps are warranted in order to preserve and enhance the diversity, abundance and quality of fish and wildlife habitats, and to restore such habitats damaged or impaired by past or present use.*

- *Management Policies and Recommendations*

- ~~*The states and towns recognize and designate the following areas as critical habitat resources, and should develop necessary measures to prevent direct and indirect alterations to such areas, contiguous areas necessary to protect their ecological integrity, and associated non-estuarine stream corridors and hydrologic complexes, where appropriate:*~~

- ~~*Plant, fish, and wildlife habitats of local or regional significance, including eelgrass beds and other submerged aquatic vegetation, shallow water areas, coves and inlets, tributary streams and stream corridors, tidal, brackish and freshwater marshes and wetlands and associated contiguous areas;*~~

- ~~*Areas where colonial waterbirds congregate during the nesting season. Such nesting sites are found in relatively few areas. Nesting habitats of waterbirds should be protected from physical alteration and from disturbance during the spring nesting season.*~~

- ~~*Historic or present staging and concentration areas for waterfowl, migratory and shorebird species. In some areas of historic concentration, these species may not be present because of habitat losses or other human impacts. Restoration of these sites is important; these areas should not be usurped by other uses. Historic habitat sites where species have been known to inhabit recently (within the last ten years) should also be protected, and investigated to determine why these areas are no longer being used and whether or not they can be rehabilitated.*~~

- ~~*Sites where endangered, threatened, or species of special concern are known to nest, spawn, rest, reproduce, feed or rear their young.*~~

- ~~*Specific sites with the Pawcatuck River estuary and Little Narragansett Bay to be considered Critical Areas include:*~~

- ~~*All large wetland complexes*~~
- ~~*The smelt habitat below Route 1 Bridge*~~
- ~~*Napatree Point*~~

- Barn Island Wildlife Management Area
- Pawcatuck River Wildlife Area
- Colonel Willie Cove
- Horace Island
- Sandy Point

Acquisition and Protection of Wetland Complexes

- Increasing the Effectiveness of Current Regulatory Programs

- The states and local governments should supplement the present regulatory protection of wetlands through acquisition of lands or conservation easements on areas which protect the biological and hydrological integrity of wetland complexes, and enhance the management of wetland systems. Efforts should be focused on areas which are crucial to the viability of wetland and aquatic habitats, but are beyond reach of existing regulatory programs, including the following:

- Wetlands and adjacent open areas located in intensively developed surroundings;

- Areas which buffer and protect the biological and hydrological integrity of protected wetlands, but because of the location or size, are excluded from regulation;

- Small upland areas interspersed within larger wetland areas, where development of such uplands could adversely impact the wetland value;

- Upland habitat corridors linking wetland areas which are essential for maintaining contiguity of habitats;

- Upland areas hydrologically linked through groundwater flow and surface water runoff to wetland areas and which are essential to maintaining the wetland water regime.

- Potential Protected Sites

All numbers refer to site identification numbers in Figure 4-4.

- Wetlands and adjacent open areas located in intensively developed surroundings:

~~*a. Upland located east of wetland Site #1, Viking Marina.*~~

~~• *Buffer areas which are vital to the protection of wetlands, but are excluded from regulation:*~~

~~*a. Increased upland buffers around all wetland sites within the planning area.*~~

~~• *Small upland areas interspersed within larger wetland areas:*~~

~~**200.** *Upland island at Site #1, Viking Marina.*~~

~~**201.** *Upland habitat adjacent to Site #2, Pawcatuck River Wildlife Area.*~~

~~**202.** *Upland areas at Site #7, Colonel Willie Cove.*~~

~~**203.** *Upland island at Site #8, Potter Cove.*~~

~~• *Upland Areas linking wetland areas:*~~

~~1. *Habitat corridor linking Site #2, Pawcatuck River Wildlife Area, and Site #4, Inland Wetland complex.*~~

~~2. *Habitat corridor linking Site #6, just south of Greenhaven Marina, with Site A, Continental Marshes.*~~

~~• *Upland areas hydrologically linked to wetlands:*~~

~~1. *Upland east of wetland Site #1, Viking Marina.*~~

~~2. *Upland east of wetland Site #7, Colonel Willie Cove.*~~

~~3. *Upland east of wetland Site #8, Potters Cove.*~~

~~• *Tributary Stream Corridors*~~

~~• *Several tributary stream corridors in the estuarine watershed are located in areas of intensive development. These critical habitats and wetland systems will be subject to greater impacts from stormwater runoff and other urban impacts, such as encroaching development than wetlands in more rural areas. The states and town should direct more intensive efforts towards protection of these areas including adjusting land use practices to reflect the sensitive nature of the areas, establishing more*~~

~~*restrictive reviews on the state level, and focusing acquisition priorities towards these areas.*~~

~~1.~~ ~~*Mastuxet Brook is the only major tributary emptying into the estuary from the eastern shore. The brook is surrounded by residential development and by the Westerly Airport. A farm located west of the airport and alongside the brook is believed to harbor the Grasshopper Sparrow (Ammodramus savannarum, sited in 1984) a species of Threatened status in the state of Rhode Island.*~~

~~2.~~ ~~*Several small unnamed streams which empty into the estuary in the urbanized areas of Pawcatuck and Westerly.*~~

~~•~~ ~~*Areas adjacent to wetlands of high, outstanding or unique habitat value may require additional protections in order to ensure the qualities of the adjacent wetland, including:*~~

~~410~~ ~~*Uplands and streambelts of wetland Site A, the watershed of the Barn Island Management Area;*~~

~~411~~ ~~*Uplands and streambelts of wetland Site B, Wequetequock Cove;*~~

~~412~~ ~~*Uplands and streambelts of wetland Site E, the Landing Field.*~~

~~•~~ ~~*The RICRMC and CTDEP should provide technical assistance to private landowners in the areas identified above to promote the development of wildlife protection and restoration activities.*~~

~~•~~ ~~*Information on sites consistent with the policies of Section 420.2.A should be developed in more detailed format, including plat and lot numbers, and property ownership. This information should be utilized by the town Conservation Commissions and land trusts to prioritize protection efforts.*~~

~~•~~ ~~*The local land trusts, Conservation Commissions and other private conservation groups should consider developing a land owner registration program. The establishment of a registry program would provide explicit and public recognition of the efforts of landowners who have protected and wisely managed the natural areas in their ownership. The recognition is formalized in a non-binding agreement in which the landowner agrees to continue to practice good private stewardship. The registry is, in*~~

~~*essence, a conservation agreement that does not require the landover to donate, sell or otherwise take legal action to protect his or her land. The agreements place few burdens on the landowner beyond the actions already being undertaken. Perhaps the most significant feature of the program is that the landowner agrees to notify the registering agent of any intention to alter the site or to sell. This provides the opportunity to consider and negotiate any further conservation action. The landowner is also asked to notify the registry agent of any threat from, or occurrence of pollution on or near the site. Through these actions the registry achieves a method of direct protection, provides a framework for enacting other protective measures, and acts as an educational effort.*~~

~~*Restoring Impaired Wildlife Habitat*~~

~~1. *Wildlife Habitat Restoration Program*~~

~~• *Definition. Wildlife habitat restoration means to revitalize or re-establish functional habitat characteristics and processes which have been diminished or lost, directly or indirectly, as a result of past alterations, activities, or catastrophic events. Areas suitable for habitat restoration may include different parts of the estuarine ecosystem, including, but not limited to: fresh and brackish hydrologic systems feeding into the estuary, the saline and fresh waters of the estuary, subtidal and intertidal lands, and tidal and freshwater marshes and associated contiguous upland areas. Restoration should involve the use of specific remedial actions, as defined by this section, to achieve improvements in habitat quality and value.*~~

~~• *Management Policies and Regulations*~~

~~• *The state and local governments should promote and require the restoration of wildlife habitats within the Pawcatuck River estuary and Little Narragansett Bay in order to offset the loss of natural habitats and species which have decreased in abundance, to restore and reestablish habitat functions and values which have been lost or degraded, and to address pressures on natural habitats and species which presently exist and future losses and impacts which are anticipated.*~~

~~• *The state and local governments should utilize existing regulatory and development control procedures to support and promote the following wildlife habitat restoration goals within the estuary:*~~

~~• *The creation, maintenance or restoration of habitat corridors and linkages between wetland areas, conservation areas and other areas of importance to wildlife;*~~

~~• *The re-establishment of anadromous fish spawning*~~

~~*habitat and migration pathways;*~~

~~• *Restoration of tidal flushing to wetland areas;*~~

~~• *Improvement in water quality;*~~

~~• *Restoration and enhancement of upland buffer zones;*~~

~~• *Restoration, creation and expansion of habitats on Sandy Point and Napatree Point;*~~

~~• *Restoration of intertidal habitat;*~~

~~• *Appropriate management of recreational access to sensitive habitat areas;*~~

~~• *Restoration of shellfish beds through active management.*~~

~~• *The state and local governments should establish consistent minimum standards for wildlife habitat restoration to achieve the goals as set forth in Section 420.3.A. above. At a minimum, all developments subject to the Coastal Site Plan Review (CSPR) review of the Town of Stonington and the jurisdiction of the RICRMC should be subject to these requirements.*~~

~~• *The state and local governments should evaluate ongoing acquisition and development programs for opportunities to further the goals of this section.*~~

~~2~~. ~~*Development of Wildlife Habitat Restoration Plans*~~

~~• *Under the programs recommended above, it should be the*~~

~~*responsibility of the applicant to submit a Habitat Restoration Plan which conforms to the requirements of this section. Such a plan should contain sufficient information to evaluate the environmental characteristics of the site, the need and potential for habitat restoration, and predicted effects of such actions. The plan should contain maps, tables, photos, narrative descriptions and explanations, and citations supporting such evaluations as necessary to communicate the information required. The following information should be included:*~~

- ~~*Statement of existing conditions. The existing environmental and hydrologic conditions of the site and of the receiving and-or adjacent waters and wetlands should be described in detail. This should include consideration of the elevation, slope, tidal influence, salinity and freshwater input of the site, soils, topography and vegetation types.*~~

- ~~*Assessment of Potential for Habitat Restoration Actions. An environmental assessment as to the potential and need for habitat restoration actions in association with the activity should be completed. Such an assessment should identify and evaluate the conditions and nature of degraded habitat sites and the cause of their condition, the cost of the restoration project, and its short and long term impacts on habitat quality. The assessment should also address the incorporation of minimum site Best Management Practices as outlined below. The reviewing agency may waive the requirements for habitat restoration actions beyond the minimum site Best Management Practices should it conclude that there do not exist appropriate opportunities for such actions presented by the application.*~~

- ~~*State of the Proposed Action. The proposed habitat restoration project should be described in detail, including the objective of the activity, anticipated changes in topography, vegetation and hydrology, and anticipated improvements in wildlife habitat quality.*~~

- ~~*Information developed for other requirements under state and local programs may be utilized to meet these requirements, where appropriate.*~~

~~3~~. ~~*Design and Performance Standards*~~

~~• *Wildlife Habitat Restoration Plans submitted should demonstrate that the proposed development or activity has been planned and designed and will be constructed and maintained in conformance with the following standards, as appropriate:*~~

~~• *Minimum site Best Management Practices (BMPs) have been incorporated into the site design and construction planning. These BMPs include:*~~

~~1.~~ ~~*Use and-or improvement of erosion and sedimentation controls in accordance with the standards of the most recent version of Rhode Island and Connecticut Soil and Erosion Control Handbooks;*~~

~~2.~~ ~~*Use and-or improvement of stormwater management and treatment, including techniques and approaches to site design which minimizes the creation of stormwater, foster retention and treatment and enhancement of site filtering abilities;*~~

~~3.~~ ~~*Restoration and enhancement of undisturbed buffers between development activities and sensitive habitat areas. Restoration is primarily the enhancement of wildlife habitat, pollutant removal and erosion control characteristics of the buffer area through the planting of native species.*~~

~~• *The project has been designed to take advantage of the natural configuration of the site, and has minimized boundaries of altered areas with adjacent development or activities that may disturb wildlife or interfere with habitat functions;*~~

~~• *The project has been designed to restore as large an area as possible, create or restore a diversity of habitats, and to protect, enhance or restore self-sustaining habitats;*~~

~~• *The project has been designed to protect, create or restore habitat corridors and linkages between and among wetlands systems, existing habitats and conservation areas;*~~

~~• *The project has been designed to, where possible, aid in the reestablishment of anadromous fisheries habitat or migration pathways;*~~

~~• Opportunities for restoring tidal interchange and flushing to wetland areas have been integrated into the project design;~~

~~• Opportunities for replacement of bulkheads with rip-rap and sloping walls, or non-structural shoreline protection have been evaluated, and incorporated into the project design where possible;~~

~~4. Restoration Sites~~

~~• The following sites have been identified as appropriate for restoration activities, to be implemented either through ongoing regulatory process or through direct government projects, as appropriate. These sites are identified in addition to restoration activities undertaken in association with development proposals:~~

~~• Restoration Site 1 Mastuxet Brook and Watershed. Restricted outflow via culverting under the road could be improved to allow greater tidal influence. In addition, stream corridor protection measures should be implemented, including establishing or increasing buffer areas and protecting headwaters and the contributing watershed.~~

~~• Restoration Site 2 Sandy Point. Anticipated dredging activity within the federal channel in Little Narragansett Bay will result in dredge material disposal on Sandy Point. Beach and intertidal habitat could be expanded with appropriate grading, plantings and stabilization. As dredging of the federal channel and disposal of some materials on Sandy Point is likely to occur in the near future, a complete, detailed restoration methodology for this project should be developed.~~

~~• Restoration Site 3 Culverts crossing tributaries. Numerous roads within the Pawcatuck River estuary watershed cross small tributaries which flow into the estuary. Some of these have been examined and are know to be limiting tidal circulation upstream of the culverts, such as the culvert just north of Westerly Yacht Club, and several culverts with tributaries entering Wequetequock Cove. In addition, there are culverts beyond tidal influence which may be impeding freshwater flow.~~

~~• Restoration Site 4 Railroad Bridge crossing Wequetequock Cove. This bridge may be impeding tidal circulation. Studies should be performed under the Coves and Embayments Program or other appropriate programs to determine adverse impacts, and ways to restore circulation, if warranted. The ongoing studies at Quaimbaug Cove should be used as a model.~~

~~• Restoration Site 5 All commercial or industrial waterfront uses. All such areas should be the focus of instituting remedial Best Management Practices in order to improve water quality and on-site impaired habitats.~~

~~5. Ensuring Proper Implementation~~

~~• To ensure attainment of the objectives of the habitat restoration plan, plans submitted should demonstrate that the proposed activity has been properly designed and will be performed and monitored to ensure that improvement, and not further degradation, takes place. When restoration projects are not undertaken as proposed, this should be considered a violation. If it is determined that the project is occurring in a manner contrary to the conditions set out in the permit, action may be taken resulting in a revocation of the permit and-or payment for damages. Legal action should be considered appropriate when violations are willful, repeated, flagrant or of substantial environmental impact.~~

~~6. Monitoring Habitat Restoration Projects.~~

~~• Two levels of monitoring should be considered in the evaluation of habitat restoration projects.~~

~~• Compliance success is an assessment of how well the permit conditions were complied with.~~

~~• Functional success is an assessment of how well the project successfully restored habitat values, and how well it met the overall objectives of the project. Such evaluations should examine, depending on project goals and objectives:~~

~~• Physical characteristics, such as surface area, slope, location, water depth, sources, flow and quality~~

(including turbidity, erosion, discharges to or within the site), and soil-substrate characteristics;

- *Plant species composition and dominance, and percent cover;*

- *Invertebrate colonization on and adjacent to the site, and wildlife utilization (established primarily through observation, sighting of individuals, nests, and tracks);*

- *Other observations regarding compliance with permit conditions and other factors affecting the successful functioning of the site.*

- *Assessments should be conducted as part of routine compliance checks after the first year of completion.*

Section 420.4 Land Use Management and Wildlife Habitat Protection

7. Land Use Management Controls for Habitat Protection

- *The future use and management of land within the estuarine watersheds will be a dominant factor in efforts to protect and restore wildlife habitat values. There exists a need within the estuarine watershed to formulate land use policies and management tools on the municipal level which will outline management methods to protect wildlife habitat and environmental quality. These tools and actions should be incorporated into the land use plans and development controls of the Towns of Westerly and Stonington, as appropriate; these should be undertaken individually by the towns of Stonington and Westerly, although a high degree of coordination should be sought, utilizing the same language and mechanisms where possible. These land use tools comple-ment the management initiatives established in other sections of this plan.*

- *The land use tools discussed below should be incorporated into a separate distinct section of the local ordinances. This will allow the municipalities to acknowledge the estuary and its distinctive shoreline environments as areas requiring special controls, while promoting uniform application of the recommended standards. In Stonington, this may be achieved through application to areas under the jurisdiction of the*

~~*Connecticut Coastal Management Act. In Westerly, as recommended in the draft Comprehensive Plan, a River (estuary) Corridor Overlay district should be established; to the extent practicable this should be uniform with the areas and activities under the jurisdiction of the RICRMC.*~~

~~• *Management Policies and Regulations*~~

~~• *The review, development and modification of land use plans and tools should be undertaken as part of the Comprehensive Planning, Plan of Development review and Facilities Planning processes for each town. The plans should address, at a minimum, the following items:*~~

~~• *The identification of areas located on fragile aquifer, watershed, streambelt, inland wetland, tidal wetland, ponds, estuary shoreline and significant adjoining areas and the assignment of a separate zoning classification to them, so as to preserve them for future and present needs. These areas should be recognized and designated as Significant Natural Areas within the zoning and other appropriate ordinances. Where applicable these areas should be identified using the definitions of existing regulatory programs such as the CSPR or RICRMC programs;*~~

~~• *The towns should assign low allowable densities to these areas, such as a minimum of 120,000 square feet or 130,000 square feet per unit;*~~

~~• *The towns should develop mechanisms and programs to accept permanent scenic or recreation easements for property within these zones;*~~

~~• *The identification of areas with general land conditions dictating lower capability for development, such as the unavailability of sewers, and where housing densities retain a rural character, and the assignment of a separate zoning classification to them, so as to preserve this rural character and wildlife habitats located there.*~~

~~• *The towns should develop mechanisms and programs to accept permanent scenic or recreation*~~

~~*easements or fee simple for significant natural resources, open space, or lands for municipal use within these areas, and permit the allowed density to be utilized in clustered designs on lands deemed suitable after review.*~~

~~• *Special plan provisions, such as extra non-infringement areas, may be required to protect wildlife habitat and other natural resources;*~~

~~• *The establishment of buffer requirements and non-infringement areas around wetlands, streams, stream corridors, ponds, tidal marsh, estuary shoreline, and other significant natural resources. Such non-infringement areas should separate these areas from all uses by a minimum 50-100 foot zone. Non-infringement areas should utilize both buffers of undisturbed vegetation and structural and activity setbacks, as appropriate, given the condition and resources of the site. Such areas should be established for all zones and within the subdivision regulations of each town.*~~

~~• *These requirements should apply to all zones located within the estuary watershed; exceptions may be made for water dependent uses such as boating and yacht facilities, however, these activities may be required to maintain non-infringement areas as appropriate.*~~

~~• *The designation of buffer requirements and non-infringement areas during the consideration of individual development pro-posals should be coordinated with appropriate state regulatory programs.*~~

~~8. *Special Use Permit Requirements and Wildlife Habitat Protection*~~

~~• *Special Use Permits are a class of uses requiring more intensive review in order to ensure that, for the purposes of wildlife habitat protection, the preservation of the significant natural features of the towns will occur. The towns should identify as Special Uses within their zoning regulations activities and other allowable uses which may result in a significant adverse impact due to size, location, timing or other unique features.*~~

- ~~*Management Policies and Regulations*~~

- ~~*The Town of Westerly should incorporate the Special Use Permit requirements from the Town of Stonington Zoning Ordinance into its revised zoning ordinance. The section should require, at a minimum:*~~

- ~~*Statements of environmental impact;*~~

- ~~*Reports on water supply and sanitary water facilities, site drainage, erosion control, and traffic circulation;*~~

- ~~*Special drainage evaluations by professional engineers as may be required;*~~

- ~~*Flood hazard reports or base flood information;*~~

- ~~*Provisions for the preservation of significant environmental features, including, but not limited to, use restrictions on significant natural resources.*~~

- ~~*The section should provide the Zoning Board of Review with the ability to approve, modify or deny the Special Use request, and exercise the following minimum abilities:*~~

- ~~*Set extra buffer requirements ranging from 50-100 feet for fragile environmental features, in coordination with RICRMC or RIDEM requirements;*~~

- ~~*Require consideration of alternatives and mitigating measures;*~~

- ~~*Require special site plan design features necessary to minimize adverse impacts on the environment;*~~

- ~~*Change the time of operation or intensity of use of a site;*~~

- ~~*Follow requirements established by RICRMC or RIDEM reviews.*~~

- ~~*The section should encourage the review and comments of the Conservation Commission in all Special Use requests.*~~

420.5 Dredging Management

420. Dredge Windows, Operations Scheduling and Interstate Notification

.1 Ongoing dredging operations necessary to maintain channels and marina facilities potentially conflict with the estuary's role as a spawning, residence and migratory fisheries area. Restrictions on timing, number and conduct of dredging operations are necessary to prevent impacts to fisheries resources. Additionally, the interstate coordination of dredging operations should be strengthened.

.2 Management Policies and Regulations

- All dredging operations within the Pawcatuck River estuary and Little Narragansett Bay, within the limits defined in Figure 4-6, should be restricted and conducted solely during the following periods in order to avoid impacts to fisheries resources within the estuary:

- Within Little Narragansett Bay, between September 1 and January 30;

- Within the Pawcatuck River estuary, between November 1 and January 15.

- All dredging operations must be completed during this period; operations which cannot be completed during this period must be conducted during sequential seasons. However, approved projects may extended for a period of up to two weeks upon approval by both the OLISP and RICRMC.

- All applications for dredging operations shall be submitted in a timely fashion such that all necessary approvals are "in-hand" by June 1 prior to the first season in which the applicant wishes to dredge. The RICRMC and OLISP shall meet and decide upon an allowable number of dredging operations which may be conducted that season, with advice and comment from the state fish and wildlife and water quality divisions of the Rhode Island Department of Environmental Management and Connecticut Department of Environmental Protection.

- The RICRMC and OLISP should exchange notices and final copies of all permits issued for dredging operations within the Pawcatuck River estuary and Little Narragansett Bay, and integrate the above policies and restrictions within all maintenance or general permits issued within the estuary.

- The RICRMC and CTDEP should formalize these policies in a joint letter of agreement. (Appendix B)

Section 420.6 Future Research Needs

~~• Building a Foundation for Ecosystem Protection~~

~~• A major commitment to the conservation of entire ecosystems, rather than restoration efforts for individual species, is needed to protect the health of aquatic, wetland and upland wildlife habitats in the Pawcatuck River estuary and Little Narragansett Bay. Protection of entire communities requires long term commitments to habitat management, and results in more permanent protection than isolated recovery efforts. Protection of entire ecosystems also promotes intraspecies preservation and land conservation, both important components of bio-diversity.~~

~~• As part of the continued implementation of an estuary-wide protection approach, long term monitoring programs are needed to preserve the diverse native wildlife resources of the estuary. Such programs should be designed to provide baseline status information for accurate assessment of changes in fish and wildlife populations and habitats. This would provide sound information upon which to evaluate recovery efforts for individual species, and assesses the effectiveness of protection policies.~~

~~• While inventories and assessments of the living resources of the estuary may serve as valuable indicators of the health of the estuary's ecosystems, they also demonstrate the extent of actual restoration and protection work needed. By focusing efforts on the entire Pawcatuck River estuary and Little Narragansett Bay ecosystem, not only will individual species be preserved, but so too will the whole communities and processes in which they evolved.~~

~~• Monitoring~~

~~• The Wood-Pawcatuck Watershed Association's River Captain and Watershed Watch Citizen's Volunteer Monitoring programs are presently underway in the watershed of the estuary; the Pawcatuck River Harbor Management Commission has promotedthe establishment of, and funded, the Watchdogs, a continuing by-state water quality monitoring program. These programs monitor water quality parameters in the freshwater and estuary portions of the Pawcatuck River, as well as conducting shoreline surveys determining vegetation, wildlife, land use, and potential problems. These programs have been very helpful, as they can enhance monitoring activities undertaken by state and research agencies, increase public enthusiasm and understanding of the ecosystem, and build local support for necessary corrective actions.~~

~~• Management Policies and Regulations~~

~~• Current citizen monitoring programs should be expanded as an effective compliment to state agency programs. An Estuary Monitoring~~

~~*Coordinator should be appointed to help achieve consistency and coordination between the various groups; RIDEM's Statewide Volunteer Monitoring Coordinator should work with the groups as necessary to achieve this. The town Conservation Commissions should be involved in assisting in the development and implementation of monitoring programs; these boards can provide an invaluable link between municipal government and the citizens monitoring program.*~~

~~• *The Bi-state Pawcatuck River Commission should coordinate joint monitoring programs between interested citizens in Westerly and Stonington.*~~

~~• *In addition to present monitoring programs, additional research needs listed below are recommended:*~~

~~• *Wetlands: Marsh plant and animal inventories; qualitative assessments and descriptions of physical changes in wetlands related to impacts of point and non-point discharges; monitoring the effectiveness of habitat restoration projects.*~~

~~• *Aquatic: The aquatic habitat of the estuary has never been comprehensively inventoried and the location of habitats for various species should be identified, especially submerged aquatic vegetation.*~~

~~• *Upland: At present, no upland habitat inventory has been undertaken and plant and animal inventories are needed.*~~

~~• *The recommended aquatic habitat inventory should be undertaken as a joint project between the RIDEM, RICRMC and CTDEP; Connecticut Department of Agriculture and the Stonington Shellfish Commission.*~~

510. FINDINGS OF FACT

Introduction

1. The Pawcatuck River estuary and Little Narragansett Bay are recreational resources of regional importance. The beaches of Napatree Point and Sandy Point, the open waters of the bay and the recreational boating facilities of the estuary all play an increasing role in the quality of life within the area, building upon an extensive historical relationship between the people of Stonington and Westerly and the estuary.

2. The number of users within the estuary has significantly increased, reflecting the growth and changes in the populations of the towns, and the accessibility and desirability of coastal recreation. The estuary is within an average two hour sailing distance from large population centers of eastern Long Island Sound and is a popular stop over of cruising vessels. The numbers of boats within the estuary itself have grown by approximately 70% over the last ten years, providing access to the waters for approximately 59,000 individuals in a single season. The waters off Napatree Point are crowded with local and transient boaters throughout much of the summer, as is the barrier island of Sandy Point. Passes to use the beach at Sandy Point were issued to 353 families in 1989, in addition to individual and daily use passes. The anchorage at Watch Hill harbor has expanded to capacity in recent years, to the exclusion of many transient boats and necessitating the establishment of a waiting list for space. The boat launching ramp at Barn Island Wildlife Management Area is the fourth most popular in the entire state of Connecticut, and averages 200 launches per weekend day. Additionally, the improvements in water quality have renewed an interest in recreation centered within the Pawcatuck River estuary itself; expanding canoe use of the upper Pawcatuck system is spilling over into the estuary, bringing new, low-intensity users seeking access and open waters.

3. The growing amount of recreational use within the estuary has raised concerns among the public, municipal officials and state management agencies about the need for increasing levels of active management. The large numbers and diversity of recreational users within the estuary inevitably result in some incompatibility and conflict among them, and with the basic, shared objective of environmental protection.

The Estuary as a Regional Recreational Resource

1. There are 22 boating facilities located within the study area that provide permanent slip and mooring space for over 1,737 vessels. These facilities provide the boating public with access to the water for fishing and sailing and provide services such as transient dockage, boat launching, boat hauling and storage, charters-rentals, bait and tackle, water, electricity and other services. Moorings not associated with these boating facilities account for 188 additional berth spaces totaling approximately 1,925 berth spaces in the estuary.

2. The study area is a popular cruising stop for day trips and vacations, as boaters drop anchor at Napatree Beach and Sandy Point, or request transient berth space at the marina facilities.

3. Extensive and various activities are concentrated in Little Narragansett Bay throughout the summer season. The area is a popular spot for boating, recreational and commercial fishing, sailing, and swimming, sunbathing, and beachcombing (McNeil; Steadman; CT Shellfish Commission; Carpenter; 1989).

4. The study area is located generally north and west of Block Island Sound, and east of Fisher's Island Sound and Long Island Sound. Each supports many activities, including commercial and recreational fishing, and sailing.

5. Block Island is located approximately 20 miles southeast of the study area and is one of Rhode Island's most popular tourist and recreational boating ports. The Great Salt Pond of Block Island supports over 2000 boats on busy summer weekends (New Shoreham Draft HMP, 1990); vessels from NY, CT, RI, MA and beyond travel by water to spend their vacations here. The Great Salt Pond is home to over 500 boats from which it may be inferred that over 1500 vessels, or 75%, are transient. Marine industry persons interviewed for this study have expressed that many of the vessels home ported within the study area boundaries travel to Block Island for day and overnight trips (Richette; Steadman; 1989).

Low Intensity Recreational Uses

1. The Pawcatuck River estuary and Little Narragansett Bay support many diverse low intensity uses such as fishing, swimming, use of the barrier beaches, and small boat use. The popularity of these pastimes, and the numbers of people engaged in them have significantly increased over the last several years. Napatree Point, Sandy Point and the Barn Island Management Area are all significant regional centers for this type of recreation; the Pawcatuck River estuary is enjoying a renaissance of use.

2. These low intensity uses are increasingly often in competition and conflict with other, more intensive uses of the estuary, such as marina development, power boat use, and development associated pressures of increasing numbers of people.
The need for open water space, shoreline access and protection from interference from other uses are all issues surrounding the use of the estuary for low intensity activities.

3. The increase in the numbers of boats within the estuary, as well as the increased use of the area on a regional basis, have put growing numbers of various types of users into an ever more crowded waterbody. While several of the newer marina facilities have been located in areas which were once open waters, the trend towards redevelopment of older facilities has minimized the direct conflict between uses. However, the ultimate increase in the numbers of people using the waterways has lent to a definite change in its character, and of the quality of many activities, especially during the peak periods on weekends and

holidays. Additionally, the use patterns on the estuary result in highly concentrated centers of activity in the areas on and around Napatree Point-Watch Hill, Sandy Point and the Pawcatuck River estuary proper; areas which have been identified as environmentally sensitive.

4. General public access to the estuary is limited by the small amount of public lands within the planning area. Most direct access comes through the commercial marinas and the Barn Island boat ramp. Much of the upper portion of the river, within easy reach of the urban sections of Pawcatuck and Westerly, is hidden behind commercial uses lining the riverbanks, areas generally ill-suited for public use even if accessible. Watch Hill, with the open expanse of Napatree Point, is of restricted accessibility due to a lack of parking.

5. The improvements in water quality within the estuary have encouraged increased low intensity uses further up the Pawcatuck River estuary. Fishing in the river is a common activity, capitalizing on the return and improvements of the estuary's fisheries. Fishing is approached from a variety of spots within the estuary: by small boat, in the surf, and from banks, bridges and piers. Access for fishermen, usually in small trailered boats, makes an important contribution to the local economy.

6. Recreational shellfishing is an activity, which although restricted within the estuary due to continuing bacterial pollution problems, enjoys strong local interest and support. The Stonington Shellfish Commission has undertaken extensive efforts to secure the certification of the waters of Little Narragansett Bay as open for recreational harvest, unfortunately without success.

7. Small boat use within the Pawcatuck River estuary is increasing in popularity. The broad, open stretches of river provide protected areas for small sailboats, sail training and canoeing in increasing numbers.

Marina Development and In-Water Structures

1. Facility Siting and Growth Management

• In 1989 there were a total of 1925 berths (either slips or moorings) within the study area. Most of these (1837) are associated with the 22 marina facilities within the estuary region (Figure 5-1)(Table 5-1).

• The Pawcatuck River estuary is one of the most significant centers for recreational boating in Rhode Island, as well as regionally. The highest percentage of boats at marina facilities in the estuary (1443) was found on the Pawcatuck River itself. Between 1979 and 1989 approximately 654 new spaces were added to the planning area, including the construction of 4 new marinas (Figure 5-2) (Tables 5-2 & 5-3). Much of this construction and increase involved expansion and enlargement of older facilities to accommodate newer and larger vessels. The commercial marinas within

~~the estuary serve as a major point of access to the open water of Little Narragansett Bay and beyond, as well constituting as a significant local industry.~~

~~• The Pawcatuck River estuary contains 17 of the 22 marinas found within the study area which support 1493 boats. The increase in the numbers of boats within the area, and particularly the Pawcatuck River estuary, has been relatively rapid. Interviews with local harbormasters indicate that the increased numbers of boats pose some concerns about boating safety, especially during peak use periods such as weekends and holidays. The estuary's use primarily as an origination port gives it some unique characteristics, which are influenced by the distribution of vessels by number, size and type throughout the estuary.~~

- The majority of the boating traffic is involved in getting in and out of the river as quickly as possible, travelling between the marinas and Little Narragansett Bay. The character of the traffic pattern is influenced by two major factors: the distribution of approximately 27% of the total number of slips within the northern section of the river and the physical configuration of the river (Table 5-4). The concentration of large power boats as well as the greatest number of boats up river creates a traffic pattern in which the greatest amount of travel time is required by the largest number of boats.

- The shallowness of the river outside the channel confines the majority of larger vessels to the federal channel. Therefore, potential conflicts and safety problems tend to be centered around the channel area itself, and in areas where structures are close to the channel. As the numbers of boats within the river has increased, greater amounts of traffic must utilize the existing, restricted channel and those areas adjacent to it with sufficient water depth to support navigation.

- Marina operators have reported that at peak use periods (weekends and holidays), on average, 50% of the boats berthed within the estuary are in use, a traffic load which has increased with the expansion of facilities.

- The lack of speed zones outside of marina areas, the common convergence points of the Pawcatuck River estuary and Sandy Point, the narrow channel within the river and overall restricted navigation conditions within the study area contribute to potential boating safety problems created by the numbers of boats.

- The marina development patterns within the estuary are determined by a combination of physical limitations, historical land use, and local and state management programs. The Pawcatuck River's hydrography has tended to focus marina development into historical use areas and expansion of existing facilities, primarily due to extensive dredging requirements necessary to attain basins of adequate depth and consequent operational and regulatory costs. These areas also generally reflect established land use patterns of higher intensity industrial and marina areas interspersed with low density residential areas. Both these factors have been reinforced by municipal zoning designations, and the policies and requirements of the state coastal management programs.

• The municipal and state regulatory and management programs have directed the majority of marina development within the planning area into the Pawcatuck River estuary, building upon the already established patterns of land use and existence of older marina facilities. The Rhode Island Coastal Resources Management Program (CRMP) identifies marina development in the Pawcatuck River estuary as a primary goal for the northern region off Margin Street; policies governing marina use in Avondale establish the maintenance and limited expansion of existing facilities as allowable; and Watch Hill Harbor is identified as a "Commercial and Recreational Harbor." The zoning ordinances for the Town of Stonington and the Municipal Coastal Management Program have established Marine Commercial zones solely within the Pawcatuck River, while making existing marina facilities within Wequetequock Cove non-conforming uses, and thereby making potential expansion more difficult. The Connecticut Coastal Management Act has explicit and aggressive non-preemption policies requiring the maintenance and protection of water dependent facilities, reinforcing the direction established by the zoning ordinance.

• Areas within the estuary which have been designated for commercial marina development under the Stonington zoning ordinance and the RICRMP are, generally, currently occupied and utilized. Future in-water marina growth will be dependent upon the maintenance of the existing management designations, focused within these areas, relatively limited in scope, and dependent primarily on seaward expansion, reconfiguration and significant improvements in efficiency of use of space. The most significant exceptions to this include the site where the Riverbend Marina is currently located, which has been approved for a substantial increase in slips (from 22 to 106), which has not been undertaken yet, and Watch Hill Cove. However, the Stonington Zoning Ordinance allows the development of boating facilities (up to 10 boats) and yachting facilities (no limitation on boat numbers) within any zoning district along the estuary.

• The river's physical configuration and controlling depths, and that of Wequetequock Cove, dictate that new site development for marinas or substantial expansions outside of existing areas can only be accomplished with significant dredging. Such operations raise important ramifications for the role of the estuary as a valuable habitat for numerous fish species and other marine and estuarine organisms. Widespread dredging of currently unaltered areas may have a deleterious cumulative impact on the estuary's functions as a nursery, overwintering location and habitat. The areas most critical to these functions would be those most significantly altered by improvement dredging and other marina-related shoreline alterations, including shallow near-shore areas, coves and inlets and other subtidal habitat areas. Additionally, many currently undeveloped areas suitable for marina development are close to the site of isolated wetland systems. Past development practices have commonly sited marina operations adjacent to, or within, wetland areas within the estuary. The isolated and dispersed nature of the wetlands systems within the Pawcatuck River estuary increases the likelihood of not only increased site-specific impacts from expanded marina development, but of potential ecosystem-wide

impacts.

- Marina development within the study area has generally utilized areas of historic use, or revitalized older industrial sites. The general distribution of the marina concentrations follows that of other land uses; the marinas are concentrated in three "nodes" within the Pawcatuck River estuary, and in Wequetequock Cove and Watch Hill Cove. Residential areas are in close proximity to the marina development concentrations, often raising concerns among neighbors about overflow impacts associated with parking, maintenance operations and other impacts occurring when the capacities of upland support facilities are exceeded.

- Marina development within the study area takes place within the context of many other uses and environmental characteristics. The public has expressed concerns that the observed rapid increase, and potential future growth, of commercial marinas and recreational boating uses areas might overwhelm and alter the unique character of the Pawcatuck River estuary and Little Narragansett Bay. The environmental quality of the area is very much an expression of the mix of uses that it supports, balancing its roles as an important recreational harbor, wildlife habitat and place to live; there is widespread sentiment that growth management should focus on preserving these qualities.

- Potential growth in the numbers of boats within the study area was examined by estimating different potential expansion levels for each facility within the estuary (Table 5-5); these figures provide some indication of potential boat numbers. Additionally, other criteria which place boundaries on facility expansion were recorded through an operator-oriented survey, including

available parking spaces (Table 5-6) and the distribution of usable shoreline to shoreline in use at the facility (Table 5-7). And finally, the numbers of existing private residential docks were calculated, and an estimate made of potential sites which might support future structures (Table 5-8).

- With a 10 percent increase in total berths available at commercial marinas, either through slips or moorings, 173 additional spaces could be added to the estuary; with a 25 percent increase, 430 additional berthing spaces could be added. However, the parking standards imposed by the Town of Stonington and the State of Rhode Island on the marina operations have a significant limiting influence on expansion possibilities. Therefore, an estimated potential growth in the numbers of boats at commercial marinas within the estuary is not unconstrained; it can be assumed to be somewhere below the total estimates for each scenario, that is, between 121 and 283 additional vessels. The growth in vessels at moorings cannot be estimated due to the lack of a formal management program by either town, and the absence of designated mooring areas which might establish boundaries on utilized areas.

- In addition to the constraints imposed by parking requirements, many of the marinas within the estuary are currently utilizing significant portions of the available shoreline at their facilities. This indicates that most facilities do not currently have significant shoreline areas available to them for expansion; additionally, not all available shoreline is considered suitable due to resource constraints (wetlands) and other factors.

- The potential increase in the numbers of boats at residential docks was estimated based upon an inventory of total residential building lots within the estuary and total existing docks; it was generally assumed that each residential lot which did not currently contain a dock might in the future, as is allowed under the current regulations of each state. Using this methodology, the estimates indicate that 270 additional residential docks could be constructed within the estuary (Table 5-8). Since more than one boat is often berthed at each dock, this represents a potentially significant increase in the numbers of boats within the estuary.

- Comparison between the expansion potential of commercial marinas and residential docks indicates that both categories present the ability to add significant numbers of boats to the estuary; there is potential for a greater proportional contribution from residential docks than commercial marinas.

2. The Relationship of Structures to the Channel

- The Pawcatuck River estuary is extremely narrow in sections, and structures often extend into the river to a short distance from the channel. These areas, in and around the marinas, are also the site of a great amount of the boating activity, with vessels leaving and arriving from the facilities as well as transiting the area. Due to the presence of the federal channel, this same zone is an area within which dredging equipment would operate should maintenance dredging be undertaken.

- The issue of growth of recreational boating and facilities development is tied closely to the condition and navigability of the federal channel. The loss of water depth at the outer edges of the channel, coupled with the high use rates and numbers of boats on the estuary during peak periods, contribute to the creation of the observed congested traffic pattern. Important secondary impacts arising from this situation may include the necessity of limiting the numbers of boats utilizing the estuary (primarily the Pawcatuck River) to ensure safe boating, as well as to create a demand for expansion and dredging of the federal channel. Dredging decisions should entail consideration of the costs to the local sponsors, either the states or the municipalities, as well as operational concerns such as disposal options and environmental impacts.

- The United States Army Corps of Engineers (ACE) has established guidelines which call for a setback of structures and activities from federal improvement projects, such as the navigation channel, of three times the project's authorized depth. In addition, these guidelines call for structures not to extend more than 25 percent of the total width into a linear waterway. The majority of the marinas sited within the northern section of the Pawcatuck River estuary have structures which currently extend into this setback (Table 5-9). This is due primarily to the fact that these facilities were constructed prior to the adoption of the guideline. The former regulatory approach focused on insuring the protection of the designated channel area itself, and structures were commonly permitted up to its limits. While the new standard has created a number of

"nonconforming" structures within the estuary, it is a more appropriate standard given that the channel conditions and levels of boating activity in these areas may exceed the capacity for safe operation.

- Neither state management program currently utilizes an explicit setback standard from the channel in relation to commercial facilities, although performance standards pertaining to potential impacts to navigation are employed; the lack of established regulatory setbacks in relation to commercial structures and the channel has led to inconsistent application of the performance standards and determinations as to what constitutes interference with navigation.

- Regulation of the extension of private, residential structures is usually more explicitly outlined; it is the current policy of the State of Connecticut to promote the use of short residential docks, in conjunction with a mooring where possible, however no explicit standards are utilized. The State of Rhode Island has established a standard 50 foot length from Mean Low Water (MLW) for residential docks, or extension to 25% of the distance across the waterbody, which ever is less.

3. The Use of the Water Surface

- The concentrations of structures in discrete areas around the estuary acts to preempt use for most other activities in that immediate area. Several of the marina facilities have associated mooring fields, which extend the amount of water area occupied by the operation. The separation of these areas from each other along the length of the river, and in the coves off Little Narragansett Bay, creates an alternating pattern of open water areas in which other low intensity activities take place.

- The water type designations system utilized by the Rhode Island CRMP and the current zoning designations under the Stonington ordinance serve analogous purposes and act to institutionalize the current pattern of in-water development and open water spaces; the primary difference being that the Connecticut program is a consequence of the zoning designations, and is not explicitly established by the state-level structures regulatory program which exercises primary, direct control.

- There are approximately 62 residential docks currently identified in the study area. While the majority of these docks are found in the Pawcatuck River estuary, it is possible, due to the current structure of both state's regulatory programs, to locate a residential dock anywhere along the shoreline of the study area, subject to resource protection policies.

- Mooring placements have developed primarily due to available and traditional access. In fact, most of the moorings in the study area are associated with

commercial marina operations, either through direct control (at-marina moorings) or by marina servicing. However, mooring placements have begun to occur in areas outside of these traditional areas, displacing other, traditional low-intensity uses such as transient anchoring.

Alternative Access to the Estuary

1. Boat Launching Ramps

• Launching ramps for smaller, easily trailered boats are one of the most important types of access to the coastal waters of Connecticut and Rhode Island. Eighty-three percent of all registered boats are under 22 feet in length and considered to be easily trailered. Many of the boats utilizing the Pawcatuck River estuary and Little Narragansett Bay are of this type. Easily trailered boats have increasingly provided an economical alternative to the high costs of boating and marina fees.

• There is only one publicly-owned boat launching ramp located within the study area, the Barn Island Management Area boat ramp, and it is the fourth most popular boat ramp in the State of Connecticut. As it is the only public boat launching ramp in the study area, it receives heavy use.

• At the marina facilities in Stonington, there are at least five (5) boat ramps are available to the public for a use fee.

• There are no public boat launching ramps located in the marine waters of Westerly. At the marina facilities, six (6) boat ramps are available to the public for a use fee. One, at the Westerly Marina, is free to all Westerly residents as a lease agreement between the marina, which runs the operation on town land, and the town. All are located in the Pawcatuck River estuary.

• The only public boat launching ramp in the study area, Barn Island, is used on average substantially more than the 11 boat ramps found at marina facilities; 200 average uses/day versus 4 average uses/day (Table 5-10). A number of reasons might help explain why the launching ramps at the commercial marinas are not used as much as the Barn Island facility including launch fees, the condition of the ramps, availability of parking and the proximity of the ramps to Little Narragansett Bay. The condition of the Barn Island public boat ramp is better than most of the marina associated boat ramps. The Barn Island ramp is also double width, whereas all of the marina facility's ramps are single width, a safety attraction when launching boats.

• Although fees could not be determined to be a major factor in the public's launching boats at marina facilities, some marina operators felt that it may contribute to the overall lack of use (J. Watsky, 1990). Other comments as to why marina boat ramps are not used as extensively as the Barn Island facility range from the fact that

a boat owner would rather trailer his "investment" to a ramp where the conditions do not pose a threat to damage the boat (Medeiros, 1990), to parking availability (R. Hall, 1989), to travel time from the ramp to a destination (Hetu, 1990).

• Location of the boat ramps in the northern section of the river, poor condition and parking availability at two marinas, interference with and proximity of marina dock structures, and the potential for traffic accidents to occur at the Mechanic Street marinas all contribute as potential reasons why these boat ramps may not have been used at greater levels.

• The four (4) boat ramps at marinas in the Avondale-Greenhaven section of the Pawcatuck River estuary, including the two (2) from the central section, have reported use averages of five (5) per day. Given that the conditions of the ramps at these marina facilities range from bad (Lotteryville Marina) to good (Greenhaven Marina; Gray's Boatyard), and parking at all but one (Lotteryville) is adequate to handle roughly 8-10 cars-trailers, a reason for the increase in average daily use at these ramps may be due to the fact that they are located closer to Little Narragansett Bay.

• The two marina facilities, Coveside Marina and Watch Hill Boatyard, that are located closest to Little Narragansett Bay have reported average ramp use rates of eight (8) per day: the highest use rates of all the marina-based ramps in the study area. These boat ramps are also in good shape and are wider than most (Coveside Marina in Wequetequock Cove, has two boat ramps separated by a fixed pier). Each has adequate parking capabilities. Good ramp conditions, adequate parking capabilities, and proximity to Little Narragansett Bay all contribute to reasons as to why these boat ramps may be used more than other marina boat ramps.

• There appears to be a correlation between the condition of the boat ramps, parking capabilities, and proximity to Little Narragansett Bay to the level of boat ramp use at marina facilities. Additionally, as the distance from marinas to Little Narragansett Bay decreases, those marinas with boat ramps, with few exceptions, all tend to have increasingly better ramp conditions and parking provisions. Most boat owners who trailer their boats to the water seem to be attracted to the relative proximity to their destination, the condition of the ramps and the associated parking capabilities.

2. Use Characteristics of Boat Launching Ramps

• There is clearly a high demand for boat ramps within the Pawcatuck River estuary and Little Narragansett Bay, as well as in the region generally. The present level and condition of facilities does not seem to be adequate to meet that demand.

• The condition of the facilities at many the commercial marinas, parking constraints and their proximity to Little Narragansett Bay appears to limit the amount of use there, in comparison to the Barn Island ramp, and act to shift much of the use to the publicly owned facility. The site constraints within the northern section of the Pawcatuck River estuary appear to be greater than those found at marinas farther south, contributing to the higher levels of use observed at those facilities. Aside from the location issue, the constraints observed, such as poor ramp conditions, are ones which may be addressed in a relatively straight forward manner.

• There are no access sites within the Pawcatuck River estuary which are dedicated solely to light boat use, a growing activity within the area. This limits the interaction between the recreational use of the freshwater portion of the system and the estuary. However,

there are several sites which are informally used for removing smaller boats from the estuary.

- There are several opportunities to provide different levels of boat ramp use within the estuary through public ownership and development, although acquisition and development costs may be high.

- Decisions concerning the siting and construction of new boat ramps must be cognizant of a number of issues, including the location of such facilities within residential neighborhoods, significant natural resource constraints to site development and boating safety concerns. Of particular concern is the contribution of additional boat ramps to existing boating levels, and the impact on the quality of the recreational use of the estuary.

- Increased levels of access to the estuary for small boats can be provided through a mixed approach of improvements to existing commercial facilities and limited public facility improvements and development.

3. Moorings

- The use of moorings has become an increasingly popular alternative to renting slips at marinas in recent years, in response to growing slip costs and lack of available space. Coastal policies in both states have helped to promote the use of moorings as a less intrusive alternative to permanent structures, and indirectly through more stringent regulation of structures development. There are no formally regulated mooring fields in the Pawcatuck section of the Town of Stonington, nor in the Town of Westerly.

- Accounting for all commercial and private moorings, there are a total of approximately 294 moorings on the Pawcatuck River estuary.

- Neither the towns of Stonington nor Westerly have a formal mooring permitting system which registers each mooring, keeps a record of the moorings in the study area, or collects fees. In addition to little formal control over the placement of moorings, the lack of a formal program results in an absence of guidance as to suitable locations from an environmental perspective, no coordinated guidelines on allocation, access or location on the differing sides of the river, and misses the opportunity to recoup some of the costs of harbor management through fees.

- The lack of formally designated mooring areas also limits the ability to predict future mooring levels. This is especially important as the physical configuration of the estuary significantly limits the areas where moorings can be placed, raising concerns about insuring equitable access to limited space. Additionally, the future growth in moorings will contribute to overall levels of boating on the estuary.

- Access to moorings within the estuary is severely limited by the lack of public access. The result has been that the majority of moorings within the study area are associated with waterfront property owners, commercial marinas and the Watch Hill Yacht Club; all entities controlling access to suitable mooring areas.

- The numbers of seasonal moorings placed in Watch Hill Cove have grown considerably over the past few years; years ago there was room in the cove to

accommodate transient anchoring such as vessels entering the cove and dropping their anchors for only a day or two at a time, or even only hours. Today, there is no room to place additional moorings in the cove nor can transient anchoring occur here (J. Hall, 1990). These moorings have effectively eliminated any use of the cove by transient boaters. All transient boaters wishing to anchor in or near Watch Hill must anchor off of Napatree beach. Moorings would have to be removed to accommodate transient boats (J. Hall, 1990). Even more efficient mooring placements (i.e., bow and stern mooring systems for one boat so that the vessel does not swing on an arc at the mooring) would not alleviate this problem (Robinson, 1990).

• The moorings in Watch Hill Cove are located in a federal project area, in this case an anchorage area. Federal anchorage areas must, by definition, be accessible to all the citizens of the United States on an equal and equitable basis (U.S. ACE, 1990). This equal and equitable access issue is interpreted by the ACE to mean equal access for allocation of the moorings as well as equal and equitable access for parking to get to the moorings. The moorings in Watch Hill Cove are open to all on a first-come, first-served basis (J. Hall, 1990) yet all but approximately two (2) belong to members of the Watch Hill Yacht Club (Robinson, 1990). Moorings in the cove are usually "handed down" or "given over to the yacht club" (Robinson, 1990). Parking for these moorings is privately controlled and available to general public use by fee only. Public use and access to the anchorage area is also limited by the lack of public shorefront property.

• Outside of the moorings in Watch Hill Cove, the remaining moorings can be found in the Pawcatuck River estuary (there are no moorings in Little Narragansett Bay nor in Wequetequock Cove), and then, predominately, at several marina facilities.

• The current placement of these marina-associated moorings occurs in areas adjacent to either side of the federal channel. This pattern of mooring placement creates the potential for boating accidents. They also appear to be in conflict with Army Corps of Engineers' (ACE) policies for structures placed near the channel.

Boating Safety, Enforcement, and Harbormaster Coordination

A. Boating Safety

1. It is estimated that over 59,000 individuals accessed the estuary in 1989 through recreational boating facilities (Willis, 1991).

2. The Pawcatuck River estuary is the only area to have posted speed zone and no wake designations. There are three (3) regulated areas, generally located where there are concentrations of boats at slips and moorings.

3. Speed zones are not uniformly established between the two states. Rhode Island has designated speed zones in the study area, while Connecticut has not.

4. While accidents are not overly common, increased usage of the estuary has led to congestion on the waterways during high use periods.

B. Harbormaster Enforcement

1. The Westerly harbormaster, and any authorized assistant harbormaster, is primarily responsible for the location and safety of all moorings in the waters

off of the town, and is also responsible for enforcing boating safety and the patrolling of Little Narragansett Bay and the Pawcatuck River. The harbormaster also has the authority to enforce all state and federal laws.

2. The Town of Westerly does not currently conduct a mooring permit program, nor are there formally designated and managed mooring fields.

3. The harbormaster's duties includes the patrolling of an extremely large and widespread area, from the upper reaches of the Pawcatuck River estuary to the open ocean areas south of Napatree Point. He additionally patrols west along the state border near Sandy Point.

4. The Town of Stonington has two separate authorities for managing the waters of the town: the harbormaster and the police department. These authorities perform two very different tasks in the management of the estuary.

5. Harbormasters are appointed by the governor of the state and are under the direction of the Commissioner of the Department of Transportation. There is currently no state appointed harbormaster for the Pawcatuck River estuary.

6. The harbormaster's general duties are derived from Connecticut state law for the supervision of the waters of the town and the safe and efficient operation of those waters. The harbormaster must exercise his duties in a manner consistent with any state-approved harbor management plan adopted by the town. Currently, the town does not have a harbor management plan for the Pawcatuck River estuary, but has appointed a commission to develop one. Also, the Commissioner of Transportation may delegate his powers and duties to the harbormaster and Town Harbor Management Commission (HMC) as authorized by Connecticut General Statute Section 15-1.

7. Within the Stonington Police Department, a harbor patrol unit has been established to patrol the entire shoreline of the town. The authority of the police patrol is broad: law enforcement, safety, rescue, towing, monitoring shellfish harvesting, and nighttime lawenforcement.

8. Because of the expanse of the shoreline, patrols within the estuary usually occur on an average of once per day. Most of the patrol time is spent in Little Narragansett Bay, at and near Sandy Point, where speeding, high concentrations of boat traffic, and safety problems are present (Sylvia, 1990).

9. When not patrolling the Little Narragansett Bay area of the estuary, the police unit generally patrols the Pawcatuck River estuary only up to Buoy 19, although patrols can travel the full length of the river (Sylvia, 1990).

C. Coordination Between the Harbor Management Authorities

1. The necessary authorities and powers exist to provide a comprehensive

management structure for boating safety, mooring management and other responsibilities related to harbor management within the estuary. However, these management programs are lacking a policy context to guide implementation which is based upon a coordinated view of the estuary, lack several basic programs necessary for effective management, are informally coordinated, and are under-funded in light of increasing recreational use of the Pawcatuck River estuary and Little Narragansett Bay.

2. Although there is an informal, working relationship between the various authorities involved in harbor management and law enforcement in the estuary, the design and operations of these programs perpetuate the problems of the estuary's nature as an interstate boundary; the allocation of resources, patrols and administration takes places differently and independently on either side of the "line". While the rules and regulations employed by each are similar, and enforcement across the state line occurs in emergencies, there is not a common set of rules consistently applied throughout the estuary. This is despite the fact that the law, historic practice and the nature of the management problems would support such an approach. Much of this may be due to the fact that the enforcement programs, traditionally viewed as implementation devices, operate without a comprehensive policy direction which addresses the estuary as a whole.

3. The management of moorings and boating safety on the Pawcatuck River estuary has historically been of an informal nature, possibly due in part to its relative "quietness" compared to Stonington Harbor and Watch Hill. The lack of an active mooring permitting program, established siting guidelines, an administrative mechanism for permits, or even its own Connecticut harbor-master are quickly becoming insufficient approaches to managing the levels of boating on the river and estuary. While boating levels and numbers of moorings are not constantly at stressed levels or creating significant problems, the peak periods do place a burden on the enforcement authorities' existing resources. The patrolling patterns and schedules are not explicitly directed towards the areas or times of highest use on the estuary, instead they take place on an ad hoc basis. The lack of formal coordination between the towns fails to capitalize on improved efficiencies and sharing of enforcement resources that might be available. It is also unclear as to whether the current division of responsibilities between the harbormasters in Westerly, and the Police Department and Harbormaster in Stonington results in more effective use of manpower and resources; the situation is further complicated by the lack of a formally assigned harbormaster in Pawcatuck.

4. Both towns receive substantial revenues from boating taxes and mooring fees. These have not been returned to the enforcement programs in a proportional manner. The result has been part-time patrols and less of an enforcement presence in an area of extremely high boating use.

D. Municipal Funding for Harbormasters

1. Both the Westerly harbormaster and Stonington marine police patrol programs are funded through the general treasuries of each municipality. Additionally, both towns are reimbursed from their respective state general treasuries a percentage of monies that have been collected through each state's boating safety division as part of the boat registration system. These monies are based on the property tax levied against all boats registered in each town. Both towns refer to these monies as a boat tax.

2. Based upon state-returned monies to each town from boat taxes, the proportion of

~~money allocated to each harbormaster-police patrol is small; 3% and 13% in Westerly and Stonington, respectively (Table 5-11). The remaining monies returned to each town remains in its general treasury.~~

~~Harbor Management Commissions~~

~~A. Both Rhode Island and Connecticut have developed programs to promote coordination between municipal and state activities through local harbor management~~

plans. Harbor management planning is voluntary in Connecticut and mandatory in Rhode Island.

B. A Harbor Management Commission is the local body that is authorized to develop and administer rules and regulations that pertain to the management of certain uses of the town's waters, in the context of a comprehensive Harbor Management Plan. Harbor Management
Commissions implement these regulations through the development of an ordinance(s) which is then enforced by the town's HMC through interaction with other town boards, the state or local harbormaster, as well as implemented through state and federal regulatory programs. Harbor Management Plans often involve recommendations on other shoreline uses. The Harbor Management Commissions can potentially act as the leading municipal agency in developing policies dealing with a variety of harbor related issues, including moorings (standards, placements, assignments, removal), speed regulations, pollution discharges, uses which occur on the water, and removal of abandoned vessels or structures. Regulatory decisions of by the RICRMC and CTDEP must be consistent with state-approved, locally adopted HMPs.

C. Factors that a harbor management commission must consider
when developing a harbor management plan are recreational and commercial boating; recreational and commercial fish and shellfisheries; fish and shellfish resources; conservation of natural resources; areas subject to high velocity waves; exposed areas subject to flooding and erosion; water dependent uses; water quality; recreational uses other that boating; water dependent educational uses; public access to and along the shore; parking; and, the rights and privileges of all citizens to use and enjoy the natural resources of the harbor or waterbody with due regard for the preservation of it's values.

D. A harbor management commission must identify existing and potential
harbor problems, establish goals and make recommendations for the use, development and preservation of the harbor and its resources. The commission, and the subsequent harbor management plan, must establish an adequate management structure and identify officials responsible for the enforcement of the plan, and propose ordinances to implement the plan.

E. Additionally, the Harbor Management Commissions and their plans have often acted in a coordinating and integrating role, tying together issues and concerns affecting the upland and activities in the harbor area. In this way, the plans often act to focus municipal and state decisions towards consideration of the interrelationship of the harbor's resources.

F. Because the HMCs are authorized under specific state statutes and regulations, their regulatory authority does not extend beyond specific areas defined within the Harbor Management Plans. In 1989, the Connecticut General Assembly
passed legislation creating a Bi-State Pawcatuck River Commission (CGS 25-160 through 25-164). The statute's intent is to promote the standardization of the rules
and management programs undertaken by the towns on either side of the estuary, and to provide general review authorities for projects on the river in order to maintain, protect and restore the river's marine resources. The legislation

requires complementary Rhode Island action to make it effective.

Dredging

A. Maintenance of navigable channels within the estuary, and adequate water depths at marina facilities is critical in supporting the recreational boating uses of the area. Condition surveys conducted by the Army Corps of Engineers and anecdotal information supplied by marina operators provide significant evidence of the need to dredge both the federal channel and several of the commercial facilities within the estuary.

1. Condition surveys conducted in 1983 and 1985 show that the authorized water depths for the federal channel have been silted in, reducing the depth below MLW by as much as 3.7 feet in places. The situation is most noticeable in the Pawcatuck River between Pawcatuck Rock and the Route 1 Bridge (Table 5-12).

2. The federal channel in proximity to Sandy Point has been impacted by the migration of the barrier island, as well as the deposition of wind-blown sand in the channel. The barrier has migrated through the channel itself, and has moved westward approximately 125 feet since 1972.

3. Siltation at the commercial marina facilities has been most notable at those marinas located in the Avondale-Greenhaven area. Marina operators have reported that water depth loss for some slip space has resulted in smaller vessels being located in slips previously utilized for larger, deeper draft vessels.

B. In addition to the direct loss of facilities and impairment of the federal channel, the need to dredge has secondary impacts on uses of the estuary. The loss of water depths at commercial facilities leads to increased pressure for mooring placement in open water, requests for extension of structures further seaward within the water body, and ultimately in diminished access to, and within the estuary. Additionally, increased pressure on boating traffic due to restricted areas for navigation within the channel may act to exacerbate congestion related problems.

C. There is currently no long-term plan for maintenance of the federal channel within the estuary. While the actual maintenance dredging operations are under the jurisdiction of the Army Corps of Engineers, the federal programs governing such operations require a significant financial commitment and participation from local sponsors. Additionally, the ACE initiates such programs at the express request of local sponsors, or upon a demonstration of need; justification of the public need and benefits of the operation must be provided. The bi-state nature of the estuary acts to complicate these requirements. While siltation in the Pawcatuck River has not severely restricted the use of the channel yet, the condition surveys to indicate an eventual need to restore the authorized depths. Dredging of the channel at Sandy Point has been authorized, however, disagreements between the State of Rhode Island and the ACE as the appropriateness of established "dredge window" restrictions has prevented the actual accomplishment of the operation.

D. Disposal of dredged materials within the estuary is problematic. Sediments dredged from the commercial marina facilities within the Pawcatuck River estuary are not generally suitable for beach nourishment, one preferred disposal option. Marina facilities in Rhode Island do not presently have access to an open water disposal site, and are often confined to utilizing on-site, upland approaches.

E. The designated nonconforming status of several of the Rhode Island marinas within the
Pawcatuck River estuary has a significant impact on the ability of these facilities to undertake dredging. Only maintenance dredging is allowed under the policies of the designation. Many of the marinas were built prior to the institution of the state regulatory program, and have not maintained adequate histories of dredging opera-tions. The result is that many proposals to dredge within these areas are considered improvement dredging, and therefore prohibited by the policies of the RICRMP.

F. Dredging regulation in Connecticut utilizes a series of considerations which the Commissioner of CTDEP (through the CLISP) must give due regard to in making decisions on dredging. These are focused primarily on site-specific resource protection and establishing use guidelines requiring demonstration that navigation channels are inadequate to provide access, and that the operation is designed to take optimal advantage of naturally deep water or existing channels. The process does not assess the cumulative impact of many alterations on an estuary-wide basis. Rhode Island utilizes a series of Water Type designations, which define on an estuary-wide basis areas in which dredging is a permissible activity; specific proposals are also subject to resource protection policies and requirements specific to the site. Neither state utilizes an explicit mechanism to assess the impacts of concurrent, simultaneous projects. Coordinated time frames within which dredging may take place have been established by each state, yet no formal agreement between the states regarding a single estuary-wide set of windows has been established.

Protecting Water Dependent Uses

A. Municipal Authorities

1. Increasing shorefront property values and other economic pressures have acted to alter the face of the waterfront throughout the region. Significant losses of many water-dependent use have taken place. The size of the commercial marinas within the estuary, and the traditionally marginal operating nature of such facilities make them susceptible to conversion should waterfront redevelopment pressures increase.

2. Municipal land use programs, through Comprehensive Plans, Plans of Development and zoning ordinances, have a significant effect on the management, development and protection of water dependent uses within the estuary. These programs have a controlling influence on types of shoreline uses, site characteristics, intensity of use and preservation of both cultural and environmental values.

3. There is currently no particular definition or special protection offered to water dependent uses by either Westerly's Comprehensive Land Use Plan or zoning ordinance. Marina facilities are typically located in either residential, commercial or manufacturing zones, and are considered legal non-conforming uses. The zoning ordinance allows other uses within each of these zones, many as priorities over water dependent activities.

4. The Town of Stonington has developed express policies within the Municipal Coastal Management Program and zoning regulations which address the protection of water dependent uses. The sum effect of these policies is to guide marine commercial

development to the Pawcatuck River estuary, and to provide a high level of protection for existing water-dependent uses and areas currently zoned for those uses. The zoning ordinance does not, however, restrict the use of these areas solely to water-dependent uses, and allows other uses which may compete with or displace the water-dependent uses.

B. State Authorities

1. The Connecticut Coastal Management Act contains several policies which require state and local regulatory programs to give highest priority and preference to water dependent uses. Strong policies as to the preemption of future water dependent activities and adverse impacts to existing activities are implemented both on the state and municipal level through the Act. However, these policies do not make a distinction between a wide class of water-dependent uses. The potential effect of this is to change the type of waterfront uses present within the estuary, with a loss of traditional marine industries, the conversion of commercial boating support facilities, the method of slip allocation and the economic contributions to the community.

2. The Rhode Island Coastal Resources Management Program designates several areas throughout the estuary for varying levels of water-dependent development. However, the program does not contain the strong preemption policies of the CCMA, and is greatly influenced by the zoning designations of the Town of Westerly. The potential for the same types of adverse impacts as described above exists, with the additional impact of total displacement of the water-dependent use.

520. MANAGEMENT REGULATIONS AND INITIATIVES

The following regulations, initiatives and recommendations are based upon Section 510, Findings of Fact, and the goals established in Section 100 of this Plan.

Boat Launching Ramps

A. Increasing Low Impact and Local Access to the Estuary

1. Greater access to the estuary that serves local needs and is of a low impact nature should be developed. It should be provided through the development and improvement of small boat ramps, utilizing public-private agreements for facility use, improvements to private commercial facilities, improvements to existing public facilities, and the development of new public ramps, where appropriate. The Harbor Management Commissions of both Stonington and Westerly should recognize this access development in their development of local harbor management plans.

2. Management Policies and Recommendations

(a) The improvement of use at the existing commercial boat ramps should be pursued so as to increase the amount of small boat access

~~to the estuary. The Pawcatuck River Association of Marina Operators (PRAMO) should undertake a program to encourage the improvement of ramps that are currently in poor condition, and to let the public know about the availability of the ramps. Additionally, marina operators should assess the parking constraints of their sites, and identify where minor rearrangement might provideadditional space for trailers. The Towns and appropriate state agencies should investigate the appropriateness of using open space funding for financial assistance in such site improvements, with necessary stipulations established to ensure public use.~~

~~(b) The improvement of the facility and ramp at Barn Island should be pursued as a priority before any additional public acquisition takes place. The State of Connecticut should pursue implementation of the recommendations included in the 1986 State Comprehensive Outdoor Recreation Plan for improvements to the site, emphasizing increased efficiency in using space.~~

~~(c) The Town of Stonington should enter into an agreement with the Workingman's Club on Mechanic Street to allow public use of the boat ramp as a light boat (canoe, kayak) access point. The parking associated with this use should be handled through the town's parking for the river park. Further, the agreement should include site operation rules that limit use to car-top boats so as not to displace existing parking with trailers.~~

~~(d) The Town of Westerly should investigate the construction of a boat launching ramp at the Meadowlark Drive street end to the Pawcatuck River, adjacent to the Municipal Sewage Treatment Plant (STP). The southern section of property at the STP is well suited for handling parking associated with the ramp, and the depth of water adjacent to the site is adequate for launching boats.~~

~~(e) A study of the feasibility of public acquisition and development of a boat ramp at Stanton Weir Point should be undertaken. The study should include an evaluation of impacts to river traffic and safety during high use periods.~~

~~(f) An investigation of the Riverside Drive (Pawcatuck) ramp should be undertaken to determine its status as either public or private.~~

~~(g) Discussions between the Towns of Stonington and Westerly concerning use of "Circus Lot" in Pawcatuck should be undertaken to determine if the town would be willing to develop a portion of the lot as a light to small boat launch area. Although the lot is an excellent site for a launch area, its use by the Town of Westerly as a major public drinking supply source must be considered.~~

~~Moorings~~

~~*A. Estuary-wide Mooring Program*~~

~~*1. A regulatory and management permitting program should be developed by each municipality to control the moorings placed in the waters of the estuary, and ensure the protection of environmental qualities, navigation and public interests. All moorings, private and commercial, should be required to gain a permit. Additionally, the program should:*~~

~~*(a) Identify each mooring owner and the boat that is using the mooring;*~~
~~*(b) Allocate moorings to the general public on a first-come, first served basis, making provisions for littoral property owners;*~~

~~(c) Identify all appropriate areas for current and future mooring placement within the estuary;~~
~~(d) Develop siting standards for the placement of moorings in relation to other activities or structures;~~
~~(e) Establish dedicated areas for transient boaters;~~
~~(f) Develop standards for mooring tackle;~~
~~(g) Allow for an annual mooring renewal process.~~
~~(h) Establish a fee schedule, where appropriate~~

~~2. Management Policies and Recommendations~~

~~(a) All moorings currently in place within the estuary should be permitted within the first year of operation of the program. All such moorings should be subject to the provisions of the mooring program.~~

~~(b) All moorings, except those permitted to littoral land owners, should be placed within formal mooring areas. Moorings belonging to littoral land owners should be allowed in proximity to their property, provided due consideration is given to issues such as environmental factors and navigation.~~

~~(c) All moorings should be assessed a fee for use of public waters, and to support the costs of the harbormaster program. All fees assessed should be returned to a dedicated harbor management fund.~~

~~(d) Both towns should adopt the same mooring regulations into their harbor management ordinances to promote consistency throughout the estuary. The mooring regulations should be part of a comprehensive Harbor Management Plan, adopted in accordance with existing state programs.~~

~~B. Siting of Mooring Areas and Managing Levels of Mooring Use~~

~~1. Mooring placement within the coves of the estuary, near conservation areas, and within identified shellfish beds and other areas defined as critical resource areas should be restricted. Mooring placement within the smaller coves of the Pawcatuck River estuary and Little Narragansett Bay should be limited to one mooring per waterfront owner. Other areas where mooring placement should be limited include Colonel Willie Cove, the shellfish beds north of Ram Point, adjacent to the Pawcatuck River~~

~~*Wildlife Area, and off Barn Island Wildlife Management Area, Sandy Point and Napatree Point, consistent with the environmental character of each of these areas (See also Section 720 Plan of Use).*~~

~~*2. The overall level of moorings within the estuary should be controlled through the permit program, the requirement that all non-littoral moorings be placed within formal mooring areas, and through establishing limited numbers of these areas. Potential mooring areas are shown in (Figure 5-4). These areas should be sited adjacent to existing access points, where moorings already occur, away from the navigation channel and resource areas. Additionally, the mooring areas should be sited in proximity to other marine uses in order to provide for open water spaces utilized for other uses and to protect the scenic qualities within the Pawcatuck River estuary. The use of these areas should be phased according to demand, the development and provision of access and support facilities, and the judgement of the municipal Harbor Management Commissions, in cooperation with the Bi-State Pawcatuck River Commission, as to the impact of overall boating levels on boating safety.*~~

~~*3. Formal mooring areas should be established in the Avondale-Greenhaven area, Colonel Willie Cove, Watch Hill harbor and adjacent to the Westerly Yacht Club, encompassing the areas currently utilized by moorings. The boundaries of the mooring areas should incorporate clear setbacks from the federal channel and the structures along the shoreline, consistent with the other recommendations of this study. All moorings which are currently sited in areas within the established setbacks adjacent to Avondale and Greenhaven should be relocated.*~~

~~*C. Access to Mooring Areas*~~

~~*1. The Towns and States should focus land and open space acquisition programs to increase the amount of public access facilities in proximity to the formal mooring areas. Because of the general lack of available land, cooperative arrangements with the marina owners and the Watch Hill Fire District should also be investigated.*~~

~~*2. Commercial mooring operators should be required to provide parking and sanitary facilities for permitted moorings according to the standards established for slips. For the purposes of mooring regulation, yacht clubs and other organizations should be considered commercial.*~~

~~*Harbor Management Commissions*~~

~~*A. Municipal Participation in Management of the Estuary*~~

~~*1. Certain regulatory and management responsibilities should be conducted by locally established Harbor Management Commissions (HMC), as provided for in Connecticut and Rhode Island law. Each HMC should be responsible for the control of moorings placed in the waters of the estuary, and provide for local public participation in insuring the protection of environmental qualities, navigation and other issues of public interest. The Town of Westerly should appoint a Harbor Management Commission consistent with the requirements of the Rhode Island CRMP, and should also consider assigning this task to the Conservation Commission. Each HMC should be charged with developing a comprehensive Harbor Management Plan.*~~

~~*2. Management Policies and Recommendations*~~

~~*(a) The Harbor Management Commissions of each Town should address the following areas of concern within the Pawcatuck River estuary and Little Narragansett Bay within their respective Harbor Management Plans, in addition to those required by statute. The Towns should coordinate the development of policies and regulations for these issues through the Harbor Management Commissions, and the Pawcatuck River Bi-State Commission:*~~

~~*1) Development of a mooring permitting program for the estuary; as outlined above (see Section 520.2 Moorings); the HMCs should evaluate the bi-state nature of mooring siting and use in the development of these programs, and coordinate an equitable distribution of costs and access as part of a first year agenda;*~~

~~*2) Regulation of recreational activities such as water skiing occurring in the estuary; the HMCs should*~~

~~*review potentially conflicting uses of the estuary as part of a first year agenda, and evaluate the need for designation of specific reserved areas for differing uses;*~~

~~*3) Removal of derelict vessels, derelict structures and the re-siting of moorings encroaching within buffer zones or navigation channels and other federal projects;*~~

~~*4) Development and implementation of a fee structure for moorings; the HMCs should establish similar mooring fees throughout the estuary, and evaluate necessary steps to ensure that an inequitable share of harbor management costs is not borne by mooring holders;*~~

~~*5) Development of authorities, responsibilities, and duties for the position of harbormaster, including the areas of mooring area siting, vessel operation, speed zones, and pollution discharges;*~~

~~*6) Development of plans and studies for the enhancement and protection of access to and from the estuary;*~~

~~*7) Coordination with other local, state, or federal agencies regarding the management and future development of the estuary;*~~

~~*8) Development of appropriate penalties for violations of any regulations set forth by the commission;*~~

~~*9) Coordination of police and harbor patrols;*~~

~~*10) Coordination with the Coast Guard and U.S. Army Corps of Engineers in relation to boating safety and the marking of the federal channel.*~~

~~*(b) The State of Rhode Island should take action to complement the Connecticut Bi-State Pawcatuck River Commission Act, in order to activate this body. The two states and towns should discuss the extent of the Commission's authorities and the procedures for its operations within the first year of the Commission's*~~

~~*existence. This Commission should function as a forum for the discussion of policy issues of mutual concern, regulatory actions before the HMCs and to further coordination and standardization of management between the towns.*~~

~~*(c) The Harbor Management Commissions for each town should function independently, however, there should be a high degree of coordination. The Towns should each appoint members of the Harbor Management Commissions to the Bi-State Pawcatuck River Commission as their representatives.*~~

~~*Harbormasters*~~

~~*A. Need for Increased and Coordinated Enforcement Presence on the Estuary*~~

~~*1. The increasing recreational uses of the estuary, especially boating, should be managed through a comprehensive and coordinated approach to enforcement, increased enforcement presence during peak periods and by establishing consistent regulations throughout the estuary.*~~

~~*2. Management Policies and Recommendations*~~

~~*(a) The Town of Westerly should petition the Rhode Island state legislature to create specific enabling legislation establishing the authority to allow the town to manage and regulate moorings and other activities that may occur on the waters within the town's jurisdiction, similar to legislation other municipalities have at GLRI 46-4;*~~

~~*(b) A Connecticut State Harbormaster should be assigned specifically to the Pawcatuck River estuary and Little Narragansett Bay region. This position should be part-time, and coordinated with both the Westerly and Stonington Police Department programs;*~~

~~*(c) The Towns should review their existing ordinances, and where necessary develop regulations dealing with the following areas: vessel operation, speed zones, mooring siting and management, pollution discharges, removal of derelict vessels and abandoned floating structures, designation of areas for other recreational uses. These*~~

~~*regulations should be integrated into the Harbor Management Plans and subsequent ordinances to allow implementation by the harbor masters and police patrols; additionally, the appropriate ordinances should be adopted to ensure that all enforcement agencies have consistent authority over all these issue areas. The Towns should adopt the same set of regulations to ensure consistency of management throughout the estuary.*~~

~~*(d) The Towns should enter into a formal agreement authorizing reciprocal enforcement authority by the harbormasters and law enforcement personnel in the waters of both towns (Appendix C).*~~

~~*B. Regionalizing Enforcement Programs*~~

~~*1. The Towns of Stonington and Westerly should develop a coordinated program for the harbor patrols in order to make more efficient use of the resources available. The program should focus resources on areas of more intensive use during peak use periods and minimize unwarranted patrols. Additionally, more effective use of enforcement resources could be gained by greater coordination using both Towns' personnel as a single, regional unit, albeit under separate control.*~~

~~*(a) Enforcement efforts should be reorganized and focused based on three enforcement zones which reflect the geographic and time patterns of use within the estuary. The zones should be:*~~

~~*1. Wequeteguock Cove and Little Narragansett Bay: Enforce-ment efforts in this area shall focus primarily on the channel and area around Sandy Point. As a focal point of vessel traffic, both entering and exiting Little Narragansett Bay and using Sandy Point itself, this area is one of the busiest points within the estuary and should have a specifically assigned patrol permanently on station during weekends and holidays.*~~

~~*2. Watch Hill Harbor and Napatree Point: As the primary destination point within the estuary, this area supports extensive boating use during the summer. It is also used heavily for other recreational uses,*~~

~~potentially creating conflicts. A specific enforcement focus in this area should be the prevention of overboard discharges of sewage from transient boats anchored off Napatree.~~

~~3. The Pawcatuck River Estuary: Navigational considerations, increasing low intensity uses and heavy traffic volume on the River suggest that there be a dedicated enforcement presence here during high use periods.~~

~~(b) Patrol schedules should be coordinated through an assignment of specific times, especially on the Pawcatuck River estuary. Patrol times should be split between all relevant enforcement authorities, allowing constant coverage. The adoption of consistent regulations and reciprocal enforcement powers will allow each harbormaster or marine police patrol to effectively patrol the entire river, removing the need to have both sides provide separate patrols at the same time. Additionally, this will free up patrol resources from Stonington to focus more on the Sandy Point and Little Narragansett Bay area during peak periods. Both harbormasters on the Pawcatuck River estuary should be on the water during weekends and holidays, effectively providing enforcement along its entire length.~~

~~C. Funding of Enforcement Programs~~

~~1. Each town receives more money derived from boat taxes than it expends on each respective harbor patrol program. The harbor patrol budgets of each town should be bolstered to adequately administer each program, especially in light of increasing recreational use of the estuary.~~

~~D. Speed Zones and Regulation of Marine Activities~~

~~1. In addition to the 5 miles per hour (mph) designated speed zones-no wake areas already in place in the Pawcatuck River estuary, speed limit zones should be established at the head of the estuary (above Margin Street), around~~

~~*Osbrook Point, and around the channel at Sandy Point. The remaining non-designated areas should have a maximum speed limit of 15 mph, enforceable during the high use periods of weekends and holidays. These periods should be designated by the Harbor Management Commissions, coordinated between the two towns, and implemented through regulations which allow the harbormaster discretion as to enforcement.*~~

~~*2. All speed zones should be marked with floating signs at their respective limits and be recommended to both the Rhode Island Department of Environmental Management, and the Connecticut Department of Environmental Protection for official designation. Those speed zone designations already established by the RIDEM should be recommended to the CTDEP for official recognition. Any additional, new speed zones\no wake areas should be recommended jointly through each harbor management commission to both state agencies for designation.*~~

~~*3. An officially-recognized no wake area should be established in Watch Hill Cove.*~~

~~*4. The towns of Stonington and Westerly should officially adopt within their Harbor Management Plans the State of Connecticut statutes (in regulation form) that prohibits any vessel from travelling greater than six (6) mph when within 100 feet of the shore, docks, piers, floats, anchored or moored vessels, or other permanent structures (see 15-136 C65). This regulation not only assures safe navigation through congested areas (marina zones, mooring fields, small coves), but also brings uniformity to harbor regulations, making enforcement efforts more clear-cut.*~~

~~*Protecting Water Dependent Uses*~~

~~*A. Existing water dependent uses within the estuary, and sites currently utilized for water dependent uses should be protected.*~~

~~*1. Management Policies and Recommendations*~~

~~*(a) Westerly is currently in the process of developing a Comprehensive Land Use Plan that will be subsequently used to revise the existing zoning ordinance. The distribution of areas along the Pawcatuck River estuary where marinas are currently sited should be maintained, and these sites be zoned as marina use zone. Additionally,*~~

~~*the Town should acknowledge the changing character of the river corridor and promote the development of water dependent industries instead of non-water dependent through establishing a water-dependency requirement within the commercial, manufacturing, and industrial designations.*~~

~~*(b) The Town of Westerly should develop more comprehensive zoning regulations that include descriptions and definitions of each zoning district and the types of allowable uses that can occur within each. Further, the intent of each zoning district should be addressed so that there is no question as to what types of uses and activities will be allowed in these districts. Additionally, the zoning regulations should provide strong protection for marine industries, through both a concise statement of policy and definition of water dependent and marine commercial uses as priorities along the waterfront in those areas currently zoned for manufacturing and commercial uses.*~~

~~*(c) The standards found in the Stonington zoning regulations for "Marinas and Yacht Clubs" should be adopted formally into the Westerly zoning ordinance to assist in special use reviews, with the exception of the specific parking requirement; the town should integrate parking standards established in the RICRMP (0.75 spaces per slip) into the zoning ordinance.*~~

~~*(d) The Stonington Zoning Ordinance should be revised to ensure that no significant changes in the character of, or displacement of existing marine uses occurs. A policy should be developed that differentiates between the condominium project which supplies boat slips, and the commercial boatyards and marinas-yacht clubs. Traditional water dependent activities should be protected through better zoning definitions, reassessment of the mixed uses allowed under the ordinance, and refinement of its objectives and allowances as necessary.*~~

~~*(e) The Stonington zoning regulation parking standard requirement of 1.5 parking spaces for each boat slip and mooring should be revised to 0.75 parking spaces per boat slip and mooring. In so doing, a consistent estuary-wide standard will be established, as the RICRMC calls for a 0.75 parking spaces per boat slip.*~~

~~(f) The RICRMC should directly adopt the policies of the CCMA (contained in Sections 22a-92(a)(3); (b)(1)(A); 22a-93(17)) pertaining to water dependent uses (Appendix D).~~

~~Coordination of State Authorities~~

~~A. Planning for Allowable Uses~~

~~1. As a management tool both state CZM programs should adopt a comprehensive plan of use of the waters of the planning area providing clear delimitations between areas where specific activities may take place; such a plan should establish marine commercial development zones, conservation areas and low-intensity use areas. The plan should be used to guide reviews for all projects according to the policies and standards established for each zone through incorporation into Municipal Harbor Management Plans, modification of zoning ordinances and changes to the RICRMP where appropriate. The plan should be adopted by the CTDEP-OLISP in accordance with authorities established at CGS 461:22a-96, and 22a:359-363 which allows the Commissioner of Environmental Protection to adopt an orderly plan of development for coastal areas by which to reference regulatory decisions. Such a plan will provide a basis for consistent application of policies between states, and provide a mechanism for interstate reviews and federal consistency. Within each management zone, specific objectives and initiatives should be established according to the issues occurring there. The designation of the management sectors, and the objectives and policies contained within them should be designed to implement and further the appropriate policies of the CCMA and the RICRMP and incorporate a proper assessment of cumulative impacts The Plan of Use is intended to provide an overall context for the application of existing programs; it should build upon existing authorities, requirements and policies. All recommendations contained within it are subject to site specific application and regulatory requirements.~~

~~2. Both the CTDEP-OLISP and the RICRMC shall observe a common set of policies pertaining to facilities growth and siting, the use of the water surface and the relationship of structures to the channel, and environmental protection as regards the management of in-water structures, dredging and shoreline alterations. These policies reflect the current statutory and~~

~~*management policies of the CCMA and RICRMP, and provide for specificity unique to the Pawcatuck River estuary and Little Narragansett Bay. These policies are shown in Table 5-13, and should also be incorporated into the Harbor Management Plans for each town.*~~

~~*3. In areas of the estuary where development is currently in place or where there exists natural or man-made constraints to the placement of in-water structures, or where safety and navigational concerns related to structures occur, consistent setbacks from navigation channels should be incorporated into both states coastal zone management or regulatory programs. To promote consistency between state and federal reviews, the recommended setback of the Army Corps of Engineers (ACE) should be adopted as a minimum standard. Those in-water structures currently adjacent to federal navigation projects, or within the recommended ACE setback buffer, shall be required to meet the minimum required setback when proposing to alter or expand the structure. This policy should apply to all structures including fixed and floating docks and piers, and moorings. Such setbacks should also be incorporated into the Harbor Management Plans for each town.*~~

~~*4. Consistent and explicit standards pertaining to the provision of parking and sanitary facilities associated with marina operations should be adopted among all governmental bodies. The OLISP should adopt a procedure for reviewing the level of proposed in water development associated with marina development to ensure that it is consistent with these. The Towns should review permits granted to commercial mooring operators to ensure that these meet the requirements, during the development of the harbor management plans.*~~

~~*B. Review Procedures and Regulatory Coordination*~~

~~*1. The States of Rhode Island and Connecticut should seek the development of a General Permit by the ACE for the review of structures placement within the estuary.*~~

~~*2. Both state coastal programs and the local municipal governments should adopt a coordinated review process for large scale proposals. The procedure should be designed so as not to alter the existing authorities or change the legal basis or sequence by which permits are issued; agencies will continue to be constrained by their specific legislative authority to act upon limited aspects of a proposal, and applicants must continue to meet the requirements and criteria of each agency. The purpose of the cooperative procedure would be to reduce possible conflicts with regulatory program requirements by making the applicant aware of what is to be expected prior to entering the permitting process, ensure notification and coordination among all major reviewing agencies, and to evaluate major development proposals on the basis of shared expertise from each permitting agency (see Section 220.4).*~~

3. The States of Rhode Island and Connecticut and the Army Corps of Engineers should exchange public notices on all proposed activities within the estuary as a matter of standard procedure. These notices should also be sent to any boards and commissions suggested by the Towns of Stonington and Westerly, as well as to the Harbor Management Commissions.

Dredging

A. Maintenance of the Federal Channel

1. The States, Towns and the Army Corps of Engineers should develop a coordinated study of dredging the Pawcatuck River estuary, Little Narragansett Bay, and the Watch Hill Cove reaches of the federal navigational channel. This plan would act as the basis for scheduling and undertaking dredging of the channel in the study area. It should address the need for dredging, scheduling, interstate coordination in permitting, establish necessary environmental protection measures (see Critical Habitat Section) and identify disposal options. Additionally, a long range dredging plan for Sandy Point should be developed by the ACE as a chapter, or subset to this overall plan which would allow the States to conduct a comprehensive assessment of necessary maintenance dredging. Such an assessment should be investigated as the basis for permitting actions on the state level in a manner analogous to the General Permits issued by the ACE, reducing or removing the need for multiple regulatory reviews.

B. Regulation of Dredging at Marine Commercial Facilities

~~*1. The RICRMC should revise the water type designation for all pre-existing marina facilities in Type 2 designation that recognizes that these facitlities be able to continue to maintain their viability as such. The Type 2 designation should allow for pre-existing marinas to undertake maintenance dredging, allow for the use of best available technology such as travellift operations, and other ancillary activities necessary to maintain the operational viability of the facilities. All facilities should be required to establish a marina perimeter in accordance with existing regulations wherein minor repairs and alterations as defined by the RICRMC should be allowed to occur, and establish the present capacity on-site for parking in accoardance with current standards. All future proposed changes to current capacities should be required to comply with existing standards for parking and sanitation.*~~

~~*2. Dredging operations associated with maintenance of necessary water depths at existing commercial marinas should be allowed; improvement dredging in support of limited expansion should be allowed, however, all practicable steps should be taken to minimize the area of disturbance and to promote the efficient use of space as a priority over expansion. A priority objective should be the maintenance of the shallow water areas along the shoreline margin and adjacent to wetland areas.*~~

~~*3. New or deepened dredged channels or basins associated with residential boating facilities should not be allowed.*~~

~~*C. Dredged Materials Disposal*~~

~~*1. The States of Rhode Island and Connecticut, recognizing the regional nature of the recreational resources of the Pawcatuck River estuary and Little Narragansett Bay, should develop and establish an agreement allowing access of Rhode Island marinas within the study area to the New London open water disposal site. Necessary procedures for coordinating reviews of proposals in Rhode Island, the dredging and disposal phases of the operations, and insuring compliance with disposal regulations and other site management requirements should be developed.*~~

~~*2. The State of Rhode Island should participate in any discussions surrounding the Interim Disposal Management Plan for Long Island Sound, as they may effect recommendation 520.7.C.1.*~~

Protection of Open Water Areas and Structures Regulation

A. Protection of Open Water Areas and Channel Buffer

1. The alternating pattern of open water areas and concentrations of more in-tensive water dependent uses within the estuary is a fundamental aspect of its character. This relationship between uses provides scenic open space between groups of structures and heavily utilized boating facilities, allows for areas where low impact uses such as small boat sailing and fishing can take place, and provides open water and undisturbed areas for wildlife within the estuary.

2. Management Policies and Regulations

(a) The Connecticut Department of Environmental Protection and the Rhode Island Coastal Resources Management Council shall require that all structures maintain a minimum setback from the federal channel limits for in-water structures development of at least 30 feet. All future structures development, redevelopment or reconfiguration of existing facilities shall be required to adhere to this standard, at a minimum. Private and commercial docks shall extend no further seaward than is necessary to gain reasonable access to navigable waters; projects requiring significant extensions into public waters to reach navigable waters shall be considered an indication of site unsuitability for structures and/or dock construction. The CTDEP and RICRMC shall re-quire the evaluation of less intrusive alternatives, such as the combined use of shorter piers and moorings, in the evaluation of such proposals.

(b) The Connecticut Department of Environmental Protection and the Rhode Island Coastal Resources Management Council shall protect the scenic, recreational and wildlife values of open water areas within the Pawcatuck River estuary and Little Narragansett Bay through the Plan of Use (Section 720), and the appropriate regulation of structures and activities as recommended therein.

610. FINDINGS OF FACT

Introduction

A. Public access to the Pawcatuck River estuary and Little Narragansett Bay occurs in many different forms. The beaches of Sandy Point and Napatree Point provide access for beachgoers, birdwatchers and bathers. Boaters gain access to the estuary through the boat ramps at the Barn Island Wildlife Management Area and the commercial marinas, as well as transients coming from other areas and canoeists from access sites upriver. The Wildlife Management area provides almost 600 acres of open space for the public, much of it available through trails and walking paths. The Pawcatuck River Park, the Riverbend Cemetery and various bridges provide scenic views and fishing and shoreline access to the river in the urban areas of the estuary. Roads ending at the shoreline are often traditional rights of way, providing for low impact access to the water for fishermen and others. Additionally, undeveloped open space and vistas from shoreline highways and roads provide visual access to the estuary for many residents as well as tourists.

B. While there are significant, small scale avenues of access to the estuary, outside of the Barn Island WMA there are no large pieces of public property supporting public use within the estuary. There are, however, several pieces of shorefront property which are owned by the municipalities.

C. Physical access to the water is primarily through private facilities such as the commercial marinas and private yacht and beach clubs. The limited "gateways" for access act to concentrate people in environmentally sensitive areas, such as Napatree Beach and Sandy Point.

D. Access to the estuary, both physically and visually is most constrained within the urban sections. The Pawcatuck River is hidden behind a screen of commercial development, and not an integral part of the downtown area.

E. Significant visual access is gained from the main highways and roads that parallel the lower estuary and Little Narragansett Bay.

F. There are several potential access sites at street ends which abut the water, however, there are no local programs to identify, maintain or develop these areas. Many of the Rhode Island potential Right of Ways (ROWs) have not been designated by the RICRMC under its program, and therefore, are not protected from possible blocking or infringement.

G. Neither the towns nor the state governments require the development or dedication of public access as an established condition of permit approvals, even where the applicant proposes to utilize public waters. However, the CTDEP-OLISP does often require the provision of access as a condition of meeting its water dependency requirements, and the RICRMC in the past has required public access at marina developments.

H. Parking and other support facilities are generally lacking at public access sites, and most of the sites are undeveloped. There are no comprehensive policies or guidelines within the estuary for public access development, or standards to guide projects proposing access. Additionally, there is no comprehensive plan for access within the estuary to provide a context for individual permit decisions.

Scenic Qualities

A. The Pawcatuck River estuary and Little Narragansett Bay contain a variety and diversity of shoreline types, land forms and uses which contribute to the scenic beauty of the area, and are an integral part of the estuary's character. These include barrier beaches, bluffs, wetlands, farms, forests, coves, traditional maritime industries, villages and the historic downtown.

B. The open water areas of the estuary provide spacing between the concentrations of development, diversifying the visual character of the system and providing a balance of use.

C. The Pawcatuck River forms the central artery of the downtown area, providng an open space corridor through the most densely developed portion of the watershed.

620. MANAGEMENT REGULATIONS AND INITIATIVES

The following regulations and initiatives are Based on Section 610, Findings of Fact, and the goal of protecting and increasing public access to the estuary.

Protecting and Increasing Access

A. General Public Access Policies

1. The state and local governments should protect and increase public access, both physical and visual, to the Pawcatuck River estuary and Little Narragansett Bay through adoption and adherence to common policies and standards, protection and development of existing public sites, or sites where there exists an easement running to the public, and requiring the dedication of access where appropriate as a condition of new development or redevelopment.

2. Management Policies and Regulations

(a) Appropriate public access should be incorporated in all private and public developments subject to the CSPR of the

~~*Town of Stonington and the jurisdiction of the RICRMC, with the following exceptions:*~~

~~*(b) Coastal access facilities should be located where they safely accommodate public use, and should be distributed throughout the estuary to prevent crowding, parking congestion and misuse of coastal resources. Access-ways and trails should be sited and designed: (1) to minimize alteration of natural landforms, conform to the existing contours of the land, and be subordinate to the character of their setting; (2) to prevent unwarranted hazards to public safety; (3) to provide for the privacy of adjoining residences and to minimize conflicts with adjacent or nearby uses; (4) to prevent misuse of environmentally sensitive habitat areas.*~~

~~*(c) Federal, state, and municipal jurisdictions, special districts and the Pawcatuck River Bi-State Commission should cooperate to provide new public access. It is recommended that these bodies endeavor to link the entire series of shoreline access areas and scenic overlooks, parks and existing public access areas to the extent feasible, without additional filling or adversely affecting natural resources. State, regional and local agencies that approve projects should assure that provisions are included as conditions of approval to promote this objective and should ensure that access is consistent with the requirements and guidelines outlined in this section.*~~

~~*(d) Public access to environmentally sensitive habitat areas such as wetlands, tide pools, or to riparian areas should be evaluated on a case by case basis. Such access-ways should be consistent with existing policies concerning these areas and such access-ways should be designed and constructed so as to avoid adverse effects on the resource and, where possible, enhance the resource. Environmentally sensitive areas should be developed and managed in a manner that does not increase hazard potential and, where appropriate, access-ways should be designed to correct abuses resulting from existing use.*~~

~~*(e) Use and development of publicly owned shorelines should be limited to water dependent and public recreational uses, otherwise such estuary and bay front properties should remain protected open space. The*~~

~~*Pawcatuck River Wildlife Management Area is a good example where public access opportunities exist at state-owned properties. Any public access development should be consistent with the site's designation as a wildlife management area.*~~

~~*(f) Public access afforded by street ends, public utilities and Rights of Way should be maintained, developed and preserved.*~~

~~*(g) Development, uses and activities on or near the estuary and bay should not impair or detract the public's visual or physical access to the water from roads or public access areas.*~~

~~*(h) Roads near the edge of the water should be designated as scenic parkways. The roadway and a right of way design should maintain, preserve and enhance visual access for the traveler, discourage through traffic and provide for safe, separate and improved physical access along the shore. Public transit use and connections to the shoreline should be encouraged where appropriate.*~~

~~*(i) Public access facilities should be designed to provide for public safety and to minimize potential impacts to private property and individual privacy.*~~

~~*(j) There should be a physical separation of the public and private space so the public clearly will know the extent of open areas, and know when they are not infringing on private rights. This separation can be achieved by adequate space and through screening such as by landscape planting, fencing and the restriction of use to daylight hours.*~~

~~*(k) Whenever public access is provided as a condition of development, on fill or on or along the shoreline, the access should be permanently guaranteed. This should be done wherever appropriate by requiring dedication of fee or easement at no cost to the public.*~~

~~*(l) Factors such as topography and proximity of the access-way should be considered in relation to the development of the site and to its support facilities. Access facilities provided on access easements should be no wider*~~

~~than necessary to accommodate the numbers and types of users that can be reasonably expected.~~

~~B. Improvement and Development of Municipally Owned Sites~~

~~1. The Towns should identify and prioritize municipally owned shoreline sites for development and use as access sites. This assessment should evaluate site specific characteristics and suitability for use, and integrate the areas into existing Plans of Development, Comprehensive Plans and other recreation plans, as appropriate. Such actions should aid in focusing open space funding requirements.~~

~~2. The Town of Stonington should undertake discussions with the Army Corps of Engineers concerning expanding public access along the hurricane dike in Pawcatuck. Any public use of the site should be consistent with safety concerns.~~

~~C. Expansion of Access to the Urban Section of the Estuary~~

~~1. Expanding access to the urban section of the Pawcatuck River estuary, and reestablishing a linkage to the downtown should be a primary focus of regulatory and acquisition efforts by both the towns and the states. All new development, or redevelopment in this area should be required to provide public access along the waterfront, aiming to develop a linear access way through the downtown. This walkway should link existing public areas, and potential acquisition sites as identified in Section 720.2.~~

~~2. The Towns and the States should develop consistent development design standards for public access provided within this area.~~

~~D. Designation, Development and Management of Public Rights of Way~~

~~1. The Towns of Stonington and Westerly should designate appropriate street ends which end at, or near the shore as local public access-ways. These areas should be developed or improved to the extent necessary to support neighborhood and local, passive use. The Town of Stonington should investigate what steps are necessary to establish the legal status of these areas, while the Town of Westerly should work with the RICRMC to designate the areas as Rights of Way. A listing of these areas is included in inventory and assessment of actual and potential~~

~~shoreline access sites (Technical Report #4).~~

~~2. The Towns should establish as policy that all designated public access-ways must be kept open and clear for the use of the public, and investigate what actions are necessary to prevent or remedy the unlawful blocking or posting of these areas.~~

~~3. The Towns should make arrangements with their respective public works departments to maintain these sites.~~

~~4. No street ends or roads at the shoreline should be abandoned by the towns until such time as a comprehensive evaluation establishes that the area cannot be used as a viable access-way to the shore, or as part of a boat launching site, park, or viewpoint.~~

~~5. The use of volunteers in maintaining local access points should be investigated.~~

~~6. The development of support facilities, such as parking, should be investigated at each appropriate Public Right of Way site.~~

~~7. Signs identifying the Public Right of Ways should be developed, and information about them promoted by the local Chambers of Commerce.~~

~~Utilizing the Shoreline Access Inventory~~

~~A. The Towns should utilize the Inventory and Assessment of Actual and Potential Shoreline Access Sites (Technical Report #4) as a basis for developing a comprehensive program for protecting and increasing access to scenic viewpoints within the estuary. Many of these sites are currently in private ownership, and the towns should investigate approaches to protecting the scenic views from construction related impacts through appropriate development controls.~~

~~B. While most of the open space sites identified in the inventory are small, their protection will help to maintain the diversity and scenic qualities of the shoreline, and may provide low intensity access sites for neighborhood use.~~

~~Protecting the Scenic Qualities of the Open Water~~

~~*A. The Estuary Policies (Table 5-13) establish basic policies on the development of the estuary. A primary purpose of these is to guide management decisions about siting of facilities, use of the water surface and environmental protection actions in order to preserve the qualities of the estuary in place now.*~~

~~*B. The Plan of Use (Section 720) establishes recommended management areas to guide the character of development and use along the estuary's shores. That section establishes Conservation, Low Intensity and Marine Commercial management sectors to provide for a separation of uses of the estuary with differing characters, and to preserve the diversity of the visual character of the area.*~~

710. FINDINGS OF FACT

710.1 Introduction

A. Managing for Coordination and Cumulative Impacts

1. As a mechanism for coordinating the ongoing regulatory programs of either state, and to account for and properly manage cumulative changes in the estuary, both state CZM programs should adopt a comprehensive Plan of Use for the planning area which provides clear delimitations between areas where specific activities may take place; such a plan should establish marine commercial development zones, conservation areas and low intensity use areas.
2. The plan should be utilized to guide reviews for all projects according to the policies and standards established for each zone through incorporation into Municipal Harbor Management Plans, modification of zoning ordinances, and changes to the RICRMP where appropriate. The plan should be adopted by the CTDEP-OLISP in accordance with authorities established at CGS 461:22a-96, and 22a:359-363, which allows the Commissioner of Environmental Protection to adopt an orderly plan of development for coastal areas by which to reference regulatory decisions. Such a plan will provide a basis for consistent application of policies between states, and provide a mechanism for interstate reviews and federal consistency. Within each management zone, specific objectives and initiatives should be established according to the issues occurring there.

3. The Plan of Use is intended to provide an overall context for the application of existing programs; it builds upon existing authorities, requirements and policies. All recommendations contained within it are subject to site specific application and regulatory requirements.

720.1 Estuary Sectors, Objectives and Policies

A. Pawcatuck River Sector #1 - Urban Waterfront Redevelopment-Low Intensity Use

1. Description

This area extends from the Stillmanville dam, through the downtown Pawcatuck-Westerly area, to above the marine commercial area at Mechanic and Margin Streets. The Pawcatuck River is extremely narrow through this section, and navigation is restricted. The federal channel in many places is 40 feet or less in width. Although the shoreline has historically been extensively altered, the area still supports critical habitat for several fish species and is part of the anadromous fish way. Land uses along this section of the river are urban-commercial and industrial, non-water dependent (with the exception of the Pawcatuck Boat Yard) and some residential in the lower part of the section. Several large, vacant parcels of land do exist within the sector. Public recreational use is extremely limited, consisting primarily of the Pawcatuck Park and the river walk above the Route 1 Bridge, although the area is increasingly used by canoeists from upriver, and by boaters from down river using the stores downtown. Several derelict vessels and deteriorating bulkhead

structures do exist, creating some interference with other uses of the water body and navigability.

2. Objectives

(a) Due to the narrowness of the river, the primary management objective should be to protect the navigable channel and the buffer area around it; this will not only protect existing uses, but ensure that should redevelopment in the downtown urban area bring more people up river, that safe navigation conditions will exist.

(b) Increasing public access and linkages between the river and the downtown area of Westerly and Pawcatuck in support of the redevelopment of the waterfront should be encouraged; developing access for users from the freshwater portion of the system should also be pursued.

(c) Protection of existing fisheries habitat and the area's role as a migration corridor for anadromous species are primary objectives also. This will necessitate controlling alterations of the river bottom, minimizing off-site impacts associated with shoreline and bridge construction, and strictly regulating the reconstruction of bulkheads and support structures of riverfront buildings in the urban section. Reconstruction of shoreline protection facilities to modern standards should also be promoted.

(d) The presently existing derelict structures and vessels should be removed from the water body.

(e) In-water development should be managed to prevent impacts to the scenic and open space qualities the river corridor creates in the urban setting, as well as to promote public access.

3. Policies, Management Regulations and Initiatives

(a) The sector is inappropriate for additional large-scale marine commercial development, due to the immediate and cumulative impacts on navigation, boating traffic levels and restricted water depths. The water-dependency requirements recommended in Section 520.5 should be met by the provision of public access along the waterfront, rather than through in-water structures

~~development. Exceptions regarding marine commercial development should be considered for access landings which are developed in public ownership, which are predominately public in nature, or private projects which support the downtown redevelopment process. In these instances, structures should be parallel to the orientation of the river, meet all appropriate setback standards, and be for transient usage only. Municipal actions as regards changes in land use regulation should reflect these limitations and recommendations, and the Harbor Management Plans of Stonington and Westerly should affirm this.~~

~~(b) The RICRMC should redesignate its classification of this area, from the Route 1 bridge south to the Viking Marina from Type 6 Commercial and Industrial Waterfronts to Type 2, Low Intensity Uses; this same classification should be extended north to the dam at Stillmanville Street, the northern extent of tidal influence within the estuary, currently unclassified.~~

~~(c) Both the RICRMC and CTDEP should restrict the dredging and alteration of the river bottom in this sector, as well as disallowing the further encroachment of structural shoreline protection into the river itself during reconstruction and maintenance activities. Reconstruction of the deteriorating bulkheads should be required during the consideration of proposals on adjacent properties.~~

~~(d) The maintenance, repair and reconstruction of the Route 1 Bridge requires special consideration on minimizing impacts to the smelt habitat, and coordinating dredging and other operations which could potentially create siltation impacts to anadromous fish migrations. Both CZM agencies should coordinate the review of such projects with their respective Departments of Transportation, requiring that these concerns be addressed; interstate coordination should be undertaken at the time of any proposed work. Any substantial reconstruction of the bridge should be required to provide public access such as scenic overlooks and fishing platforms.~~

~~(e) Increased recreational linkages with the freshwater portion of the Pawcatuck River should be encouraged by pursuing the development of new public access sites and small boat landings in this area. Potential sites include:~~

~~1) The "Working Man's Club" boat ramp through a cooperative arrangement with the owners. The use of the landing should be restricted to light, non-motorized boats,~~

with associated parking handled at the Town's river park;

2) The "Circus Lot", wellhead site owned by the Town of Westerly in Pawcatuck. Parking associated with this site must be accommodated in a manner that does not pose problems or conflicts with the site's nature as a wellhead for Westerly's drinking water;

3) The Hanley-Williams Lumber Co. Site is now vacant. While previous attempts by the State of Rhode Island to acquire this site have been unsuccessful, efforts should continue to successfully acquire it. The size of the site presents opportunities for multiple uses, and could form the centerpiece of reestablishing a connection between the downtown area and the river. Concerns over additional traffic congestion resulting from small boat launches at this site need to be addressed when evaluating the use of this site in downtown re-development.

(f) The Towns of Stonington and Westerly should revise their zoning ordinances to require the dedication of public access along the river front during any development or redevelopment.

(g) A five (5) mile per hour speed zone should be established within this sector; the zone should be established within the Harbor Management Plans for both towns and recommended to the RIDEM, and the CTDEP for state designation.

B. Pawcatuck River Sector #2 - Marine Commercial Development

1. Description

The area extends from the northern boundary of Viking Marina to the southern boundary of NorWest Marine. It contains the largest concentration of marinas in the estuary, as well as the greatest percentage of vessels. The river is relatively narrow, and the marina construction typically extends to within the buffer area around the federal channel. The land uses are predominately commercial and industrial. There is a large wetlands complex on the eastern side of the river, designated for preservation.

2. Objectives

(a) Due to the historical marina use of this area, the primary management objectives

~~should be to protect commercial marine use. This area is one of the primary existing focal points for access to the estuary, through the commercial marinas; increasing and guiding future access opportunities within this area is a primary objective while addressing the issues of maintaining safe boating operations and necessary upland support facilities in a congested area. These are closely linked to the encroachment of existing structures into the recommended buffer zone, and insuring consistent implementation of recommended setbacks.~~

~~(b) Protection of existing fisheries habitat and the area's role as a migration corridor for anadromous species are primary objectives also. The extension of structures into the mainstem of the river must be managed for potential impacts to fish migrations.~~

~~*3. Policies, Management Regulations and Initiatives*~~

~~*(a) The Town of Westerly should adopt zoning provisions designating the upland areas within this section currently used for marinas explicitly for marine commercial uses in accordance with Section 520.5. The Town of Stonington should maintain its present zoning designations, given the restricted availability of upland support facilities outside of the current MC 80 zone.*~~

~~*(b) The Town of Westerly property on which the sewage treatment plant is sited presents one of the best opportunities within the estuary for establishing new public access. The property is adjacent to a platted street, Meadowlark Road which dead-ends into the water. The street is already informally used as a small boat launching site. The southern section of the property is well suited for handling parking associated with the ramp, and the water depth is sufficient to accommodate most boats. This use is currently consistent with the RICRMP policies. The Town has recently acquired the property to the north of the STP in order to provide for future expansion needs; any future site design should accommodate public access to the shoreline, primarily for visual access on the northern site. The site's proximity to existing marina development, and potential upland access and parking facilities, also make it an appropriate site for a small scale public mooring area; however, boats utilizing this area will have to have extremely shallow draft, because of the depth limitations. The Department of Environmental Management should investigate the development of a marine boat launch at this site, in cooperation with the Town of Westerly. The Town of Westerly Harbor Management Commission, when constituted, should investigate further the designation of a formal mooring field in this area.*~~

(c) The RICRMC should require the development of public access at the STP site during any redevelopment or expansion, consistent with operational and safety concerns. Such a requirement is consistent with the Rhode Island State Guide Plan recommendations of evaluating and accommodating public access where possible where public funding is utilized.

(d) Dredging operations associated with maintenance of necessary water depths at existing commercial marinas should be allowed; improvement dredging in support of limited expansion should be allowed, however, all practicable steps should be taken to minimize the area of disturbance, as well as to minimize impacts to fisheries and wildlife habitat and to promote the efficient use of space as a priority over expansion. A priority objective should be the maintenance of the shallow water areas along the shoreline margin and adjacent to wetland areas.

(e) New or deepened dredged channels or basins associated with residential boating facilities should not be allowed; shoreline alterations and structural protection in association with such facilities should not be permitted.

C. Pawcatuck River Sector #3 - Low Intensity

1. Description

This area extends from the marina concentration of Sector #2 south to the northern boundary of the marina concentration in Avondale-Greenhaven. This is one of the most diverse sections of the estuary containing residential land uses, valuable fisheries and wildlife habitat, extensive tidal wetland areas, several marinas and open water areas used for low intensity activities. It is also one of the most scenic stretches of the estuary, with the low intensity shoreline uses and open water areas in juxtaposition to the marine commercial concentrations at either end.

2. Objectives

(a) The primary management objectives should focus on protection of the natural, scenic and low intensity resource values in this area. Specific objectives include prevention of conflicts between uses, insuring safe boating, regulation of environmental alterations, and preservation of scenic values.

(b) The area should support a level and mix of uses consistent with its designation as low intensity, including residential docks, low impact recreational activities and maintenance of the federal channel, consistent with the policies established under

~~Section 520.6 (Table 5-13).~~

~~(c) While commercial marinas and moorings do exist within this section, their expansion must be assessed in relation to potential impacts on both in-water and upland resources, including protection of open water areas for scenic purposes and low impact uses such as recreation.~~

~~*3. Policies, Management Regulations and Initiatives*~~

~~*(a) To protect the potential future utilization of shellfish resources within this sector, docks should not be allowed to extend to distances where they may interfere with access to identified shellfish concentrations. New or deepened dredged channels or basins associated with residential boating facilities should not be allowed; shoreline alterations, structural protection and filling in tidal waters in association with such facilities should not be permitted.*~~

~~*(b) Dredging operations associated with maintenance of necessary water depths at existing commercial marinas should be allowed; improvement dredging in support of limited expansion should be allowed, however, all practicable steps should be taken to minimize the area of disturbance, as well as to minimize impacts to fisheries and wildlife habitats, and to promote the efficient use of space as a priority over expansion. A priority objective should be the maintenance of the shallow water areas along the shoreline margin and adjacent to wetland areas.*~~

~~*(c) New or deepened dredged channels or basins associated with residential boating facilities should not be allowed; shoreline alterations and structural protection in association with such facilities should not be permitted.*~~

~~*(d) The mooring of houseboats, floating homes and floating businesses outside of marinas, as well as industrial and commercial structures and operations (excluding fishing and aquaculture) should all be prohibited.*~~

~~*(e) Public launching ramps should permitted, although all possible steps should be taken to minimize the disturbances associated with their construction and operation. The site at Stanton Weir, to the north of the State of Connecticut's property, is an optimal site for a public boat launching ramp within this area; the upland area is sufficient to provide parking and its location away from the main marina concentrations minimizes*~~

~~*boating safety problems. Such a facility could be constructed with a minimum of environmental alteration and provide a maximum of public access. Special care should be taken in the design and operation of such a facility due to the relationship of the area to the channel, and possible traffic problems during peak use periods.*~~

~~*(f) An appropriate fairway from the commercial marina facilities within Ram Cove should be designated by the RICRMC and incorporated into the Westerly Harbor Management Plan. This fairway should be sufficient to protect ingress and egress from these facilities to the federal channel. Maintenance dredging of this channel should be allowed.*~~

~~*(g) Moorings should not be placed in proximity to the Pawcatuck River Wildlife Area. Moorings for waterfront owners should be located in proximity to their properties, and avoid the shellfish concentration area between Ram Point and Pawcatuck Rock. Any moorings associated with the commercial marinas or the Westerly Yacht club should be regulated by the respective towns, in accordance with the recommendations of Section 520.2 -*~~ *Moorings*~~*. These mooring areas should also have formally established boundaries to manage expansion.*~~

~~*(h) A fifteen (15) mile per hour speed zone should be established within this sector; the speed restrictions should only be applicable during the high peak use periods of weekends and holidays, or in other instances as determined appropriate by the harbormaster. The zone should be established within the Harbor Management Plans and ordinances for both towns and recommended to the Rhode Island Department of Environmental Management, and the Connecticut Department of Transportation for state designation. The existing "No Wake" areas should be maintained, and if not currently formally designated, should be.*~~

~~D. Pawcatuck River Sector #4 - Marine Commercial Development~~

~~1. Description~~

~~This section includes the marinas of the Avondale and Greenhaven areas, as well as their associated mooring areas. The area is the second largest concentration of vessels within the estuary, and therefore an important access center. Although an area of historic maritime-oriented use, the marinas are sited in close proximity to~~

~~private residences, with little, if any, land area for expansion of support facilities such as parking. The commercial moorings operated by the marinas are sited directly abutting the federal channel, creating an area of intense activity aggravated by the relative narrowness of the river. The physical characteristics of the river have created sedimentation problems which have affected the ability of the marinas to operate.~~

~~2. Objectives~~

~~(a) A primary objective for this section is to allow adequate maintenance of the commercial marina facilities, while insuring that any expansion which occurs is consistent with upland capacities to support the increased use.~~

~~(b) Additional objectives are to maintain an appropriate buffer zone around the federal channel, and to minimize conflicts with other uses through the control of the seaward extension of the facilities.~~

~~(c) The public use of the mooring area should be increased, outside of commercially available moorings.~~

~~*3. Policies, Management Regulations and Initiatives*~~

~~*(a) The areas presently dedicated to mooring space should be formally established and regulated by the Towns through the Harbormasters and the Harbor Management Plans in accordance with Section 520.2 Moorings. Any moorings currently located within the recommended channel buffer area should be relocated.*~~

~~*(b) The regulation of marina development in this sector should minimize the extension of structures into the river to the greatest degree possible, while allowing for a reasonable use of the water area necessary to support the operation of the facilities. As a matter of policy, the states should require permit applicants to address and demonstrate consideration of reconfiguration and more efficient use of space within areas currently utilized by the marina facilities as a preferred alternative to the seaward extension of structures, including consideration of upland-rack storage. Future commercial structures development, redevelopment or reconfiguration of existing facilities, should extend no further seaward than the general line of structures now in place. Both states should utilize existing statutory powers to establish seaward construction lines which limit significant seaward expansion of the structures and interference with the proposed mooring field.*~~

~~*(c) Dredging operations associated with maintenance of*~~

necessary water depths at existing commercial marinas should be allowed; improvement dredging in support of limited expansion should be allowed, however, all practicable steps should be taken to minimize the area of disturbance, as well as to minimize impacts to fisheries and wildlife habitats, and to promote the efficient use of space as a priority over expansion. A priority objective should be the maintenance of the shallow water areas along the shoreline margin and adjacent to wetland areas.

(d) New or deepened dredged channels or basins associated with residential boating facilities should not be allowed; shoreline alterations and structural protection in association with such facilities should not be permitted.

E. Pawcatuck River and Little Narragansett Bay Sector #5 - Low Intensity

1. Description

This sector includes the portion of the Pawcatuck River estuary from south of the Greenhaven-Avondale area to Little Narragansett Bay. The management sector contains the large expanse of open water associated with Little Narragansett Bay, which supports a variety of commercial and recreational activities while maintaining very valuable fish and wildlife habitat. This area is also adjacent to Watch Hill Harbor and Wequetequock Cove, which support water-dependent commercial and high-intensity recreational activities. The area contains one commercial marina, Watch Hill Boat Yard, with an associated mooring area. The Pawcatuck River estuary widens significantly in this area as it enters the Bay. The shoreline uses within the estuarine portion are low density residential, and agricultural. Little Narragansett Bay is the site of intensive recreational use, being both an area where boaters congregate and a transit area for those destined for the marinas upriver, and an active fishing, sailing and waterskiing area.
The area around Sandy Point where the federal channel enters Fishers Island Sound is an especially active and congested area, as boats leaving and entering the Bay must utilize this point. Little Narragansett Bay is classified as a wetland of statewide significance by the State of Connecticut, and supports extensive submerged aquatic vegetation, shellfish beds and other fisheries habitats. The areas surrounding Barn Island Wildlife Management Area, Sandy Point, Napatree Point and Watch Hill Harbor have been excluded from this description.

2. Objectives

(a) The primary objectives for this area include maintaining a balance among the diverse activities found there, insuring boating safety in light of increasing use, and

protecting important fishery and wildlife habitats, especially the coves and wetland systems.

3. Policies, Management Regulations and Initiatives

(a) The mooring field within Colonel Willie Cove should be formally established and regulated by the Town of Westerly, through the Harbormaster and Harbor Management Plan. All moorings currently located there should be required to gain municipal permits, subject to the standards and regulations established in accordance with the recommendations of Section 520.2 Moorings. Given the environmental characteristics of this area, it is an important fishery and wildlife habitat, additional mooring growth should be assessed against potential environmental impacts. Mooring levels should be limited to 1 mooring per waterfront property owner who can establish a need for a mooring, and to existing commercial mooring levels. Expansion beyond these levels should not be allowed until an assessment of environmental impacts can be developed. Any commercial moorings within the areas should be subject to the parking and sanitary standards established under the Harbor Management Plans.

(b) Dredging operations associated with maintenance of necessary water depths at the existing commercial marina should be allowed; improvement dredging in support of limited expansion should be allowed, however, all practicable steps should be taken to minimize the area of disturbance, as well as to minimize impacts to fisheries and wildlife habitats, and to promote the efficient use of space as a priority over expansion. A priority objective should be the maintenance of the shallow water areas along the shoreline margin and adjacent to wetland areas.

(c) Within this management sector the associated mooring area should not be considered part of the commercial marina operation for purposes of dredging, rather, proposals for dredging the mooring area should be reviewed and judged upon a site specific environmental assessment of impacts and potential benefits.

(d) The mooring of houseboats, floating homes and floating businesses outside of marinas, industrial and commercial structures and operations (excluding fishing and aquaculture) and filling should all be prohibited.

(e) New or deepened dredged channels or basins associated with

residential boating facilities should not be allowed; shoreline alterations and structural protection in association with such facilities should not be permitted. Dredging within Little Narragansett Bay which is not associated with the maintenance of the federal channel or for the purposes of preserving or enhancing the area as a conservation area or fishery habitat should not be permitted.

(f) A ten (10) mile per hour speed limit should be established around the northwestern tip of Sandy Point, for the purposes of controlling vessel traffic through the channel at this point. The zone should be established far enough away from the turning point to allow for safe and orderly navigation. The speed restrictions should only be applicable during the high peak use periods of weekends and holidays, or in other instances as determined appropriate by the harbormaster. The zone should be established within the Harbor Management Plans and ordinances for both towns and recommended to the RIDEM, and the CTDEP for state designation.

F. Watch Hill Harbor Sector #6 - Marine Commercial Development

1. Description

Watch Hill Harbor is the most popular transient anchorage within the study area. Land uses adjacent to the Harbor support a mixture of residential, tourist-oriented and commercial uses. The Watch Hill area is predominately summer use oriented, being adjacent to the beaches of Westerly. The Harbor's relationship to Fisher's Island Sound and Block Island, as well as the protection afforded by Napatree Beach, make it a favorite anchorage and destination point for cruising boats. The federal anchorage within the harbor has become utilized to capacity by seasonal moorings, precluding its general use for transient anchorage and creating a waiting list of requests for access; approximately 300 transient vessels per season are accommodated at private dock facilities within the Harbor. Public access to the harbor is very limited by the nature of property ownership in the area, and parking constraints.

2. Objectives

(a) The primary objectives for this area include insuring the equitable and most efficient use of the anchorage space within the harbor, providing for a balance of transient, public and resident usage. Protecting water quality from potential discharges by transient vessels is a principle environmental concern.

3. Policies, Management Regulations and Initiatives

(a) All mooring use within the federal anchorage should be required to obtain a permit from the Westerly harbormaster, and be regulated subject to the standards and regulations established in accordance with the recommendations of Section 520.2 Moorings through the Harbor Management Plan. Specific allocation policies should be established which provide for an equitable distribution of available mooring and anchorage space between transient, private and public use within the harbor. These policies should be implemented through the permitting process, and address the following issues:

1. There is a distinct need to expand the amount of area within the harbor dedicated to free transient use. The State of Rhode Island should consider reestablishing the Guest Mooring program within the harbor, to ensure available transient moorage. The Town of Westerly, as a condition for approval of the Harbor Management Plan, should be required to develop an approach for making space available for transient use or anchorage. A potential approach is to formalize the policy of the Watch Hill Yacht Club of allowing overnight use of unoccupied private moorings; this should be formalized and included within the HMP. A nominal fee should be allowed to cover launch costs.

2. The availability of moorings to the general public from areas of the town outside Watch Hill should also be expanded, however, this is complicated by the lack of dedicated public access to the harbor and public support facilities such as parking. The Town of Westerly and the State of Rhode Island should make the acquisition and development of land for these needs a priority; an investment in the upland increases the potential public use of the water-side resources greatly.

3. Moorings have recently been established outside the harbor area proper; the RICRMC should require that these be maintained for open, free transient use in the HMP and ordinance. The mooring tackle should be removed during the winter, and winter stakes set to mark the location of the bottom gear.

4. The Harbor Management Plan should establish requirements that the commercial marina facilities and yacht

clubs in Watch Hill dedicate a specific number of parking places for use by the mooring holders who are not patrons of the marina, as a condition of acquiring commercial mooring permits. Access through the facility to the mooring area should also be provided. The number of parking places required should be related to the numbers of commercial permits granted.

5. Any commercial moorings within the area should be subject to the parking and sanitary standards established under the Harbor Management Plans.

6. The RICRMC should require the adoption and integration of these recommendations into the Westerly Harbor Management Plan as a condition of its approval.

(b) The RICRMC should establish an explicit setback for structures within the Cove from the boundaries of the federal anchorage.

(c) The Westerly harbormaster should evaluate the efficiency of the current mooring field arrangement; significant gains in available space may be achievable by rearranging current mooring placement to more closely reflect draft and swing requirements.

(d) Options for managing transient boat sewage should be explored, in accordance with the recommendations of Section 320 Managing Boat Sewage.

G. Little Narragansett Bay, Napatree Point Sector #7 - Conservation

1. Description

Napatree Point is a privately owned, one mile long barrier beach, located south of Watch Hill Cove. It is an extremely important and valuable natural habitat, as well as a popular recreational site. The barrier functions as a important migratory bird stopover, and contains a variety of coastal habitats as well as habitat for species of bird classified as federally threatened and Species of Special Concern. The water areas to the north of Napatree Point are used extensively as an anchorage by transient vessels, with concurrent use of the shore for recreation. Water quality monitoring has shown that bacterial levels increase during summer months in proximity to this area, with overboard discharges from transient vessels as the most probable source.
The area also provides one of the most scenic views on the estuary, with both the expanse of Little Narragansett Bay and the Sounds in sight from the

barrier. This section includes the waters surrounding Napatree Point to a distance of 500 feet offshore.

2. Objectives

(a) The overriding objective for the management of Napatree Point is to preserve and protect this area from activities and uses that have the potential to degrade its scenic, wildlife, and plant habitat values, or which may adversely impact water quality and to restore impacted or degraded habitat values. The proper management of the recreational uses offshore of Napatree Point, and of the barrier system itself are essential to achieving these objectives.

3. Policies, Management Regulations and Initiatives

(a) The establishment of new mooring fields, the construction of recreational boating facilities, either private or commercial, filling below mean high water, the discharge of substances other than runoff water and the placement of industrial or commercial structures or operations (excluding fishing and aquaculture) should all be prohibited in this area.

(b) Activities and alterations including dredging, dredged materials disposal, structural shoreline protection, and grading and excavation of this area should all be prohibited unless the primary purpose of the alteration or activity is to preserve or enhance the area as a conservation area and natural buffer against storms.

(c) The mooring of houseboats, floating homes and floating businesses in this area should be prohibited, and made an action subject to enforcement and fines under the Harbor Management Plan and Ordinance.

(d) Further study of the conflicts between human uses of the barrier and wildlife habitat and utilization requirements should be undertaken to identify potential solutions and management actions.

H. Little Narragansett Bay, Sandy Point, Sector #8 - Conservation

1. Description

Sandy Point is a low, uninhabited barrier island, located in the approximate center of Little Narragansett Bay, which separates Fisher's Island Sound and the Bay. It is a

historic site of several rare and endangered wildlife species, however, significant recreational use of the area has resulted in habitat degradation and subsequent loss of these species in this area. The area is heavily used in the summer by boaters and beachgoers, being readily accessible from Stonington and Westerly. The barrier is migrating in a northwesterly direction, necessitating dredging at the northern end to maintain the federal channel. This sector includes the waters surrounding Sandy Point to a distance of 500 feet offshore.

2. Objectives

(a) Management actions and initiatives pertaining to Sandy Point should aim to protect this area from activities and uses that have the potential to degrade its scenic, wildlife and recreational values, and to restore impacted or degraded habitat values.

3. Policies, Management Regulations and Initiatives

(a) The placement of moorings, seasonal houseboats, floating homes or permanent structures within this sector should be prohibited to prevent conflicts with general public recreational use of the area.

(b) Activities and alterations including dredging, dredged materials disposal, structural shoreline protection, and grading and excavating in this area should be prohibited unless the primary and dominant purpose of the alteration or activity is to preserve or enhance the area as a conservation area and/or natural buffer against storms. This requirement shall not apply to maintenance dredging of the federal channel. The RICRMC should require that the disposal of dredged materials from the federal maintenance dredging activity of the Little Narragansett Bay channel be carried out in such a way as to restore and enhance wildlife habitat in accordance with the requirements of Section 420.3 Restoring Wildlife Habitat.

(c) Further study of the conflicts between human uses of the barrier and wildlife habitat and utilization requirements should be undertaken to identify potential solutions and management actions.

I. Little Narragansett Bay, Barn Island Sector #9 - Conservation

1. Description

The Barn Island Wildlife Management Area contains high quality wildlife habitat,

including extensive tidal and brackish wetlands. The Management Area provides significant breeding areas for wildlife, as well as being a significant research and scientific area. The area is the largest holding of undeveloped land within the study area. Additionally, the boat ramp facility provides access to the largest numbers of users within the estuary. This sector generally extends to a distance of 500 feet offshore.

2. Objectives

(a) To preserve, maintain and where possible restore and expand the conservation and wildlife management status of the area.

3. Policies, Management Regulations and Initiatives

(a) The placement of moorings, seasonal houseboats or permanent structures within this sector should be prohibited to prevent conflicts with general public recreational and conservation use of the area.

(b) Activities and alterations including dredging, dredged materials disposal, structural shoreline protection, and grading and excavating on abutting shoreline or coastal features should be prohibited unless the primary and dominant purpose of the alteration or activity is to preserve or enhance the area as a conservation area and natural buffer against storms.

(c) The State of Connecticut should continue its efforts to expand the area under protection through the acquisition of adjacent lands. Additional efforts should be made to acquire conservation easements along the wetlands corridor between the Davis Farm property and the Pawcatuck River estuary.

J. Wequetequock Cove, Sector #10 - Low Intensity

1. Description

Wequetequock Cove encompasses an area generally north of Little Narragansett Bay and Ledwoods Island. The Cove is approximately one and one half miles long. The Cove supports both marine commercial uses and some of the most extensive wetland resources in the study area. Other land uses are predominantly low density residential. Water depths within the Cove are extremely shallow, and the area is subject to continuous siltation. The AMTRAK causeway limits access to the area by all but smaller vessels. These factors indicate that significant expansion or further

development of marine commercial uses within the Cove is inappropriate.

2. Objectives

(a) Maintain an intensity and character of use within the Cove that is consistent with its resources, surrounding uses and physical limitations.

3. Policies, Management Regulations and Initiatives

(a) Dredging operations at the commercial marinas should be limited to that necessary to maintain existing water depths, and to maintain the accessibility of the existing channel; significant expansion or improvement dredging should not be permitted.

(b) The Cove should be evaluated for inclusion in the "Coves and Embayments Program" of CTDEP.

(c) The Town of Stonington should maintain its present zoning designations as regards marine commercial development within Wequetequock Cove.

(d) Conservation easements should be sought, where appropriate, to expand the upland buffers adjacent to the wetland areas of the Cove.

CHAPTER THREE

Connecticut Dept. Env. Protection, "Water Quality Standards". 1990

Deacutis, Chris. Rhode Island Department of Environmental Management. Personal Communication, 1991.

Desbonnet, Alan. 1991. An Assessment of the Current Status of Water Quality and Pollution Sources in the Pawcatuck River Estua

r y and Little Narragansett Bay. University of Rhode Island

Coastal Resources Center. Prepared for the Pawcatuck Estuary Interstate Management Project.

Doering, P., et. al., Unpublished data. MERL. University of Rhode Island, GSO, Narragansett, RI.

Quinn, J.G., J.S. Latimer, C.G. Caney and E.J. Hoffman, 1987. A study of the water quality of the Pawcatuck River: Chemical monitoring and computer modeling of pollutants. Vol.1: Chemical monitoring of pollutants in the Pawcatuck River. RIDEM, Division of Water Resources, Providence, RI.

Rhode Island Department of Environmental Management. Division of Water Resources "Water Quality Regulations for Water Pollution Control", 1990.

United State Food and Drug Administration. 1984

CHAPTER FOUR

Alfieri, Daniel J. 1975. Organismal Development on an Artificial Substrate 1 July 1972 - 6 June 1974. Estuarine and Coastal Marine Science, Vol. 3 pp.465-472.

Boule, Marc and Ken Bierly. 1987. "History of Estuarine Development and Alteration: What Have We Wrought?" In: The Northwest Environmental Journal, 3(1) Winter 1987, pg.43-61.

Carlton, James T. 1990. Introduced Marine and Maritime Species of Little Narragansett Bay, Rhode Island. Unpuld. report. Maritime Studies Program, Williams College - Mystic Seaport Museum, Mystic Connecticut.

Champ, Michael A., and David F. Bleil. 1988. Research Needs Concerning Organotin Compounds Used in Antifouling Paints in Coastal Environments.
U.S. NOAA.
Science
Applications
International
Corporation
,
Rockville, Maryland.

Chmura, Gail L. and Neil W. Ross. 1978. The Environmental Impacts of Marinas and Their Boats: A Literature Review with Management Considerations. RIDEM Marine Advisory Service. NOAA/SeaGrant URI Marine Memorandum 45. 32 pg.

Citak, James. Connecticut Department of Environmental Protection, Hartford, Connecticut. Personal Communication, 1989.

Cortright, et. al. 1987. The Oregon Estuary Plan Book. State of Oregon, Department of Land Conservation and Development. 126 pp.

Demos, Catherine J. 1986. Environmental Assessment, Finding of No Significant Impact, Section 404 (b)(1) Evaluation: Proposed Maintenance Dredging of Little Narragansett Bay Rhode Island and Connecticut. Attachment 2. New England Division, U.S. ACOE, Waltham, Massachusetts. 15 pg.

Desbonnet, Alan. 1991. An Assessment of the Current Status of Water Quality and Pollution Sources in the Pawcatuck River Estuary and Little Narragansett Bay. University of Rhode Island Coastal Resources Center. Prepared for the Pawcatuck Estuary Interstate Management Project, Rhode Island Coastal Resources Management Council, Wakefield, RI.

Gaines, Jack L. 1982. Sanitary Quality of the Shellfish Growing Waters of Little Narragansett Bay, Rhode Island and Connecticut. Northeast Technical Services Unit, U.S. FDA.

Ganz, Arthur. RIDEM Division of Fish and Wildlife, Marine Fisheries Division, Shellfish. Personal Communication, 1989 and 1990.

Gibson, Mark. RIDEM Division of Fish and Wildlife, Marine Fisheries Division, Great Swamp Management Area, Kingston, Rhode Island. Personal Communication 1990.

Guthrie, Richard C., et. al. 1979. A Strategic Plan for the Restoration of Atlantic Salmon to the Pawcatuck River. RIDEM Division of Fish and Wildlife, U.S. Fish and Wildlife. 30 pg.

Howard-Strobel, et. al. 1987. The Narrow River Special Area Management Plan. Adopted December 8, 1986. Coastal Resources Management Council. 146 pg.

IEP, Inc. 1989. Comprehensive Plan Revision, Working Paper No.1: Natural and Cultural Resources. Prepared for: Westerly Comprehensive Plan.

Advisory Committee.

MacConnell, William P., et al. 1974. Rhode Island Map Down, Land-use and Vegetative Cover Mapping Classification Model. Circular No. 169, Cooperative Extension Service, URI, Kingston, RI.

McConnaughey, Bayard H. and Evelyn McConnaughey. 1985. Pacific Coast Audubon Society Nature Guides. New York: Knopf.

Merola, Paul. Connecticut Department of Environmental Protection, Franklin Wildlife Management Area, North Franklin, Connecticut. Personal Communication, 1989.

Miller, William R. and Frank E. Egler. 1950. Vegetation of the Wequetequock-Pawcatuck Tidal Marshes, Connecticut. Connecticut Fish and Game Service. Reprinted from Ecological Monographs, 20: 143-172.

Narragansett Times. 1986. "Coyote: A Problem in North Kingston". In: Narragansett Times, September 12.

Pellegrino, P.E. and W.A. Hubbard. 1983. Baseline shellfish data for the assessment of potential environmental impacts associated with energy activities in Connecticut's coastal zone. Southern Connecticut State University Foundation, Inc. New Haven, Connecticut. 177 pg.

Rosza, Ron. Connecticut Department of Environmental Protection, Hartford, Connecticut. Personal Communication, 1990.

Sisson, Richard T., et. al. 1987. Marine Sport Fisheries Investigations: Sportfish Population Surveys in RI Marine Waters. Draft Report. RIDEM Division of Fish and Wildlife.

Sisson, Richard T. RIDEM Division of Marine Fisheries, Wickford, Rhode Island. Personal Communication, 1990.

Sposato, John. Staff biologist, Rhode Island Coastal Resources Management Council, Wakefield, Rhode Island. Personal Communication, 1989.

Swimmer, Evelyn, et. al. 1984. Wood-Pawcatuck Rivers Study. Technical Report I. National Park Service, Mid-Atlantic Region.

U.S. Environmental Protection Agency. 1985. Coastal Marinas Assessment Handbook. U.S. EPA, Region IV, Atlanta, Georgia.

Vlaun, Marcia A. and Robert J. Birmingham. 1982. Town of Stonington Coastal Area Management Municipal Coastal Plan. Town of Stonington.

Connecticut and Connecticut DEP
Coastal
Area Management
Program.

Visel, Tim. University of Connecticut Seagrant, Avery Point, Connecticut. Personal Communication,
1989
and 1990.

Warren, R. Scott, William Niering, et.al. 1985. Barn Island Management Study. Unpubl. report. Connecticut DEP. 38 pg.

White, 1972.

Whitlach, Robert B. 1982. The Ecology of New England Tidal Flats: A Community Profile. U.S. Fish and Wildlife Service, Biological Services Program, Washington, D.C. FWS/OBS-81/01. 125 pp.

Williams, Jack E., James E. Johnson, et. al. 1989. Fishes of North America Endangered, Threatened, or of Special Concern: 1989.
Fisheries, Vol. 14,
No. 6.
Nov-

D e c 1989.
p p 2-20.

Willis, Jeffrey M. 1991. Technical Report #2. An Assessment of the Current Status of Recre ation a l Uses o n t h e Pawc atuck River Estua r y a nd Little Narra ganse t t Bay. Pawc atuck Estua r y Inters t a t e Mana geme n t Proje ct.

CHAPTER FIVE

Carpenter, Ben. Stonington Harbor Management Commission. Stonington, Connecticut.
Personal Communication, December 7, 1989.

Hall, John Frank Hall Jr. Boatyard and Assistant Harbormaster, Westerly, Rhode Island.
Personal Communications, December 14, 1989; January 11 and 24, 1990; and February 27, 1990.

Hall, Roger. Lotteryville Marina. Westerly, Rhode Island. Personal Communication, December 14, 1989.

Hetu, Henry. Cove Edge Bait and Tackle. Westerly, Rhode Island. Personal Communication, February 12, 1990.

McNeil, Eileen. Executive Director, Stonington Community Center, Stonington, Connecticut. Personal Communication, December 11, 1989.

Medeiros, Thomas. R.I. Coastal Resources Management Council. Wakefield, Rhode Island. Personal Communication, August 1 and October 16, 1990.

New Shoreham, Rhode Island, Draft Harbor Management Plan, 1990.

Pichette, Edward. Wequetequock Cove Boat Company. Stonington, Connecticut. Personal Communication, November 24, 1989.
Robinson, Neil. Manager, Watch Hill Yacht Club. Personal Communication, May 1, 1990. Sylvia, Francis, Sgt. Stonington Police Department. Town of Stonington, Connecticut. Personal Communications, May 1 and June 25, 1990.

Steadman, Larry. Assistant Harbormaster, Westerly, Rhode Island. Personal Communications, November 12, 1989; March 15 and 16, and June 25, 1990.

Stonington, Connecticut, Shellfish Commission meeting, 1989.

United States Army Corps of Engineers, New England Division. 1989. Guidelines for the Placement of Fixed and Floating Structures in the Navigable Waters of the United States.
U.S. Army Corps

Of Engineers, NED.
Waltham, Mass.

Watsky, Josh. Coveside Marina. Stonington, Connecticut. Personal Communications, December 6, 1989 and March 13, 1990.

Willis, Jeffrey M. 1991. An Assessment of the Current Status of Recreational Uses on the Pawcatuck River Estuary and Little Narragansett Bay. RI Coastal Resources Management Council, Wakefield, RI, developed for the Pawcatuck Estuary Interstate Management Project.